Aalborg Universitet

From "bugs" to exploratory exhibition design

Transforming design flaws in users experiences

Madsen, Kristina Maria; Vistisen, Peter

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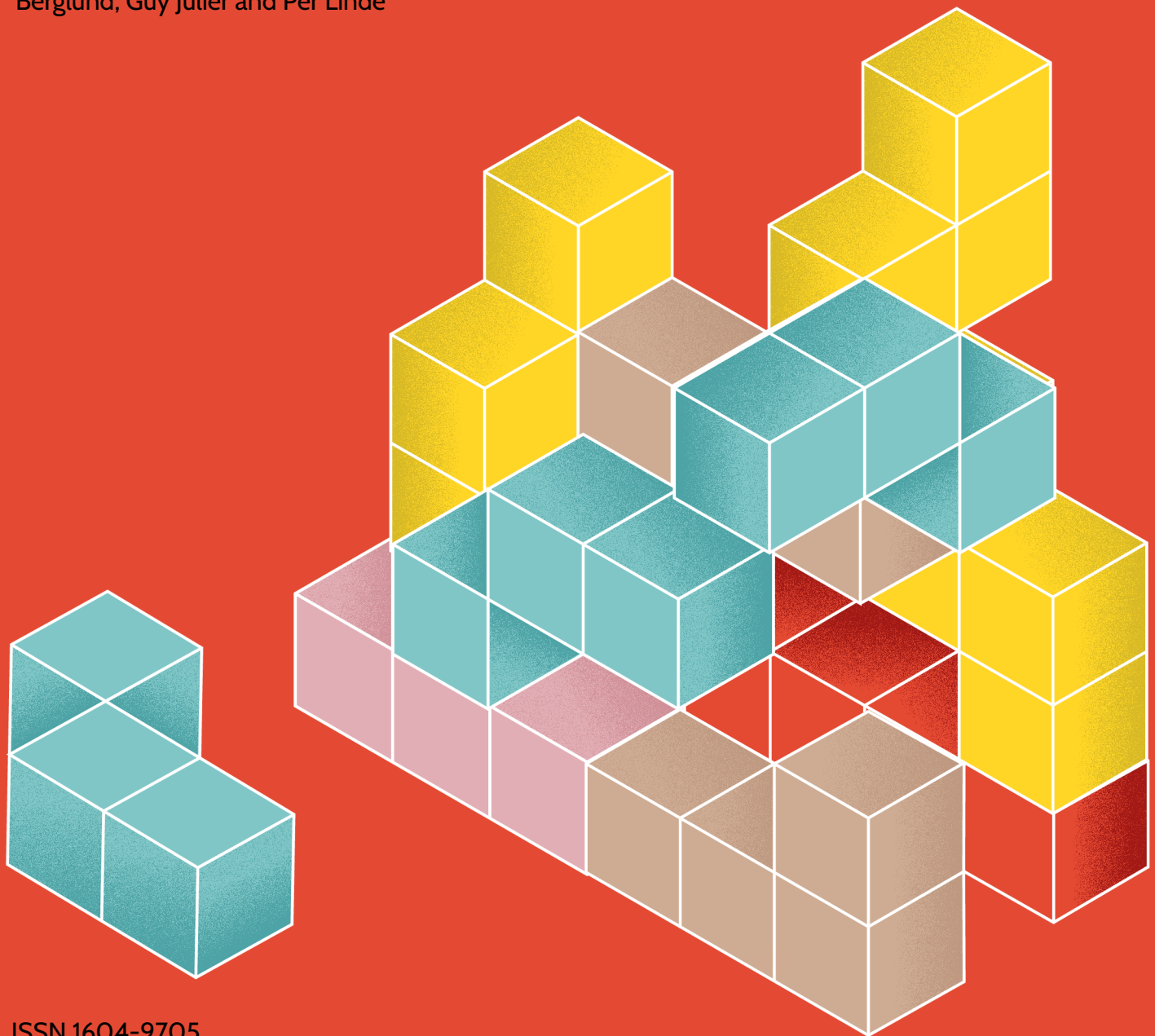
NORDES 2021

Matters of Scale

Proceedings of the 9th Nordic Design Research Conference, Kolding, Denmark

15-18 August 2021

Edited by: Eva Brandt, Thomas Markussen, Eeva Berglund, Guy Julier and Per Linde



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NORDES 2021

Matters of Scale

NORDES 2021

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NORDES 2021

About Nordes

NORDES – Nordic Design Research – was established in 2005 when design researchers from the Nordic countries decided to organize the first Nordic Design Research Conference which welcomed all kinds of design research as opposed to more narrowly defined research conferences. In addition to organising the biannual Nordes Conferences and Summer Schools, Nordes promotes the publication and dissemination of design research through the open access Nordes Digital Archive (nordes.org) and the DRS Digital Library (dl.designresearchsociety.org).

The ambition of Nordes is to be a vital inspirational platform that gathers scholars interested in design research no matter if one come from for instance the so-called artistic institutions, from universities, polytechnical universities, business schools or is an independent scholar. Over the years, Nordes has attracted still more contributions and participants from the rest of the world. Today, it is acknowledged as an international conference of the highest academic standards.

Nordes Commons is an open network of people interested in design research and participating in the Nordes Conferences, the Nordes Summer Schools or other Nordes activities. As part of the Nordes Commons network people will receive information about Nordes events and other issues of relevance for design and design research. All people taking part in the Nordes events will be offered to be part of the Nordes Commons network. Everyone in the Nordes Commons network will be called for a meeting to appoint the Nordes Board during the Nordes Conference.

The Nordes Board is responsible for all activities between conferences, for example Nordes Summer Schools. The Nordes board consists of the previous and present conference's General and Programme Chairs, as well as representatives from the Nordic countries not otherwise covered by those functions. The chair(s) of the board is the General Chair(s) for the next conference. The board meets when needed, at least twice a year. The General Chair(s) for next conference should be complemented by at least two Programme Chairs representing at least two countries. The Programme Chairs are proposed by the Conference Chair(s) and appointed by the board.

Currently (2019 – 2021) the Nordes Board consists of:

- Tuuli Mattelmäki (Aalto University, FI)
- Mette Agger Eriksen (KAD, DK)
- Satu Miettinen (University of Lapland, FI)
- Andrew Morrison, (AHO, NO)
- Henry Mainsah, (OsloMet, NO)
- Eeva Berglund, (Aalto University, FI)
- Per Linde, (Malmö University, SE)
- Guy Julier, (Aalto University, FI)
- Thomas Markussen, (SDU, DK)
- Eva Brandt (Design School Kolding, DK)

Nordes Programme Committee is recruited by the board to review research papers and other contributions. The requirement for being part of the Programme Committee is to have a Ph.D.-degree. At the pre-conference, Nordes Programme Committee Meeting, it is decided which contributions to accept or reject based on peer-review. Research papers are always subject to a double-blind, peer review process. Besides the Programme Committee takes part in developing the conference programme with sessions etc. at the Programme Committee Meeting.

The Nordes Summer School will normally be organised the year between the biannual conferences and in another country than the next conference. The board appoints the people responsible for organising the next summer school.

Nordes Publications are promoted through the DRS Digital Library (dl.designresearchsociety.org) and the Nordes Digital Archive (Nordes.org) that gives open access to design research presented at Nordes events and other design research such as doctoral dissertations. Nordes may also initiate and promote other forms of publication of design research. Responsibility for Nordes publications and particularly for the Nordes digital Archive are held by the board and those they appoint.

Previous Nordes Conferences

Who Cares?
8th Nordic Design Research Conference
3-6 June 2019, Aalto University, Espoo, Finland

Design + Power
7th Nordic Design Research Conference 2017
15-17 June 2017, AHO, Oslo, Norway

Design Ecologies
6th Nordic Design Research Conference 2015
June 7-10, 2015, Konstfack, Stockholm, Sweden

Experiments in Design Research
5th Nordic Design Research Conference 2013
June 9-12, 2013, KADK, Copenhagen, Denmark & Malmoe University, Sweden

Making Design Matter
4th Nordic Design Research Conference 2011
May 29-31, Aalto University, Helsinki, Finland

Engaging Artifacts
3rd Nordic Design Research Conference 2009
August 30-September 1, AHO, Oslo, Norway

Design Inquiries
2nd Nordic Design Research Conference 2007
May 27-30, Konstfack, Stockholm, Sweden

In the Making
1st Nordic Design Research Conference 2005
May 29-31, Royal Danish Academy, School of Architecture, Copenhagen, Denmark

Welcome to Nordes 2021: Matters of Scale

This volume is the proceedings of the 9th biennial Nordes conference, hosted by Design School Kolding and the University of Southern Denmark, 15 – 18 August 2021. All contributions relate in different ways to the overall theme, 'Matters of Scale'.

Designers are often invited to upscale their efforts to help solve the big challenges facing our societies and the planet. But just as often, the idea of upscaling is met with a critical requirement to evaluate, document and account for design-initiated change. Otherwise, the idea easily ends up representing "the overblown claims", as Geoff Mulgan once called them, that unfortunately stick to design.

"Scale is ubiquitous in the world of design, but its implications mostly go unnoticed"

Nordes 2021, Original Call for Submissions.

It has become evident over the decades that upscaling is not always the key and will not lead to the solutions needed to address the challenges proliferating in our troubled times. On the contrary, the urge to upscale itself arises out of the very beliefs and ideologies that are largely responsible for the distress that we – and our descendants – will have to deal with. Since the dawn of modern design, ideas of scaling have doubtless led to socially beneficial innovations and human well-being. But upscaling also leads to disastrous environmental as well as social outcomes. The utopian imaginaries of the modern movements that emerged in inter-war period were indeed duly critiqued. It became clear that the notion of 'modern design' itself needed to be de-scaled or trans-scaled to refrain from being too commercially driven, too megalomaniac, too discriminating - too much!

Scale offers itself as a constructive lens for scrutinizing these histories and narratives of design, helping to trace multiple critiques from postmodernism's satire and anti-design to today's ongoing feminist and post-colonial design discourse and practices. Scale may provide new explanatory power for understanding how design and sustainable future-making are practiced in an increasingly complex and unpredictable world. This is a world where the forces that condition design – markets, economies, politics, migration, pandemics – change and articulate in unexpected ways, not least due to processes of neoliberalization, globalization, and the normalization of digital technologies. And with the advent of Big Data and AI, life is now surveilled, exploited, and proactively speculated upon at unprecedented scales

Scale is also important for grasping how the notion of agency is, today, radically transformed from a question about the freedom to act in given structures, to a question of how we as a species can co-exist and survive with other species or artificial, hybrid organisms and plants. The Copernican revolution of our anthropocene epoch consist precisely in the discovery that climate change is the result of stacking ecologies with serious damages emanating from the human scale. In this situation, how can design be of value in efforts to to fundamentally change the way we live, work, produce, think, eat, dress, consume, communicate, and transport ourselves?

As scale is a feature of all systems, artefacts and organisms, understanding scales may provide designers and design researchers with significant insights in how to practice design for change. This raises a range of questions, such as how can design research be used to explore the interconnected aspects of scales and make them visible? What kinds of scalar relationships does design involve and how does – or might – design research identify, study and problematize these? What research methods and conceptual frameworks exist - or need to be developed - for enquiring into the multiple implications of scales in the world of design?

These and many other central questions are addressed in the four keynote talks, doctoral consortium, paper presentations, workshops and exhibitions that can be experienced at Nordes 2021. As to the number of submissions, we are grateful for all those designers/ design researchers and artists who proposed submissions and all those participating in the conference. Among the conference paper categories, there was an unusually high amount of full and exploratory papers submitted this year. Based upon double-blind peer reviews, of the 86 submitted there were 32 full papers accepted and 23 exploratory papers accepted of the of the submitted 73 proposals.

As design practice and processes are understood at Nordes to be invaluable and legitimate methods of inquiry, we have allocated a full conference day for 5 workshops, selected from 21 workshop proposals that were submitted. In addition, the exhibition Agency in the City of Kolding has been curated as an artistic scaling experiment in how the conference format itself can be challenged by breaking out of the institutional settings. In the form of eight urban interventions made by artists and designers from Australia, Belgium, Canada, Denmark, Germany, Poland, Portugal and Spain, the Nordes 2021 conference manifests itself at eight sites that can be experienced both online and physically in the city of Kolding. Furthermore, how scaling is at stake in some of the interventions will be a topic of discussion in the new initiative called 'Exhibition Conversations'. Last, but not least, four panelists will prompt debate with the delegates about new sites of design enquiry.

Nordes was established in 2005 by design researchers from Scandinavian design schools and universities. One can tell by the countries represented today by authors, workshop organizers, designers and artists that Nordes has truly become a venue for dissemination, attracting broad international attention. We are proud to present this year's high-quality conference programme and excited to see how participation will be conducted through the online format.

These proceedings largely follow the organization of the conference program. This means that full papers and exploratory papers are grouped within a number of sub-themes. Please have a look at the detailed program in order to get an overview of the papers. After the papers, there follow presentations of the eight works for the exhibition. A separate Nordes 2021 exhibition catalogue can be found at (https://conference2021nordes.org/). On the website you can also find videos from the exhibition. The proceedings conclude with the workshop descriptions. https://conference2021nordes.org/

Organizing the conference would not have been possible without the immense work, expertise and support invested by the scientific organizing committee, conference producers, session chairs, review committee, digital and media chairs, student/alumni volunteers, Design School Kolding, the University of Southern Denmark and the conference sponsors. Thank you to everyone!

We hope you will enjoy the conference and the proceedings!

Eva Brandt, Thomas Markussen, Eeva Berglund, Guy Julier and Per Linde
Conference and Program Chairs for Nordes 2021

Original Call for Submissions: Matters of Scale

Scale is ubiquitous in the world of design, but its implications mostly go unnoticed. Terms that are easy to use, like the global or human-scale, have widespread allure and even impact, yet they also hide and confuse.

Although scale is a fundamental feature of all systems, artefacts and organisms, it is surprisingly rarely reflected upon in design. In the abstract, scale points to mathematical features but it is, above all, inherently relational and comparative. To think about scale nearly always involves thinking about another context of activity or reception that is either inside, outside or beyond the immediate field of practice. Design research may be pivotal in how matters of scale are understood and acted on.

In these times of urgent troubles, problems appear to be large-scale and designers are often invited to 'scale up' their efforts to solve them, or defend the wellbeing or the rights of a universal 'human'. Meanwhile viruses, for instance, wreak havoc in machines and bodies across different orders of scale, connecting and disconnecting in complicated ways. If size, temporal duration, scope, territory and impact work in scalar ways in design, whether noticed or not, how can we learn to take scale seriously?

NORDES 2021 provides opportunities to explore the multiple roles, processes and impacts of scales across all areas of design and design research in all their manifestations. How does scale matter in the context of design, designs and designers? What kinds of scalar relationships does design involve and how does or might design research identify and problematise these? Full papers, exploratory papers, exhibition artifacts and workshops that, in design research, explicitly address the topic of 'Matters of Scale' are invited.

Potential conference themes may include, but are not limited to:
• Audit, measurement and ranking
• Manufacture, modularity and making
• Human-, non-human and other scales and calibrations
• Queer scales
• Communities, publics, diasporas, networks
• Governance, design for policy and implementation
• Downscaling, relocalising, resilience, resistance
• Territories, borders, shrinkage, dead spaces
• Economies of scale
• Temporal regimes: routines and irregularities; sprints and hacks
• Open, big and small data
• Prototypes, toolkits, archetypes, blueprints, guidelines, models
• Platforms and one-offs
• Representations, reproductions, fakes

The Nordes 2021 conference invites original papers and submissions addressing matters of scale in various ways. Papers will undergo double blind peer-reviews and accepted papers will be presented in the conference programme and published in the conference proceedings. The proceedings will be available as an open access online database during and after the conference.

Submissions to all categories receive peer review. We do not accept abstracts so in order to be considered full submissions need to be made within each category and uploaded before January 27nd 2021. Full and exploratory papers are subject to a double-blind, peer review process, and accepted full and exploratory papers will be published in the online Nordes Digital Archive (Nordes.org).

NORDES 2021

About Design School Kolding

Design School Kolding is an independent institution under the auspices of the Ministry of Higher Education and Science in Denmark. We teach about 350 students and offer BA, MA and PhD Degree Programs with education based on innovative practice and research in close collaboration with the business community and with public and private institutions. We also offer postgraduate courses and consultancy services. Our BA program comprises four study programs, Industrial Design, Communication Design, Fashion & Textile Design, and Accessory Design, including interdisciplinary courses within design methods, aesthetics, design history, the history of science as well as form studies.

Our MA program is an international, cross-disciplinary program that supports and expands the above-mentioned design fields and allows students to specialize in one of three areas: Design for Play, Design for Planet and Design for People to which we also dedicate our research and development activities within the three laboratories. We are a locally based learning environment that works internationally. By attracting talent and close partners from around the world, we provide our students with skills and contacts to engage effectively in a global labour market.

Design School Kolding has approximately 100 fulltime employees. The school offers a dynamic work environment with dedicated colleagues from many different backgrounds. The atmosphere enriches daily work and brings life to the old factory building in which the School is housed and which is constantly changing to suit the School's needs. With the three overall strategic areas of Social Design, Sustainability and Design, and Design for Play, Design School Kolding is dedicated to improving the world through design. This also means that Design School Kolding has a strong focus on creating an education that is relevant and aimed towards future employability. Another way of strengthening the education is by having research aimed towards the four directions of the BA programs, as well as towards the strategic areas. The research thus supports and develops the teaching while ensuring cross-pollination. We offer a dynamic, internationally oriented education and research environment with close collaborations with external actors and research environments.

NORDES 2021

About SDU

The University of Southern Denmark (SDU) is a state-financed, self-governing institution operating within the public administration under the supervision of the Ministry for Higher Education and Science. SDU have five faculties with more than 27,000 students, almost 20% of whom are from abroad, and more than 3,800 employees distributed across our main campus in Odense and regional campuses in Kolding, Slagelse, Esbjerg and Sønderborg. Several international studies document that we conduct world-class research and are one of the top fifty young universities in the world.

SDU Kolding is one of SDU's five regional campuses and with its location in the heart of Kolding, close to the train station, Kolding's other educational institutions and the local entrepreneurial environment, it is centrally located in the so-called Triangle Region in Jutland.

We are housed in a distinctive triangular building, which, with its characteristic appearance and its well-designed interior creates attention and constitutes an invitation for collaboration with internal as well as external parties. The building houses over 2,000 students and approximately 200 employees.

SDU Kolding provides the setting for research activities within the social sciences and the humanities, with entrepreneurship, design, relationship management, IT and communication as keywords. Research activities are often cross-disciplinary and involve a variety of collaborators. Municipalities, companies, and cultural and educational institutions throughout the region are a part of the activities, and the latest addition is the innovation environment Pakhuset at the Port of Kolding. As part of the Science Parks of Southern Denmark, Pakhuset brings together educational institutions, entrepreneurs, and companies in Kolding to create new solutions to the challenges of the future.

The research lays the foundation for innovative and socially relevant educational programmes that develop the individual student to take part in an ever-developing knowledge society. Several of the programmes at SDU Kolding are interdisciplinary and there is a focus on extraordinary talents such as for example the international Master's degree programme, European Master in Tourism Management.

NORDES 2021

Program Overview

2021 AUG **15** Sun.

DOCTORAL CONSORTIUM

CONFERENCE OPENING

PLENARY SESSION
Rethinking Scale

KEYNOTE: JAMER HUNT
The Powers of Eleven: How Shifts in Scale are Remaking the Possible

2021 AUG **16** Mon.

WELCOME

KEYNOTE: LENE TANGGAARD
Creativity – a Matter of Scale?

PARALLEL PAPER SESSION 1
Manageable Scales | Rankings and Other Values
Scaling Exhibitions | Resistances

PARALLEL PAPER SESSION 2
Futures (1) | Non-human and Other Scales | (Un)sustainability (1)

PARALLEL PAPER SESSION 3
Futures (2) | Bodily Scales | (Un)sustainability (2)

PARALLEL PAPER SESSION 4
Shifting Scales | Working Scales | Organisational Re-Scaling

EXHIBITION TOURS

2021
AUG
17
Tue.

WORKSHOPS

EXHIBITION CONVERSATIONS

PANEL DISCUSSION
Off-Topic - New Sites for Design Enquiry

KEYNOTE: CELIA LURY
How do we count ourselves? The New Political Arithmetic of Personalisation

2021
AUG
18
Wed.

PARALLEL PAPER SESSION 5
Policy Worlds | Weavings | Proximities

PARALLEL PAPER SESSION 6
Intimate Scales | Learning Scales | Urban Scales

KEYNOTE: MIKAEL COLVILLE-ANDERSEN
The Life-Sized City

CLOSING REMARKS

NORDES COMMONS MEETING

NORDES 2021

Detailed Program

15 - 18 August 2021

Program Day 1

2021 August 15th Sunday

(F) = FULL PAPER
(E) = EXPLORATORY PAPER

08:15	main room	Online technical support
09:00		**DOCTORAL CONSORTIUM**
12:00		LUNCH
13:00		**DOCTORAL CONSORTIUM**
16:00		BREAK
17:00	main room	**CONFERENCE OPENING** Eva Brandt and Thomas Markussen
17:30	main room	**PLENARY SESSION: RETHINKING SCALE** Session chair: Andrew Morrison **Rethinking Scale – Relationality, Place, and Critical Zone** Ole B. Jensen (F)
18:30		BREAK
19:00	main room	**KEYNOTE: JAMER HUNT** **The Powers of Eleven: How Shifts in Scale are Remaking the Possible** Introduction by Eva Brandt
20:00		END OF DAY 1

Program Day 2

2021 August 16th Monday

(F) = FULL PAPER
(E) = EXPLORATORY PAPER

08:15 main room — Online technical support

09:00 main room — **WELCOME**
Eva Brandt and Thomas Markussen

KEYNOTE: LENE TANGGAARD
Creativity – a Matter of Scale?
Introduction by Helle Marie Skovbjerg

10:00 BREAK

10:15 **PARALLEL PAPER SESSION 1**

zoom room A — **Manageable Scales**
Session Chair: Louise Ravnløkke

- **Teaching Size, Area and Scale**
  Ingri Strand and Eva Lutnæs (E)
- **On Wearing Diaries and Scaling Practices: Exploring Wardrobe Studies in Fashion Education**
  Julia Valle Noronha (E)

zoom room B — **Rankings and other Values**
Session Chair: Andrea Botero

- **Envisioning Large-Scale Effects of Teaching Values in Design**
  Anne Linda Kok, Eva Eriksson and Elisabet M. Nilsson (F)
- **Scaling up Diversity and Inclusion: From Classroom to Municipality**
  Annukka Svanda, Martina Čaić and Tuuli Mattelmäki (F)

zoom room C — **Scaling Exhibitions**
Session Chair: Andrea Wilkinson

- **Object/Display/Architecture: Integrating Scales in Museum Exhibition Design**
  Ane Pilegaard (F)
- **From "Bugs" to Exploratory Exhibition Design – Transforming Design Flaws in Users Experiences**
  Kristina Maria Madsen and Peter Vistisen (E)

zoom room D — **Resistances**
Session Chair: Liesbeth Huybrechts

- **Value, Design, Scale: Towards a Territories and Temporalities Approach**
  Guy Julier and Elise Hodson (F)
- **Counter-Framing Design: Politics of the 'New Normal'**
  Sharon Prendeville and Pandora Syperek (F)

11:15 BREAK

11:45

PARALLEL PAPER SESSION 2

zoom room A

Futures (1)

Session Chair: Josina Vink

Troubling the Impact of Food Future Imaginaries
Danielle Wilde, Markéta Dolejšová, Sjef van Gaalen, Ferran Altarriba Bertran, Hilary Davis and Paul Graham Raven (F)

The Design Fiction Matrix— A Synthesis Tool for Grounding Fiction Scenarios in Real Facts
Peter Vistisen (E)

Temporal Scales of Participation: a Rift Between Actors and Spectators
Alicia Smedberg (E)

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zoom room B

Non-human and Other Scales

Session Chair: Thomas Binder

'Design for Noticing' with Biodiversity Logbooks
Liz Edwards, Serena Pollastri, Linda Pye and Robert Barratt (E)

A Tale of a Wise City: A Speculation on Entanglements of Non-Humans and Humans in an Urban Space
Inna Zrajaeva (E)

Cocoon – Conceptualisation of a Virtual Membrane in the Current Transition Towards More-Than-Human Design
Cornelia Hulling, Jan von Loeper, Swathi Shivaraj, Yanyi Lu (E)

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zoom room C

(Un) sustainability (1)

Session Chair: Maria Göransdotter

Multiple Lives of the Products: An Investigation of Products' Journey in Freecycle Community
Ayşegül Özçelik and Ayşe Kaplan (F)

(Un)Weaving (Un)Sustainability
Sheida Amiri-Rigi and Despina Christoforidou (F)

13:15 LUNCH

CONTINUED

Program Day 2

2021 August 16th Monday

(F) = FULL PAPER
(E) = EXPLORATORY PAPER

14:00

PARALLEL PAPER SESSION 3

zoom room A

Futures (2)
Session Chair: Pandora Syperek

- **Amphibious Scales and Anticipatory Design**
  Andrew Morrison, Bastien Kerspern, Palak Dudani and Amanada Steggell (F)
- **Revealing Words for a Design Debate: A Design Lexicon Case**
  Yaprak Hamarat, Catherine Elsen and Çiğdem Yönder (E)
- **Transitional Design Histories: Present-ing History in Design**
  Maria Göransdotter (F)

zoom room B

Bodily Scales
Session Chair: Per Linde

- **Where did the Body Go? Re-Framing Human Scale**
  Andrea Victoria Hernandez Bueno, Cecilie Breinholm Christensen and Shelley Smith (F)
- **Breathing Commons: Affective and Somatic Relations Between Self and Others**
  Vasiliki Tsaknaki, Stina Hasse Jørgensen, Lena Kühn, Karin Ryding, Mai Hartmann, Jonas Fritsch and Maria Foverskov (E)
- **Scaling Bodily Fluids for Utopian Fabulations**
  Karey Helms, Marie Louise Juul Søndergaard and Nadia Campo Woytuk (E)

zoom room C

(Un) sustainability (2)
Session Chair: Anna Seravalli

- **Exploring Implications for Designing for Sociotechnical Transitions: Taking Reflexivity as s Matter of Scale**
  Peng Lu and Daniela Sangiorgi (F)
- **Rethinking Food: Co-Creating Citizen Science for Sustainability Transitions**
  Danielle Wilde, Anna Lena Hupe, Sarah Trahan, Caroline Guinita Abel, Solvejg Kjærsgaard Longueval and Corey McLaughlin (F)

15:30 BREAK

16:00

PARALLEL PAPER SESSION 4

zoom room A

Shifting Scales

Session Chair: Tuuli Mattelmäki

Challenges of Downscaling and Upscaling in Human Centered Design
Simon Nestler, Sven Quadflieg and Klaus Neuburg (F)

Big Data and Small Beginnings – How People Engage with Data Physicalizations
Jacob Buur, Jessica Sorenson and Christina Melanie Cooper (F)

A Matter of Scales: Experiential Evaluation as a Caring Platform Scales
Lieve Custers, Oswald Devisch, and Liesbeth Huybrechts (F)

zoom room B

Working Scales

Session Chair: Namkyu Chun

Distributed Thinking Through Making: Towards a Relational Ontology in Practice-Led Design Research
Luis Vega (F)

Tangled Becomings in Materialities of Felt Practice(s)
Bilge Merve Aktaş and Julia Valle Noronha (E)

The Extension of the Craftsman's Hand by Robotics
Flemming Tvede Hansen (E)

zoom room C

Organisational Re-Scaling

Session Chair: Canan Akoglu

Attempting to Resist Ontological Occupation when Designing for Scale in Healthcare
Josina Vink, Felicia Nilsson, Thiago Freitas and Shivani Prakash (F)

Developing a Design-Based Understanding of Learning in Transitions: A Multiple Case Study
Elif Erdoğan Öztekin and İdil Gaziulusoy (F)

Capturing Scales of Institutioning
Harriet Simms (E)

17:30

DINNER BREAK

CONTINUED

Program Day 2

2021
August 16th
Monday

19:00 | 21:30

PHYSICAL EXHIBITION TOUR

Tour Guide: Eva Knutz

1. One Square Meter
Site: Kolding Å
By Ekaterina Feil

2. I Am You
Site: Grafitti Tunnel
By Leah Ireland

3. Motion of Scales
Site: Narrow Path
By Mara Trübenback and Marianna Czwojdrak

4. Scale the Change
Site: The Spanish Stairs
By Maria Candela Suarez

5. Material as Playmates
Site: The Public Library
By Karen Juhl Petersen

6. Rewild
Site: The Station Square
By Aymeric Delecaut

7. mAcrobiome
Site: The Railway Tunnel
By Alison Marinas Palomino

8. Forgotten Spaces
Site: Kolding Habour
By Katharine Morag Graham

END OF DAY 2

19:00 | 20:30

main room

ONLINE EXHIBITION TOUR

Tour Guide: Kathrina Dankl

8. Forgotten Spaces
Site: Kolding Habour
By Katharine Morag Graham

7. mAcrobiome
Site: The Railway Tunnel
By Alison Marinas Palomino

6. Rewild
Site: The Station Square
By Aymeric Delecaut

5. Material as Playmates
Site: The Public Library
By Karen Juhl Petersen

4. Scale the Change
Site: The Spanish Stairs
By Maria Candela Suarez

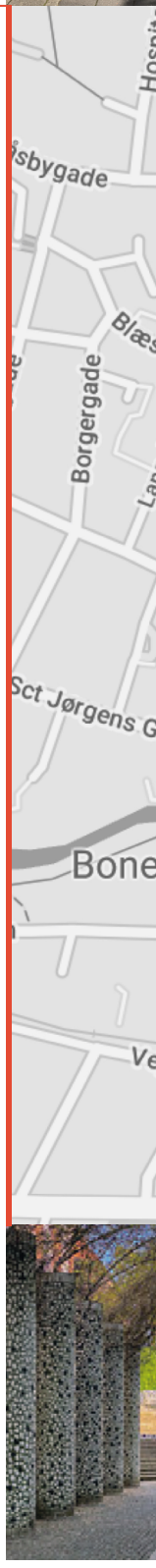
3. Motion of Scales
Site: Narrow Path
By Mara Trübenback and Marianna Czwojdrak

2. I Am You
Site: Grafitti Tunnel
By Leah Ireland

1. One Square Meter
Site: Kolding Å
By Ekaterina Feil

END OF DAY 2

SITE 5: The P



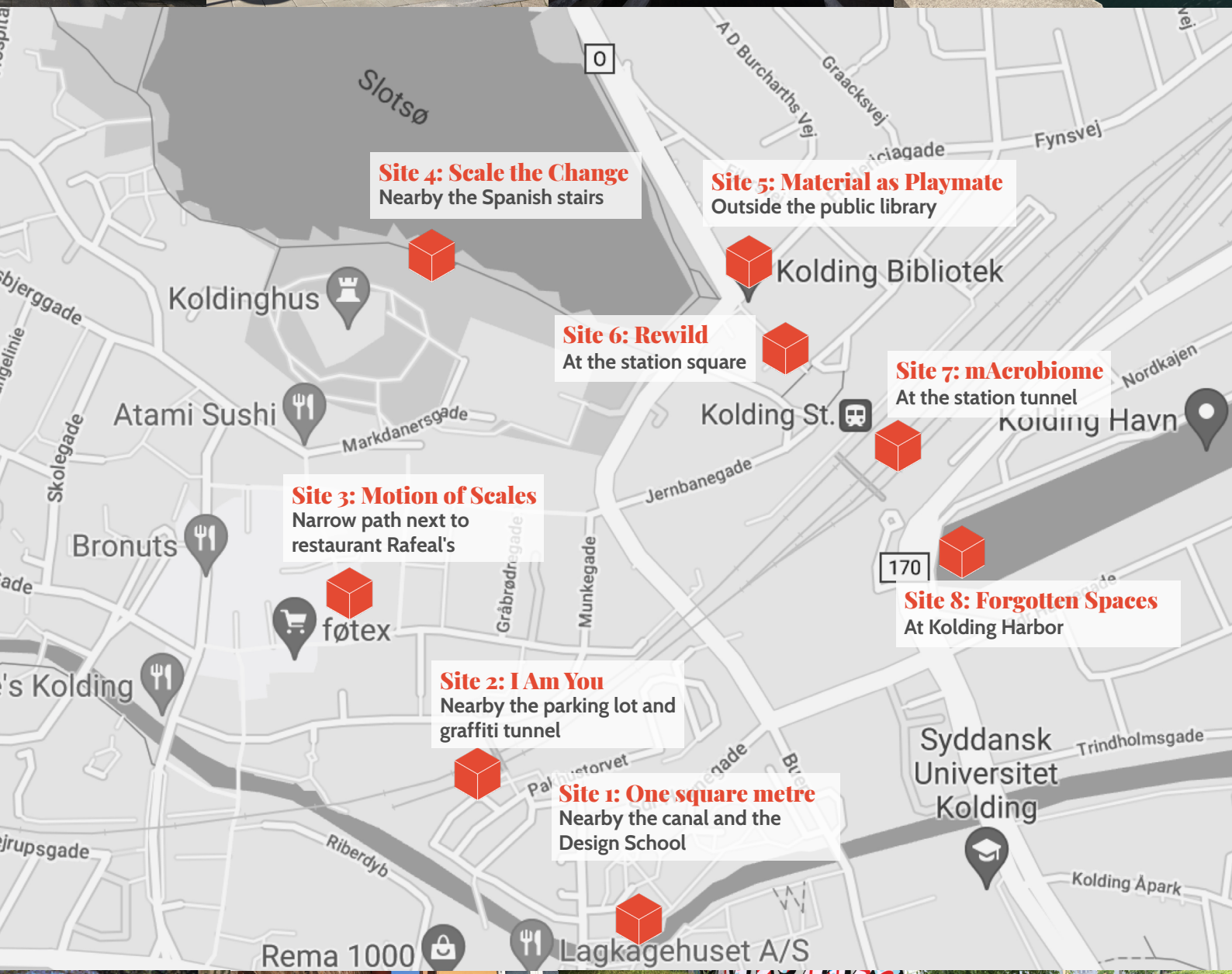
SITE 4: The Sp

Public Library

SITE 6: The Station Square

SITE 7: The Railway Tunnel

SITE 8: Kolding Habour



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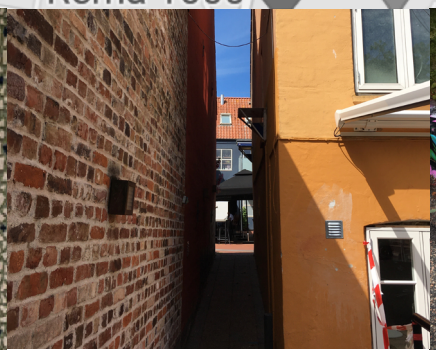

SITE 3: Narrow Path

SITE 2: Grafitti Tunnel

SITE 1: Kolding Å

Program Day 3

2021 August 17th Tuesday

09:00

WORKSHOPS

12 Principles of Social Design
Jocelyn Bailey, Lucy Kimbell, Patrycia Kaszynska and Christian Nold
HALF DAY

Stories for Collaborative Survival
Nicholas B Torretta, Lizette Reitsma, Brendon Clark, Per Anders Hillgren and Li Jönsson
FULL DAY

Residue of Interaction: Scaling Participatory Experiences
Andrea Wilkinson, Lieke Lenaerts, Niels Hendriks and Rita Maldonade Branco
FULL DAY

09:00 | 10:30

main room

EXHIBITION CONVERSATIONS

Scaling Art & Design in Public Space
Session Chair: Connie Svabo

12:00

BREAK

13:00

WORKSHOPS

Desis Philosophy Talk #7.3 Designing down to Earth: Introducing Re-worlding
Virginia Tassinari, Liesbeth Huybrechts, Ezio Manzini, Oswald Devisch and Annalinda De Rosa
HALF DAY

Stories for Collaborative Survival
Nicholas B Torretta, Lizette Reitsma, Brendon Clark, Per Anders Hillgren and Li Jönsson
FULL DAY

Residue of Interaction: Scaling Participatory Experiences
Andrea Wilkinson, Lieke Lenaerts, Niels Hendriks and Rita Maldonade Branco
FULL DAY

Designing Scales of Domestic Mending in Fashion
Louise Ravnløkke and Iryna Kucher
HALF DAY

16:00 BREAK

16:30 main room **PANEL DISCUSSION:**
Off-Topic - New Sites for Design Enquiry
Session Chair: Thomas Markussen
Panellists: Natalia Särmäkari, Vicky Gerrard, Anna Valtonen, Ingrid Mulder

17:30 BREAK

17:45 main room **KEYNOTE: CELIA LURY**
How do we count ourselves? The New Political Arithmetic of Personalisation
Introduction by Guy Julier

END OF DAY 3

Program Day 4

2021 August 18th Wednesday

(F) = FULL PAPER
(E) = EXPLORATORY PAPER

09:00

PARALLEL PAPER SESSION 5

zoom room A

Policy Worlds
Session Chair: Lucy Kimbell

- **Co-Citizen Design Labs in Resilience Making**
  Stephanie Carleklev and Wendy Fountain (F)
- **Beyond a Living Lab: Scaling Social Innovation**
  Signe Yndigegn, Lone Malmborg, Maria Foverskov and Eva Brandt (F)
- **In search of (Organizational) Learning and Translation in Public Innovation Labs**
  Anna Seravalli (F)

zoom room B

Weavings
Session Chair: Karen Marie Hasling

- **Fibre, Fabric, and Form: Embedding Transformative Three-Dimensionality in Weaving**
  Kathryn Walters (F)
- **Between Yarns and Electrons: A Method for Designing Textural Expressions in Electromagnetic Smart Textiles**
  Erin Lewis (F)
- **Prototyping Scales of Knitwear Design for Sustainability**
  Louise Ravnløkke (F)

zoom room C

Proximities
Session Chair: Brendon Clark

- **Critical Proximities**
  Henrik Oxvig (F)
- **Living World Dynamics - Or what Brian Eno can Teach us About Knowing in a Complex World**
  Connie Svabo (F)
- **Tracing Matters of Scale by Walking with Minerals**
  Petra Lilja (F)

10:30 BREAK

11:00

PARALLEL PAPER SESSION 6

zoom room A

Intimate Scales

Session Chair: Yaprak Hamarat

On DIY Cloth Face Masks and Scalar Relationships in Design
Joanna Saad-Sulonen, Andrea Botero and Mille Rosendahl Hansen (E)

Places in the Making: How Fashion Design Transforms the Multitude of Scales
Namkyu Chun (E)

Thinking With/In the Wardrobe
Anna-Mamusu Sesay (E)

zoom room B

Learning Scales

Session Chair: Eeva Berglund

Micro-Scale Curriculum Development in Design for Sustainability Education
Karen Marie Hasling and Louise Ravnløkke (E)

Re-Thinking Pedagogy and Dis-Embodied Interaction for Online Learning and Co-Design
Salu Ylirisku, Giyong Jang and Nitin Sawhney (F)

Appropriating a DBR Model for a 'Research Through Codesign' Project on Play in Schools - to Frame Participation
Hanne Hede Jørgensen, Helle Marie Skovbjerg and Mette Agger Eriksen (F)

zoom room C

Urban Scales

Session Chair: Jacob Buur

Scaling Up and Down. Landscape Design Processes and Choreographic Inquiry
Enrica Dall'Ara and Melanie Kloetzel (E)

Scaling Experiments in Urban Space – An Exploratory Framework
Eva Knutz and Kathrina Dankl (E)

Closer to Earth: Scales of Planning for Urban Waters
Kristine C.V. Holten-Andersen (E)

12:30 LUNCH

13:30 main room

KEYNOTE: MIKAEL COLVILLE-ANDERSEN

The Life-Sized City
Introduction by Eeva Berglund

14:30 CLOSING REMARKS

15:00 BREAK

15:30 | 16:30 main room

NORDES COMMONS MEETING

Nordes conference 2023
Nordes Summer School 2022 (PhD school)
Feedback & Learnings

END OF CONFERENCE

NORDES 2021

Keynotes

Jamer Hunt
Lene Tanggaard
Celia Lury
Mikael Conville-Andersen

The Powers of Eleven: How Shifts in Scale are Remaking the Possible

We often think of scale in two straightforward ways: as a means for comparing the relative size of things, or as a process for increasing the market share of a business product. In this presentation, Jamer Hunt suggests that we must begin to understand scale as a conceptual framework for thinking through the present. Digital dematerialization and network entanglements are deforming our perception and conception of scale and unsettling our capacity to link cause and effect — or design with its outcomes. Cutting across disciplines and ranging across topics (from ants to traffic circles and from surveillance systems to COVID-19), this presentation will x-ray our current social predicaments and outline design strategies for navigating the complexity of our many "broken" systems.

Jamer Hunt

Vice Provost for Transdisciplinary Initiatives

Associate Professor of Transdisciplinary Design University

The New School, Parsons

Biography

Jamer Hunt collaboratively designs open and adaptable frameworks for participation that respond to emergent cultural conditions — in education, organizations, exhibitions, and for the public. He is the Vice Provost for Transdisciplinary Initiatives at The New School (2016-present), where he was founding director of the graduate program in Transdisciplinary Design at Parsons School of Design (2009-2015). He is also Visiting Design Researcher at the Institute of Design in Umeå, Sweden. He is the author of Not to Scale: How the Small Becomes Large, the Large Becomes Unthinkable, and the Unthinkable Becomes Possible (2020), a book that repositions scale as a practice-based framework for navigating social change in complex systems. Fast Company has named him to their list of "Most Creative People." With Paola Antonelli at the MoMA he was co-creator of the award-winning, curatorial experiment and book Design and Violence (2013-15). They have also collaborated on the Design and the Elastic Mind symposium as well as on HeadSpace: On Scent as Design, and he served on her Advisory Committee for the XXII Milan Design Triennial Broken Nature. With Hilary Jay he co-founded DesignPhiladelphia in 2005, at that time the country's largest design week. He has published over twenty articles on the poetics and politics of design, including for Fast Company and the Huffington Post, and he is co-author, with Meredith Davis, of Visual Communication Design (Bloomsbury, 2017).

Lene Tanggaard

Rector at Design School Kolding

Professor of Psychology in the Department of Communication and Psychology at the University of Aalborg, Denmark

Creativity – a Matter of Scale?

In this presentation, the point of departure will be the recent moves in creativity research towards more relational, distributed and cultural-historical, systems-oriented perspectives on creativity. This implies that researchers increasing try to research creativity in real-life settings outside the laboratory or the testing situation, even if the lab or the test are still the norm instruments researching creativity. However, cultural-historical, relational and distributed theories make the way for larger, more encompassing and broader ideas of what creativity is. Accordingly, moving outside the laboratory requires creativity researchers to think more about scales; going from the small and controllable lab or testing situation towards reaching the complexity of creativity in the midst of everyday life. This means going from researching situations (in the lab, in the testing situations or in the survey) towards understanding the process of creativity or of being creative as it moves along trajectories of participation in social practices in material and temporal terms not downsized to one point in time measured by one instrument. Although the concept of scale has not been in the center of research on creativity from cultural-historical, relational and distributed perspectives, it might pave the way for new, innovative, methodological experiments. What this might mean for understanding and researching design and not least the process of being creative as a designer will be discussed.

Biography

Lene Tanggaard is Rector at Design School Kolding and Professor of Psychology in the Department of Communication and Psychology at the University of Aalborg, Denmark where she has been supervisor for more than 20 PhD.-students as well as Director of The International Centre for the Cultural Psychology of Creativity (ICCPC), and co-director of the Center for Qualitative Studies, a network of more than 90 professors and researchers concerned with methodology and development of new research tools. She is regional editor of The International Journal of Qualitative Research in Education. Recent publications include: Glaveanu, V. P., Tanggaard, L. & Wegener, C. (2016 red.), Creativity: A new vocabulary Palgrave Macmillan, Tanggaard, L. (2018). Creativity in Higher education: Apprenticeship as a 'thinking-model' for bringing back more dynamic, teaching and research in a university context. In: J. Valsiner (red.). Culture and Higher Education: The making of knowledge maker. (1. edition, Vol. 1.) and Tanggaard, L. (2018). Content-driven pedagogy: on passion, absorption and immersion as dynamic drivers of creativity. In: R. Beghetto & G. Gorazza (red.). Dynamic Perspectives on Creativity: New Directions for Theory, Research, and Practice in Education. (1. edition, Vol. 1).

How do we count ourselves? The New Political Arithmetic of Personalisation

Scholarship on the history of statistics has provided us with an understanding of the crucial role of 'political arithmetic' in classical liberalism, where subjects perceived themselves as autonomous individuals with separate interests in an abstract system called society. This society and its component individuals became intelligible and governable through what has been described as a deluge of printed numbers. Probabilities enabled commensuration and comparison of distributions in a way that made society as a whole intelligible and governable. The proposal developed in a collaborative project, People Like You: Contemporary Figures of Personalisation (peoplelikeyou.ac.uk) is that the categories, numbers and norms of this 'statistical' political arithmetic have changed in a ubiquitous culture of personalisation. In this paper, I develop this claim by exploring the kinds of scaling that are at work in the emergence of 'personalised generics' such as #MeToo and MyUniversity, focusing on their relational, comparative and perspectival possibilities.

Celia Lury

Professor in the Centre for Interdisciplinary Methodologies at Warwick University

Biography

Celia Lury is Professor in the Centre for Interdisciplinary Methodologies at Warwick University. She is currently working on a collaborative medical humanities project: "'People Like You': contemporary figures of personalization". A new publication is Problem Spaces: Why and How Methodology Matters, Polity 2020. Deriving from her interest in the way 'live' methods represent social worlds, she works on interdisciplinary methodologies, feminist and cultural theory, sociology of culture, consumer culture, and algorithms. Celia Lury is co-editor of Routledge Handbook of Interdisciplinary Research Methods (Routledge, 2018), Inventive Methods: the Happening of the Social, (Routledge, 2012), and Measure and Value (Blackwell, 2012), among other volumes.

Mikael Colville-Andersen

Urban designer

Author and host of the documentary TV series The Life-Sized City

The Life-Sized City

Through his work as an urban designer in over 100 cities around the world and his experiences filming his global TV series about urbanism, The Life-Sized City, Mikael Colville-Andersen will speak about how in this, the Age of Urbanism, we are thinking differently about our cities for the first time in a century. We need to return to designing our cities for people instead of merely engineering streets. Citizen engagement is a key element in our shift towards life-sized cities. Mikael will inspire with his philosophies as well as fantastic ideas he has seen in his work all over the planet.

Biography

Mikael Colville-Andersen is one of the leading global voices in urbanism. He has worked in over 100 cities around the world, advising about how to design – and embrace – bicycle and pedestrian friendly streets in order to improve urban life. He is known for his pioneering philosophies about simplifying urban planning and how cities and towns should be designed instead of engineered. Mikael Colville-Andersen is the author of Copenhagenize – the definitive guide to global bicycle urbanism and the host of the urbanism tv series. He motivates with his keynotes around the world about how to make cities better through design thinking, how cities should be at the forefront of fighting climate change and how this Age of Urbanism is inspiring citizens around the world.

NORDES 2021

Plenary Session:
Rethinking Scale

Session Chair | Andrew Morrison

Rethinking Scale-Relationality, Place, and Critical Zone

Ole B. Jensen

NORDES 2021

RETHINKING SCALE – RELATIONALITY, PLACE, AND CRITICAL ZONE

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ABSTRACT

Scale is an important concept. It works in geography, architecture, urbanism and a number of other areas. It also works in the 'real world' of humans where it organizes societies and fuel politics. Scale gather people in collectives, as well as it works a political force for pitting them against one another. Hence scale is far from neutral. In this paper, we want to critically challenge an understanding of scale as something fixed, structural, obdurate, and ordered. Rather we encourage a thinking of scale as something related to fluidity, mobility, networks, and continuums. Rethinking scale along these lines is important for the academic understanding of the world, as well as it is key to many of the global and planetary challenges of the immediate future. This will be discussed with reference to the notion of 'Critical Zone' at the end of the paper.

INTRODUCTION

A perception of scale as fixed, ordered, layered, human, and sedentary is problematic in a context global challenges and environmental multi-species crisis. Ideas about scale as either something 'out there' or simply an act of the imaginary are equally unhelpful. Some design practitioners and architectural theorists frame scale as fixed, bounded, and professionally identity-giving (from more than 20 years of co-teaching in an academic architecture and design program, this author has heard many statements from architectural lecturers seeing themselves as 'building architects' defined by the 'building scale'). Here scale is ontologized as an ordered, hierarchy fitting with a particular layer of reality. The notion that scales are existing as 'layers of reality' is problematic in the sense that such fundamentalization of scale tends to ignore the relational processes of becoming. Furthermore, the notion of scale a 'layers of reality' obscures the fact that entities in the world are related across domains such as subjects and objects, humans and non-humans. Ideas about holism and continuity blurs the parceling of reality into distinct (scalar) layers. Within architecture and urbanism some scales are furthermore vested with normative judgement. Such is the 'human scale' which often is pitched as the 'good' scale and perspective up and against top-down plans and 'inhumane' urbanist schemes. Seeing the world from the point of view of the 'human scale' is thus considered to be normatively on the side of humanism and progressive politics. In this paper we shall not dispute the relevance of taking the perspective of the human, neither of the citizen – on the contrary. However, what is problematic is an unquestioned and uncritical understanding of normativity and scale. Somewhere between the materialism of scales being 'out there' and the idealism of seeing such as purely mental constructs needs to be located a rethinking of scalar ontologies. The same goes for seeing a particular human scale as the best place to intervene (at times we might indeed need to move beyond the human to make sense of the world). Scales are often seen as ordering devices. As a framing bringing order and hierarchy to an unruly world. From nation building and politics of territoriality to business organization the order produced by scale is key in a stratifying taxonomy.

In this paper we want to offer a rethinking of the of scale in such a manner that we move beyond both sedentary and nomadic ontologies (Cresswell 2006), as well as we propose to break with modernist dichotomies such as subject and object. The looking beyond such dualisms also problematizes the separation of nature and culture as well as it rearticulate a focus on seeing the relatedness of entities in the world. The latter perspective might be termed 'holistic' in lack of a better term. The critical point of departure for such a

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rethinking may be located in many places. Hence, the thinking within 'new materialist' discourse may indeed be helpful here (e.g. Bennett 2010; Tønder 2020). Moreover, we may seek inspiration in the works of Bruno Latour (2005) and Tim Ingold (2011) as an attempt to 'blow up' the confinements of scalar fixities. In relation to spaces and human practices the work coming out of the so-called 'mobilites turn' may be equally fruitful. Thinkers such as John Urry (2000), Mimi Sheller (2018) and Tim Cresswell (2006) with their focus on relations and Mobilities are relevant. Working from within the area of the mobilities turn John Urry thought rather critically about the notion of scale. In particular what he termed the 'linear metaphor of scale' (Urry 2003:122). On par with Latour, Urry saw the social sciences being marked by a simplistic and un-critical scalar thinking. One that relied on the linear metaphor of scale as '*stretching from the micro level to the macro level, or from the life world to the system'* (ibid.). Rather, Urry argued, we should apply a metaphor of 'connections' as a substitute for the idea of scale. As Urry, Latour saw the metaphor of scale as something that has 'haunted' social science and which needed to be substituted by a notion of connections and networks (Latour 2006:212).

Scale suggest that there are levels or layers (their ontological status notwithstanding) which means that one way of thinking about scale is to perceive it as a device for subdivision or analytical dissection (Harvey 1996). Thinking about cities and their components may indeed be compared with an act of analytical dissection or subdivision if we for instance start 'breaking it down' into quarters, neighborhoods, streets, blocks, houses etc. Such scalar dissection furthermore lends itself to a political and organizational perspective since we do not only dissect by scalar levels to increase our analytical understanding, but we may also apply the scalar dissections and levels as organizational principles. Hence, spatial organizations related to neighborhood councils, city halls, regional assemblies, national parliaments and even supra-national entities such as the European Union or the United Nations. The two scalar logics of *spatial analysis* and *political organization* may also fuse into a perception of how to solve problems and transformational challenges. This is for example the case when a political challenge is recognized to be addressed at 'more levels' (i.e. scales). Environmental challenges may not adequately be dealt with at local levels only as well as for example the migration crisis needs to be addressed at levels beyond national regulatory frameworks.

SIZING UP – SCALE AS SIZE

Within some quarters of social science the idea of society is synonymous with 'large scale'. However, already Georg Simmel was aware that society is not a 'big thing' but rather a complex of myriad associations and interactions. He renounced the classic analogy of society as being like a body with important organs such as brain, heart etc. Rather he spoke of the 'numerous unnamed tissues' that connects the multiple associations (2019:53). So from Simmel and onwards some sociologist has been able to mobilize a critique of society as 'big scale' as well as the distinction between 'micro and macro' sociology. In mainstream social science, scale has, however, become synonymous with size. In the word of Latour:

> 'Whenever we speak of society, we imagine a massive monument or sphere, something like a huge cenotaph … society, no matter how it is construed to be, has to be something large in scale … the problem is that social scientists use scale as one of the many variables they need to set up *before* doing the study, whereas scale is what actors achieve by *scaling, spacing*, and *contextualizing* each other through the transportation in specific vehicles of some specific traces' (Latour 2005: 183-4, Italics in original)

Latour's position is that 'scale is the actor's own achievement' (p. 184). However, rarely is this accepted since scale tends to be thought of as a 'well-ordered zoom' (ibid.). Scaling within the social sciences are, according to Latour, a way of 'putting things into frame'. Something that is considered disciplinary and scholarly needed in order to bring reality under either control or as an object of knowledge. Latour is not arguing against scalar framings as such, but he problematizes when the effects of scaling are left unacknowledged or un-reflected. The parallel is a 'zoom' attempting to order matters smoothly as a set of Russian dolls. He reminds us that: '*Events are not like tidy racks of clothes in a store. S, M, X, XL labels seam rather confusingly distributed; they wane and wax pretty fast; they shrink or enlarge at lightning speed'* (p. 186). For Latour, the notion of scales within the social science points towards totalizing and ordered representations forgetful of their own blind spots.

According to Herod, the notion of scale was prior to the 1980s pretty much taken for granted within social science (2011:5). However, a heated debate within human geography led to a positioning of scales as either something real and existing in the world, or as a mental framework imposed on the world. This distinction is the key between a 'materialist' and an 'idealist' notion of the ontological status of scale (p. 13). However, in line with the thinking of Latour some started to think about scales as 'topological' rather than as areal units (p. 23), seeing neither the global nor local as nearly as interesting as the intermediary arrangements of networks (Latour 2006). If one extends this interest in

the 'continuum of links' across geographies, scale should not only become something which is less fixed and sedentary. It will also need to be understood beyond a mere two-dimensional and plane area. In other words; scales are volumes and hence three-dimensional (this point will be discussed further below). Coming out of the dispute over the ontological status of scale as something either material or mental, Moore took a different standpoint. Rather than choosing one or the other, Moore argued that one had to make a distinction between scale as a 'category of practice' and scale as a 'category of analysis' (Herod 2011:35). Such a so-called 'non-substantial' approach to scale partly seems to acknowledge (in a very pragmatic sense) that scales might 'work' as humans oriented themselves according to these (in politics as in everyday life). Moreover, it lays emphasis on processes and relations as an attempt not to reify scale (p. 37). Bob Jessop and colleagues criticizes a scalar reductionism and essentialism within social science (ibid.). As an outcome of this critical discussion, they used the terms territory, place, scale and network to make a more nuanced placing of scale within the theoretical vocabulary of social science.

METAPHOR OF SCALE / SCALE AS METAPHOR

Many theoretical concepts may be fruitfully analyzed from the point of view of metaphor. The literature on metaphors is rich and comprehensive so we cannot do this theme full justice. However, scale has been described by numerous metaphors. First of all, we should acknowledge that 'metaphor' means transportation (Herod 2011; Lakoff & Johnson 1980; Rigney 2001; Schön 1993). In essence, metaphor is about 'understanding and experiencing one kind of thing in terms of another' (Lakoff & Jonhson 1980:5). So a metaphor 'transports' meaning from one semantic domain or context to another. This we know from poetry and arts, but in our everyday life metaphors are prevalent (ibid.). The concept of scale drives its meaning from Latin and hence the notion of 'scala' has led 'stairs' to be one of the predominant metaphorical references (Herod 2011:15). Seen metaphorically 'scale as stairs' then refers both to taxonomy and order, as well as to hierarchy.

We find a number of different scalar metaphors; ladders, music scales, concentric circles, 'Russian dolls', tree roots, earthworm burrows, and spider webs to mention a few (Herod 2011:45-56). Herod and Wright argues that a central dispute related to scale within human geography is whether scale is a material feature that can be 'seen' in the landscape, or if they are an arbitrary mental device enabling making sense of the world (2002:5). The dispute over the ontological status of the notion of scale within geography has pitched a set of materialist against idealist assumptions.

According to Herod and Wright, the ontological dispute and the competing metaphors for scale has led to a third key feature related to the discussion of scale within human geography, namely that of the 'politics of actually producing scale' (ibid.). More metaphors are, however, within the interpretative horizon of the notion of scale. One such example is the notion of scale as within music where one will find a particular set of tonal intervals as being the defining characteristics of specific scales. Again we see a systematic device that orders particular elements within a structure (however, this time with a sense of dynamics and temporality as its root). However, as we shall see other metaphors have been entering the scalar discussion (networks, meshworks, rhizzomes etc.). Metaphors that signify less structure and fixity, and more openness and process-orientation.

THE NORMATIVITY OF 'THE HUMAN SCALE'

Within architecture and urbanism the notion of the 'human scale' has more than a descriptive ring to it. From writers as diverse as Steen Eiler Rasmussen (1959) over Jane Jacobs (1961) to Jan Gehl (1996) the notion of a 'human scale' has not only to do with size and proportion, but also with an idea of human values or of taking into consideration the experiences and life conditions of humans. The criticism of modern urban planning with large-scale infrastructures and city-wide systems let to the perspective of the 'human-centered' architecture and planning. Taking the position of the human has to do with seeing the designed and 'made' world from the point of view of the human body with its sensorial capacities, as well as it has to do with ideas about human flourishing and humanistic values. This is a complex history that we cannot do justice here. However, the position of Jan Gehl and since his studio 'Gehl Architects' have been one of the most predominant advocates for the 'human scale' so here we shall mainly reference their work and thoughts. In the book '*Soft City – Building Density for Everyday Life*' published by the studio, the position of an urban design with point of departure in the 'human scale' is put forward:

> 'Human Scale in general terms means dimensions rooted in the human senses and behavior, resulting in smaller built components and lower heights. In particular, it means designing with attention to the experience at eye level, including appealing to sensory stimuli, and using dimensions that relate to the human body' (Sim 2019:220)

There is much reason to have sympathy for this approach. Recognizing the positionality of soft bodies and limited sensory capacities (which actually should be the way in which we perceive ourselves as species) do

require building and designing things with empathy (Fjalland & Samson 2019; Veselova 2019). Much design, architecture and urbanism seem to disregard these ideas and the critique of master plans, rational top-down schemes, and mega-structures are easily connected to a progressive bottom-up type of 'everyday urbanism' (Chase et al. 1999). Both Jacobs (1961) and Gehl (1996) have laid the foundation for a critique of architecture and urbanism beyond the human scale. It is, however, perhaps too easy to follow this advocacy for a normative conception of the human scale. Questions of wider societal goods, practicalities of thinking across larger scales, and the critical and reflective understanding of locality and smallness as something potentially also regressive, dismissive and exclusionary needs to be looked into as well. Balancing the understanding requires not taking the human scale as the only perspective. So even though the critical-normative attempt to think scale progressively is valued, we would argue for a more 'progressive sense of place' (Massey 1994). One that also acknowledge the planetary background to human practices, architecture and urban design (Latour & Weibel 2020).

The Dutch enfant terrible of architecture, Rem Koolhaas published the 1344-pages long book '*S, M, L, XL'* in 1995. Together with Bruce Mau he gave an account of some contributions from his studio 'Office for Metropolitan Architecture' (OMA). The book recognizes architecture as a 'chaotic adventure' seeing the scalar ordering as a viable way to organize the material (Koolhaas & Mau 1995:xix). The idea would be to present projects and ideas according to size as the only organizing principle, with 'no connective tissue'. Besides organizing architectural projects according to scale (here defined a size), the book in itself is claimed to have an 'epic scale' (ibid.). The 'big-ness' of the book clearly served as a PR stunt raising urbanists and architect's interest across the world. Here we are not engaging in the content, simply taking this as an interesting example of how scale (as size) may work as an attempt to impose some level of narrative hierarchy to the practices and thoughts of an architectural studio. On a meta level the scale of the book signified the multi-scalar dimension of architectural thinking and urbanism. In particular there is an essay in the book dedicated to '*Bigness or the problem of Large*' (ibid, p. 495). The essay is written in the upbeat tone as is well-known form Koolhaas' architectural writings, and in it he boldly state that:

> 'Bigness no longer needs the city: it competes with the city; it represents the city; it pre-empts the city; or better still, it *is* the city. If urbanism generates potential and architecture exploits it, Bigness enlists the generosity of urbanism against the meanness of architecture. Bigness = urbanism vs. architecture' (ibid., p. 515, italic in original)

It is hard to say what Koolhaas precisely means here and the polyvalent vagueness of his statements has grown to become a watermark of his writings. One interpretation of this book, and of the problem of bigness in particular, is that there is a blurring of the scales that used to be defining characteristics for a division line between architecture and urbanism. In a frenzy dynamic of technology and Capital Koolhaas witnessed a bold and cynical 'tabula rasa urbanism' sweeping over the globe. From Singapore and Asian leapfrogging urban agglomerations, to the questioning of new beginnings and abolitions of European 'heritage', Koolhaas' scalar provocations re-ordered the order of scale in architecture.

PLACE – A CRITICAL 'WINDOW' INTO SCALE

The dispute between a sedentary and nomad perception (or ontology) of places that has been described in the literature (e.g. Cresswell 2006; Kolb 2008) may serve as a 'window' into scalar discussions. Thinking about places as either fixed and bounded, or open and relational draws lines into underpinning ideas about relations to place, definition of sites and identities of belonging. Sedentary conceptions of place such as the ones advocated by Sennett (1994) or Nordberg-Schulz (1971) draws on phenomenological and conservative ideas that point towards equally fixed and sedentary notions of scale. In opposition hereto, nomad ontologies of place draws on ideas of flows, movement and non-essential place attachment as in Deleuze & Guattari, (1987/ 2003) or Natter & Jones (1997).

However, somewhere between these two poles lies a perception of place that is relational, open, and process-oriented (Jensen 2009). Proponents for this middle ground are thinkers such as Massey with her notion of a 'progressive sense of place' (1994), but also Cresswell (2006) and David Kolb (2008) give voice to a place thinking connected to relations and mobilities. The ways in which the interconnectedness of places and increasing interdependence of mobility and immobility of humans, information, vehicles, data, information, goods etc. materializes suggest that a notion of scale might be helpful and relevant, but only if it has the capacity to embrace openness, fluids, relations, processes without installing foundational, sedentary principles of fixity and order. Places are interrelated and their qualities are a matter of their relational couplings. This means that scale needs to be understood as open, process-oriented, and relational.

The notion of a mobility-oriented and relational sense of place infers that scales are open and continuous rather than fixed and hierarchical. Such an understanding furthermore connects to a different way of thinking about centrality and networks. This has in the Mobilities literature been described as the 'proximity-connectivity nexus' (Jensen 2013). What this means is, that the ways

in which connectivity and proximity becomes meaningful for social action and interaction has transformed radically in the aftermath of global network technology and infrastructural development. Being co-present was a pre-condition for interaction and trade in a traditional barter economy and hence also a condition for the sedentary and hierarchical understanding of scale. Cities and city states was organized and ranked in scalar systems of centrality. Later with the advent of modern infrastructure centrality was still a matter of fixed locations in scalar systems ('Central Place Theory' was one such conceptualization, Herod 2011:102). Centrality still has to do with being close to particular resources and infrastructures, but with the advent of globalization and digital media technology the ways in which scalar ordering stand out looks very different. 'Being close to' (proximity) is still important for some activities, but increasingly 'being connected to' becomes more and more central. What is taking place is a reconfiguring of the nexus between proximity and connectivity, and this process renders a sedentary, hierarchical and fixed notion of place (and scale) rather imprecise as a description of the present condition. This development is not eradicating the notion of scale, but as with the notion of place it requires a different conceptualization and understanding. One that opens up towards relations, networks, Mobilities and processes. The openness of scales is a consequence of the reconfiguration of the proximity-connectivity nexus, and leads to a reconfiguration of notions such as centrality and de-centrality. We might want to think about a 'new centrality' in recognition of the importance of connecting scales to open processes, relations and Mobilities. Understanding such new centrality requires a rethinking of old scalar ontologies. In an analysis of mobile situations in the city, Jensen explains how the networked urbanism in the contemporary city is a testament to a rethinking of scale:

> 'It is a situation where the fixed hierarchy of global and local becomes blurred and the notion of 'scale' becomes more a question of mediation, networked selection and Mobilities … The key point being that in the heterogeneous model proximity is defined by selective and filtered mediation' (Jensen 2013:126)

The notion of a reconfiguration of place in the light of contemporary network technologies and infrastructures requires not only rethinking in terms of theories an concepts, but also an ethnographic approach to realize how scales cross and interfere. Castells was aware of this issue back in the mid-2000s:

> 'The analysis of networked spatial mobility is another frontier for the new theory of urbanism. To explore it in terms that would not be solely descriptive we need new concepts. The connection between networks and places has to be understood in a variable geometry of these connections … we can build on an ethnographic tradition … But here again speed, complexity, and planetary reach of the transportation system have changed the scale and meaning of these issues. Furthermore, the key reminder is that we move physically while staying put in our electronic connections. We carry flows and move across places' (Castells 2005:54)

And even earlier on, Henri Lefebvre noticed that social space has such a 'hypercomplexity' (p. 88) that ideas of a fixed 'local' scale has to be abolished in the quest for understanding how scales are more related to movements, connections, and flows.

'TO SCALE' – PROCESSES OF BECOMING AND DOING

The political organization of territories and spaces has been connected to a 'politics of scale' (Brenner et al. 2003), in which the nation state in particular has been seen as an agent for re-thinking and re-scaling the political organization of territory. Moreover, the emergence of supra-national entities such as the European Union has given reason to explore how scales are not just nested and ordered layers, but relational and power-laden dynamics (Jensen & Richardson 2004). Cities, regions, nation states and beyond – the European Union has been conceptualized as a multi-scalar field of politics where different policies and interests are articulated. Within political science and geography such re-scaling means:

> 'The continual production and reproduction of scale expresses the social as much as the geographical contest to establish boundaries between different places, locations and sites of experience. The making of place implies the production of scale in so far as places are made different from each other: scale is the criterion of difference not so much between places as between different kinds of places' (Smith 1993:99)

Lefebvre spoke about a 'stratified morphology' as his way of conceptualizing the relations between scalar spaces such as the room, the hut, the farm, the village, the city, the area, and the state (Lefebvre 1997:45). According to Lefebvre, such scalar logics meant both an ordering as well as he saw it as a precondition for establishing a 'science of space' (ibid.). Within the study of politics and states, scale has been identified as both a troubled but also an important concept (Brenner et al. 2003). The ways in which processes of territoriality and identity-formation connects to scale has been subject to analysis in relation to politics. So

has the meaning and importance of borders and regions as vehicles for socio-spatial identity formation and territoriality (Jensen & Richardson 2004).

RETHINKING SCALE

The scalar imaginary from geography has been predominantly fixed and layered. However, more recent studies influenced by Actor-Network-Theory has problematized such a layered, hierarchical and fixed scalar ontology (Latham & McCormack 2010). Through a critique of traditional sedentary, fixed and hierarchical notions of scale within geography Latham and McCormack sees a danger is conflating the abstract concept and representation of the world (here scale) with the reality of the world. Far from being a neutral abstraction, scale may indeed become generative and thus shape and affect the world is supposed to 'mirror' (p. 67). Even though the notion of scale is criticized Latham and McCormack recognize the value and attraction of the term as an important concept to 'grasp and think through the qualities of space' (ibid). Scale, they say, need still to be part of the geographical vocabulary. So instead of dismissing the notion of scale ANT-inspired research should recognize that networks and connections should 'be followed' across scales, but also that affective and 'sensed scalar qualities' needs to be accounted for (ibid.). The notion of scale is thus kept alive, however corrected with an emphasis on relations, affects and atmospheres. In a similar attempt to apply ANT to urban studies Smith argues that scale needs to be critically re-conceptualized as a reflection of networks and movements taking place over continuums (2010:75). The appeal made by Smith to 'forget scale, follow networks' (p. 82) might stand as a slogan for the more radical type of such scalar rethinking (Smith is, however, more dismissive of the whole notion of scale than Latham and McCormack is).

British geographer Nigel Thrift puts the case a bit sharply, but addresses the problem of scale quite head on:

> '… I never really understood scale and I still don't. One of the problem you get into if you decide that there are scales is that you start allocating things to one scale or another, to one territory or another. Once you start doing that you almost predetermine the conclusions in ways which are really quite problematic. They are problematic in terms of the distinctions you use: big or small, flow or static, all these kinds of distinctions. Once you start using scale you start to foreground conclusions … For me, it is a term I can do without' (Thrift 2010:117)

Furthermore, scale is not only a question of size and reach:

> '… it is also about how resonant affects move and circulate between closely packed bodies moving together and differently. And the intensity of scale is also a matter of duration: not just a matter of how long an event lasts, but of how the temporality of an event registers differently in moving bodies' (Latham & McCormack 2010:67)

From these discussions, we want to point towards the specific situation and the ways in which we inhabit various infrastructural systems, landscapes and technologies with our bodies. Instead of seeing the body as 'the local' the networked technologies and the urban infrastructures discussed so far points towards understanding bodies as enacted in assemblages of infrastructures and materialities across geographies. Furthermore, this in ways that renders the idea of fixed and sedentary scales obsolete and problematic. In an argument for the value of Actor-Network-Theory to urban studies, Farias states that sites are not defined by spatial boundaries or scales, but rather processes, linkages and networked relations. In other words:

> 'Space, scale and time are rather multiply enacted and assembled at concrete local sites where concrete actors shape time-space dynamics in various ways, producing thereby different geographies of association' (Farias 2010:6)

The recent post-colonial and 'multiverse' thinking as articulated by Escobar (2018) and Cadena & Blaser (2018) is also a case of critically rethinking a multi-scalar and hybrid perspective. This way of thinking points towards an 'ontology of encounters and becoming'. It is a conceptualization disregarding the fixities of local-global scaling, that rather takes point of departure in processes, fluids, fluxes, and moments of encounters (Amin & Thrift 2002:30).

CRITIAL ZONE AS MATTER OF SCALE

From the point of a relational and process-oriented sense of scale we might take our rethinking of scale towards the political. Increasingly, we see challenges with climate, inequality, migration, and environment that supersede many of the scalar fixities of the modern world. As Latour argues, the planetary reach of contemporary challenges moves beyond scale as we realize that there is 'no outside' (Latour 2018). The previous discussion drawing on geography and Mobilities research suggests that process-oriented, mobility-focused and fluid scalar conceptions are relevant. However, the pressing political issues and matters of concern not only transcends scale in a traditional sense. They also animate the need for

thinking through a new political ecology of the 'Critical Zone' (Latour & Weibel 2020).

The notion of critical zone refers to different earth science disciplines and their collaboration and holistic effort to understand the complex interplay between what in modern times was known as culture and nature (Latour 2006). In the words of Szweszynski the critical zone is:

> '… the near surface layer of the Earth where most living things reside … this region of the Earth's extended body is a complex, dense world, filled and folded, crowed with entities and processes, movements and transformation, activity and signs, whose powers and conditions of existence are hard or impossible to disentangle' (Szerszynski 2020:344)

Gaillardet argues, that we do not live on Earth but on a 'thin film, barely visible on a planetary view' (2020:122). The critical zone is one of the most important, complex and fragile 'interfaces of the planet … functioning at different scales' (p. 123):

> 'The concept of a Critical Zone does not set up an opposition between humans and nature or between living and non-living states. It refers to a system, which we still have difficulties naming and representing that is anchored locally, and orchestrated by biochemical cycles in which living organisms including humans are agents, among others (Gaillardet 2020:127)

The notion of critical zone is an attempt to articulate and comprehend what might be termed 'territorial metabolism' (p. 129), which require a rethinking of scale.

The earth science's focus on a 'zone' critical to life on this planet problematizes sedentary scalar politics and points to new and networked relationships. The interdisciplinary and multi-scalar (or cross-scalar) endeavor basically aims at offering a more viable perspective on the co-existence of humans and non-humans on the planet. Critical zone thinking explores the ecologies of materials and matter that enables life and sustains various lifeforms on planet Earth. According to Latour such knowledge becomes pertinent if we are to 'land safely' as he terms it (2018), and extend 'care for the planet' beyond humans (Veselova 2091).

The critical zones of planetary existence are beyond fixed and sedentary scales. They are volumes and 'life spaces' of human and non-human lifeforms whose interdependence only slowly are emerging on our political radar. A planetary scale for a planetary set of challenges seems obvious, but instead of distanced judgements and abstract solutions, we are 'in it'. The art of figuring out 'how to land' (i.e. survive as species in a manner respectful to the planet and its living species) requires not only fluid, volumetric, multi-scalar thinking. It requires politics close to the matter of concern:

> 'Instead of trying to indicate a distance from the situations that require judgement, it points to the effort of gaining a *new proximity* with the situations we have to live in. The logic of *critical proximity* is what this book [Critical Zone] is about' (Latour & Weibel 2020:9, italics in original)

The increasing concern with the material conditions of planetary existence requires a politics of critical proximity as much as it requires a set of global solutions. Elsewhere, Latour has made a point of stressing that the urgent matters of concern increasingly relates to territory and soil (2018). The politics of the ground, the soil, and the earth are the urgent matters of concern (Latour 2020). Here, nested hierarchies of fixed scales for political institutions or territorial identity will lead us nowhere.

The critique of scale as fixed and flat needs to be countered by a sense of relational connectivity that moves continuously across volumes of relevance. Hence, the figure of 'Critical Zone' becomes a vital source of inspiration to think of human activities in their relations to ecologies that contains the underground, the surface level, as well as the atmosphere above. Designing for a sustainable future in light of this means that architects, urbanists, and designers should be aware of the interdependencies of what they might think of as separate parcels of reality (bodies, artefacts, buildings, cities, landscapes, regions, and nations). The notion of 'Critical Zone' is not only reminding us of complex interdependencies moving beyond human and non-human, nature and culture. It also means that the volumetric dimension of the world invites to a rethinking of scales as something dynamic and continuous. Regardless if one designs artefacts, buildings, or cities being critically aware of the 'holistic' interconnectedness is vital. 'Critical Zone' thinking is one potential vehicle for doing so.

CONCLUDING REMARKS

Let us end on the note that scale is troubled – but still relevant! There are academic disputes over the concept's ontological status where things still are in process. However, there is also everyday life actions and practices in the mundane realms where a more or less traditional concept of scalar fixities and order still works to give meaning to the world. Moreover, much politics and planning seem to be based upon sedentary,

fixed and hierarchical notions of scale. This, however, does not mean that there is no reason to rethink scale. But it means that theoretical as well as empirical work still needs to be carried out in order to create more coherent frameworks of open-ended, process-oriented, relational and Mobilities-focusing senses of scale. What we are arguing for is not scale as ontological structure 'out there' (sedentary materialism), nor scale as conceptual grid and mental structure (idealism), but rather scale seen as a continuum of relational Mobilities. We might think of scale as a much more volatile and 'plastic' feature of the world.

From the discussion in this paper we want to advocate an approach to scale that recognizes it as an important but also troubled concept that often has been taken hostage by political agendas and regressive forces. Instead of abandoning the concept, we would rather attempt to rethink it in the light of this discussion. This means to think of scale as:

- related to a relational- and mobility-oriented sense of place
- a phenomenon working continuously across geographies and spaces
- non-sedentary and non-foundational
- relevant to ethnographies of situated accounts and explorations
- relevant to situational understandings that sees the body not as 'the local', but as an articulated node in a continuum of geographies
- matter of concerns that connects different geographies in a continuum rendering an 'outside' perspective on politics obsolete
- spatial and social dimensions of planetary reach that must include all species and soils, volumes and surfaces

It is useful to rethink scale with an eye to the distinction between the materialist and idealist discussion presented in the opening of this paper. What we advocate here is a pragmatic and reflective position that instead of insisting on scale as either a material reality, or a mental imaginary treats it as both! Somewhat similar to the famous gestalt drawing from Rubin where the spectator either see a vase or two faces in profile. We propose to rethink scale in such a pragmatic manner that it becomes useful for design, urbanism and architecture as a 'gestalt' that at times may relate to geographical hierarchies and spatial borders, and at other times to mental relations and imaginaries. This, however, can only be done if one accepts a rethinking that moves beyond the sedentary and fixed ideas of scales as ontologically material structures out in the world. This idea needs to be critically rethought.

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Paper Session 1

Manageable Scales

Session Chair | Louise Ravnløkke

Teaching Size, Area and Scale
Ingri Strand and Eva Lutnæs (E)

On Wearing Diaries and Scaling Practices: Exploring Wardrobe Studies in Fashion Education
Julia Valle-Noronha (E)

NORDES 2021

TEACHING SIZE, AREA AND SCALE

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ABSTRACT

Gaining an understanding of scale, area and size is an important part of the subject of Art and crafts. Although this skill should be practiced, perhaps even mastered, by pupils in primary education, it is regarded as difficult to teach, due to the skill being intangible and difficult to discuss. This paper seeks to aid in overcoming these difficulties, as it gathers initial findings from ongoing interviews with teachers on their strategies for teaching this important skill. Instead of highlighting one strategy as the best, we wish to showcase a broad range of appropriate approaches to this theme. Tensions between these approaches are also discovered and discussed to highlight the inherent properties of the different strategies.

INTRODUCTION

An understanding of matters of scale, area and size is an important skill, whether used in planning, redecorating or choosing private housing, or in participation in public planning and building processes. The importance of this is reflected in the new Norwegian curricula in Art and crafts, implemented in 2020–21, which aims to have pupils achieve competence in sketching and modelling architectural solutions for their local surroundings (Utdanningsdirektoratet, 2020). This requires an understanding of scale, a skill that may be viewed as difficult to grasp and to put into words. While Art and crafts is a subject filled with non-linguistic knowledge (Bloch, 1991), an understanding of size and a sense of space might be the most difficult skills to teach, as they are difficult to demonstrate or explain. In this paper, strategies used by Art and crafts-teachers to teach their pupils this skill is explored.

Although this skill is important in different aspects of adult life, it is not mastered by everyone. Observing the interaction between an architect and two clients while planning a residential building, Nielsen (2000) found that the clients understood the architectural drawings only to a certain extent and had difficulties in imagining the spatial properties of the finished building. The same lack of understanding was also evident, for example, in the building of a centrally located hotel in Oslo, the Thon Hotel Opera, in 2000. The hotel was critiqued for being too high, creating a wall in front of the Opera building (Neubert, 2007). The politicians behind the decision did not fully understand the drawings, and it is unlikely that they would have consented to the plans if they had understood the implications (Lundgaard, 2000; Nielsen, 2004).

Educating children and youths to become engaged, critical and knowledgeable citizens is also necessary to ensure good democratic processes (Nielsen and Digranes, 2007). This belief is shared by the International Union of Architects (IUA), who is behind the UIA Architecture & Children Work Programme. This educational program aims to develop children into responsible citizens able to participate in democratic processes (International Union of Architects, undated). The foundation Archikidz, which has arranged architecture-workshops for children in the Netherlands, United Kingdom, Spain, Norway, Australia and Chile, is involved in a similar effort (Archikidz Rotterdam, undated). Their belief is that engaging children in urban planning "can help to create better communities and a more sustainable future" (Archikidz Australia, undated). Gaining an understanding of proportions, area and units of measurement, as well as the relationship between two-dimensional representations and three-dimensional objects, prepares children for participation in planning and building processes.

This exploratory paper addresses the following research question: *Which strategies are used by Art and crafts-teachers to enhance the pupils' understanding of scale, area and size when working on architectural projects?*

The concept of teachers' methodological freedom is strong in the Norwegian public school system. It is therefore important to mention that the goal of this paper is not to recommend one approach, but rather to showcase the broad range of approaches that may enhance pupils' understanding of scale, area and size.

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METHOD

Data was gathered through qualitative interviews with teachers in Art and crafts in lower secondary school. Informants were chosen through purposive sampling (Bryman, 2016). Searches in a non-academic journal and a research base of educational content in Art and crafts, along with inquiries within the authors' professional network, led to the identification of teachers with a strong background in teaching architectural projects. A request to participate in a research interview, as well as one reminder, was sent to ten teachers. Seven teachers responded positively. Currently, research interviews have been conducted with five teachers, and a sixth is scheduled.

All five interviewed informants were well educated and highly qualified to teach Art and crafts. They had between 3 and 20 years of teaching experience and taught at lower secondary levels in public schools. The interviews were semi-structured (Brinkmann and Kvale, 2015) and lasted between 50 and 70 minutes. Interviews were conducted in December 2020 and January 2021. As this is still a work in progress, the results presented here are preliminary and based upon initial analysis.

ARCHITECTURAL PROJECTS

The teachers were asked to describe one or more of their projects within the area of architecture in Art and crafts. In the following section, each teacher's project is portrayed. This offers a context to their teaching strategies, described in the next section.

Teacher1 collaborated with the software developer Ludenso, which gave him the opportunity to use their 3D-modelling app with an Augmented Reality (AR) application at a fairly early stage of development. The pupils designed a holiday home of 100 m^2. This was a large project spanning over most of a semester, about 15 weeks. It started with an open exploratory phase in which the pupils could use different techniques, such as sketching on grid paper, building with wooden blocks or using Minecraft or IKEA Home Planner. After this, they moved on to modelling in the Ludenso app. The finished buildings were viewed at a life-size scale on an empty soccer field, using the AR-application and Head-mounted Displays (HMDs). For the last part of the project, the pupils replicated their buildings at a scale of 1:50 using cardboard.

Teacher2 chose to describe different parts from several projects. In one project, the pupils worked on form experiments using the 3D-modelling software SketchUp to explore constellations of three blocks of different character. This was done as preparation for modelling a small cabin of 30 m^2. The pupils worked individually in SketchUp and afterwards in groups to collaborate on a floor plan and a cardboard model based on one of the group members' ideas. Another project focused on remodelling their own school, analysing which needs the building did or did not meet and designing changes accordingly. This project also used SketchUp, along with sketching on existing floor plans and making drawings. A third project had a more sculptural focus: designing a model in cardboard to be drawn in perspective later.

Teacher3 used model figures as a starting point, asking the pupils to design houses suitable for a 1 cm or 2 cm tall figure. The pupils started with an exercise to understand how to make a three-dimensional shape, cutting out and gluing together a pre-drawn house, before moving on to their own design in cardboard.

Teacher4 gave her pupils the task of designing a studio for a chosen artist, such as a ceramist, painter or street-artist. Instead of giving them any limitations in area, the size of the studio was instead to be tailored to the artists' needs, while keeping in mind that a large studio would be expensive. The pupils started out with drawing their ideas in one-point perspective, before drawing a floor plan and building a cardboard model at a scale of 1:40.

Teacher5 prioritised exploration of form in her architectural project, in which the pupils designed a small cabin of 18 m^2. The pupils were randomly assigned a geometric shape as a starting point for their design. To further challenge them, Teacher5 gave them a "change card" that would force them to make a specific change to the design they had started to work on, such as moving, removing or doubling a shape. The project began with an open idea phase involving sketching on paper, iPads or in Minecraft before the pupils moved on to three-dimensional "paper sketches" or prototypes in thin paper. The prototypes were then disassembled and used as templates for the end product: cardboard models at a scale of 1:25.

The teachers had different approaches to the work on matters of scale in their architectural projects. While most of the teachers gave their pupils a certain scale to convert real-world measurements into, Teacher3 stood out with a more playful approach, as she gave the pupils the task of designing a house for a scaled figure. These figures were referred to throughout the project instead of talking about scale. Teacher1, Teacher2 and Teacher5 set limitations to the area the pupils could use, while deciding the appropriate area for the user was an important part of the task given by Teacher4. The area the pupils had to work with differed significantly, from Teacher1's large holiday home of 100 m^2 to Teacher5's small mini cabin of 18 m^2. Irrespective of this variation, all teachers said that their pupils complained about being given a small area. Although most of the teachers focused on the exterior of the building, some work on the interior and the creation of floor plans were part of the projects of Teacher1 and Teacher2, while Teacher4 focused solely on the interior.

STRATEGIES FOR TEACHING MATTERS OF SCALE

The initial analysis revealed six different strategies employed by the interviewed teachers, presented below.

MEASURING ITEMS OR AREA OF A ROOM

All teachers except Teacher3 mentioned measuring a certain area or items in a room as an important strategy when working on architecture-projects. Both Teacher2 and Teacher5 conducted exercises with the class where they measured the given area of their classroom. This area was marked with tape on the floor or pupils standing in the corners of the area. This provided them with an initial understanding of the area they had to work with. Teacher1 and Teacher2 also described talking about or measuring the floor-to-ceiling height of the classroom.

These four teachers also gave their pupils the task of measuring items in their surroundings, particularly the doors were mentioned. Teacher1 stated that he always kept a measuring tape in the classroom. Teacher2 and Teacher5 said that when they were asked about the size of an item, they told the pupils to take thorough measurements themselves. For Teacher4, measuring the furniture and equipment in their workshop, such as wood carving benches and sewing tables, prepared the pupils for their decisions on how large an area their artists would need.

RELATING TO FAMILIAR ROOMS OR PLACES

Another common theme was talking about rooms or places familiar to the pupils. Instead of measuring the area the pupils were assigned, Teacher1 and Teacher4 would measure the area of the classroom and then discuss how much larger or smaller their buildings or rooms should be. Teacher4 told them to keep in mind that the workshops were designed to fit twenty pupils, while they were only designing a studio for one, in an effort to avoid studios that were too large.

During the lockdown in the spring of 2020, when the pupils worked from home, Teacher5 also gave them the task of measuring their own bedrooms. Teacher4 said that her pupils often chose to take measurements of their bedrooms, as they got curious about area while working on the project.

Teacher2 explained that while working with a floor plan of their school, the pupils got an understanding of the scale of the floor plan through talking about the gymnasium. Imagining the size of this familiar room, the scale of the rest of the floor plan made sense to them. “So the fact that they can relate to, that they have been to the places they are talking about or that they have experienced it physically, these exact sizes, I think that is of great importance,” Teacher2 said.

USING FIGURES AT SCALE

Teacher3 was the teacher who most actively used figures at scale, but this strategy was also mentioned by most of the other teachers, apart from Teacher4.

As a starting point, Teacher3 gave her pupils the task of designing a house to fit a 1 cm figure, sometimes 2 cm. All of the heights of the model were calculated to fit the figure, while the other measurements were set to be proportionate to the heights. The figures were used actively throughout the project to gauge whether the pupils were on the right track with the scale of their models.

Teacher5 gave her pupils the task of using metal wire to make a model of themselves at a scale of 1:25, the same scale as the model. This also introduced them to the proportions of the human body. These figures would later be used while working with the models. When asked whether the scale of the model seemed correct, she would reply “Just bring yourself out—can you get through this door?”

In a similar fashion, Teacher1 brought a scaled figure around when his pupils were working on their physical models to check whether they had gotten the scale correct. Both Teacher1 and Teacher2 also mentioned that the software they had used, Ludenso and SketchUp, had figures in the modelling area for scaling purposes. They were both unsure if their pupils had actually used them, but as Teacher1 said, “… he is standing there, so if it is a complete disaster, then you at least understand that you have started all wrong.”

CALCULATING MEASUREMENTS TO SCALE

All teachers except Teacher3 gave the pupils a set scale to work with. For Teacher3, avoiding this seemed a conscious decision, as she was determined to keep the subject of Art and crafts a practical subject. Her experience was that working with calculations discouraged the pupils and caused them to not have fun anymore, while her approach instead gave the pupils a more implicit understanding of scale. Teacher2 said that while working on the sculptural model at scale, she had only briefly discussed the concept of scale. The pupils did not work a lot with scale themselves, but this choice was mainly due to time constraints.

Teacher1’s project was interdisciplinary in that it involved mathematics: pupils made calculations and created a spreadsheet for converting life-size measurements to scale. Teacher3, Teacher4 and Teacher5 expressed that organisational conditions made it difficult to collaborate with mathematics teachers, but that they had a dialogue about their work on models at scale. To overcome this challenge, Teacher5 chose to work with practical mathematics in her Art and crafts lessons, at the start of the project. The pupils worked in groups, discussing previous experiences with scale, e.g.

using maps and solving practical tasks, such as figuring out how to convert real life measurements to a scale of 1:25. Both Teacher4 and Teacher5 talked about their projects as an approach to understanding mathematics, as they had experienced pupils struggling with mathematics finally gaining an understanding of it when working with materials and solving practical problems

PERSPECTIVE DRAWING

Perspective drawing was also a theme that emerged in most of the interviews. The teachers had different views on its usefulness in working on matters of scale, area and size. Teacher1, who had let his pupils use their methods of choice in the idea phase, said that the pupils who had drawn their house in perspective seemed to have less of a general sense of the size and scale of their structure, especially compared to the pupils who had worked with a floor plan in IKEA Room Sketcher. Teacher4, on the other hand, viewed perspective drawing as an important part of the preparation phase. Her pupils started by drawing their studio in one-point perspective, before moving on to make the floor plan and model at scale. Here, the perspective drawing was used to gain a feeling for the space in their room and as a basis for discussions on whether the room should be made smaller or larger in the next stages.

In general, Teacher4 viewed perspective drawing as a basic skill in Art and crafts, useful both for achieving more realism in visual arts and for visualising ideas while working on crafts or product design. Teacher2 expressed that she wished to continue teaching perspective even though it is not specifically mentioned in the new curricula. “I think it is a very important part of understanding the transfer from 3D to 2D,” she said. Teacher3 also expressed her desire to continue teaching perspective drawing, although now with a larger focus on the creative angle than the mathematical.

USING DIGITAL TOOLS VS. WORKING WITH MATERIALS

There were also differences in the teachers’ approaches towards digital versus more traditional work. Teacher1 and Teacher2 had projects where the pupils worked with 3D-modelling, in Ludenso or SketchUp, as a large part of the project. This meant that the pupils used life-sized measurements instead of converting measurements to a scale.

Teacher1’s pupils got the freedom to choose methods in the idea and planning phase, leading some of them to draw digitally or work in Minecraft or IKEA Room Sketcher. In Teacher5’s project, the pupils ended the project by making a poster where they edited an image of the model into a picture of the assigned plot of land using the app Snapchat. Some of her pupils also used Minecraft in the idea phase. All teachers let their pupils use digital tools in the inspiration-and-information-gathering phase. Teacher4 and Teacher5 expressed that they would like to work digitally more, and Teacher5 had previously used SketchUp several times. The implementation of iPads at their schools hindered this.

Teacher3 used digital tools the least of this group and expressed that her priority was letting the pupils feel the joy of working with materials. She also asked the pupils to build a paper model based on a template she handed out during her introduction to the project to make them understand how to work three-dimensionally from the very start. Although positive about the digital sphere, Teacher1 and Teacher5 also emphasised working with materials from an early stage of the project. Among the techniques Teacher1 mentioned from the idea phase was building with wooden blocks. Teacher5 had chosen to leave out two-dimensional sketching in favour of making three-dimensional sketches or prototypes, as she had learned from experience that this improved pupils’ understanding of their final cardboard models.

DISCUSSION

In the interviews, it was apparent that an understanding of matters of scale, area and size was something many of the teachers viewed as challenging to teach, although some felt that they had found an approach that worked well. Both Teacher1 and Teacher2 described this skill as something fleeting and difficult to grasp.

The three most prominent strategies involved converting an abstract number to something more tangible, whether it was showing the pupils how large their given area or familiar rooms were, measuring items or using figures they could relate to in the correct scale. Without such a physical component, several of the teachers suggested that it would be too difficult for the pupils to understand the sizes they were talking about. As Teacher1 said, “It's just a number somehow. There is a difference between numbers and a physical understanding.”

This group of teachers did not exhibit any opposition to digital work, something one may come across among Art and crafts teachers (Strand and Nielsen, 2018). Instead, most of them perceived it as useful to work digitally with architectural projects. However, working with materials could give the pupils’ work a tangibility that digital work does not possess. Teacher1 pointed out that when working digitally, you can’t really see the difference between five and fifty meters, as it changes when zooming in or out. The intangibility of the digital sphere may be viewed as contradictory to the strategy of connecting numbers to something physical, which may explain why all of the teachers also included some physical elements in their projects.

The teachers differed the most in their approach to working with calculations and other mathematical activities within the project. While some worked in an interdisciplinary way or gave the pupils practical mathematical tasks, one teacher avoided calculations

and instead adopted a more playful approach to working with scale through the use of scaled figures. Despite this, most of the teachers talked about this project as an approach to gaining an understanding of scale that benefits the pupils' competency in mathematics, as the projects offered physical experiences with scale. Here, the calculations were used in practical tasks instead of working with abstract calculations, which some pupils would regard as more pointless. This connection to mathematics is lacking in solely digital projects, as life-sized measurements are used in 3D-modelling. In addition, digital works are often experienced as abstract images on a screen. An exception to this is Teacher1's project, where the pupils viewed their buildings in three dimensions and at life scale using AR with HMDs. This experience marked the end of their work on the models and was therefore not used to adjust their buildings. Teacher1 described the pupils as very engaged and enthusiastic but was unsure whether viewing their buildings or encountering new technology was the cause of their enthusiasm.

The teachers also had some conflicting views on the usefulness of perspective drawing as part of such a project. While Teacher4 used it actively to give the pupils an understanding of room sizes, Teacher1 observed that it did not give them a good overview of their building. It is important to note that they used it in different ways, in part explaining these different outcomes.

The preliminary findings of this research should be further developed by connecting the strategies of the teachers to key ongoing discussions on the understanding of scale, theories from the architectural and design fields, as well as other studies on how an understanding of scale, area and size may be enhanced. In further research by the authors, the use of Virtual Reality in connection to 3D-modelling will be explored as a strategy to hone these skills.

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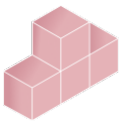

ON WEARING DIARIES AND SCALING PRACTICES: EXPLORING WARDROBE STUDIES IN FASHION EDUCATION

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ABSTRACT

This paper seeks to explore ways to promote scalar thinking in the field of clothing and fashion design education for more responsible futures by means of wearing diaries, a method in wardrobe studies. It does so through the case of activities carried in a bachelor level course in Fashion Design called Futurology at the Estonian Academy of Arts. In the course, students collect diary notes on their personal wearing practices during a semester alongside designing future-oriented design proposals for the field of clothing and fashion design. The final reflections suggest that by attuning to personal wearing practices design actions may be scaled to help overcome the great environmental threats posed by current practices related to textile and clothing today. The work contributes especially to the development of teaching and research methods in the field addressed.

INTRODUCTION

The past few decades saw a great change in how we understand current practices of making and consuming clothing. Mass production, usually carried in offshore locations, previously understood as business opportunities, starts to raise spread concerns on the ethical and environmental implications of the clothing and textile industries (Kim et al., 2013). Aside from quantity and quality concerns, the high complexity of the production chain leads to well-founded criticism on the various processes that support the industry, ranging from macro perspectives such as agricultural practices (Rigby and Cáceres, 2001) to textile finishing (Muthu, 2016), and more granular ones, including fitting strategies (Valle-Noronha, 2019). Just as the general understanding of practices of making and consuming clothing has changed, and as we face climate collapse, the need to update educational strategies is urgent.

This exploratory paper asks if wardrobe studies (Fletcher and Klepp, 2017; Valle-Noronha and Wilde, 2018; Skjold, 2014) could be integrated in fashion education to drive critical discourses in fashion and sustainability. To explore that question, it looks into the case of a bachelor level course in Fashion Design, namely Futurology—taught under the current format since 2018. In it, an autoethnographic approach done via wearing diaries is taken to raise students' understanding of the complexity of factors that impact the environmental footprint of garments. The proposal expects to promote scalar thinking as students become able to critically analyse their wearing practices and connect those to professional design choices. Due to the exploratory nature of this contribution, it is relevant to note that the intention is not to provide clear answers to how fashion education should change and evolve, but rather to explore possibilities through the case exposed.

In the first section of the paper, a brief overview of fashion education today helps identify the gap of suitable methods in learning approaches, shedding light on the relevance of experience-oriented and informed decision-making alternatives to teaching fashion design. Next, the course is outlined in a general sense and the diary activity is explained. Following, an exploration of the notion of scales based on the teachers' perspective is made, grounded on personal experiences. Reflections on the limitations of the work and future directions in transforming the fashion education system for more responsible futures conclude the work.

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FASHION EDUCATION NOW

From as early as the 60s, fashion designers have raised discussion on the need to change the ways we make, consume and wear clothes in the global north context, driven by the hippie movement. However, it is not until the early 2000's that the discourse started to gain strength in academic realms (e.g. Fletcher, 2008; Berlim 2012). These initial efforts focused on opening up the complex fashion industry and identifying a need for change, especially in terms of production and consumption. Since then, the field has become a fruitful arena for discussion, and countless valuable publications emerge each year, identifying new forms of thinking and designing clothing with an environmental balance in mind.

While the discussions are currently present in most educational environments, little efforts have been put so far in affecting the ways fashion design is taught in higher educational institutions, with rare publications offering specialised perspectives to fashion education (e.g. Parker, 2009; Williams, 2016). Until today, the well-established approach to teaching fashion as image making (McRobbie, 1998) remains prolific in most fashion curriculums, with few exceptions. Some examples that challenge this norm are the masters in Practice held in Common and Fashion Strategy at ArtEZ (ArtEZ, 2021) and Fashion Futures at UAL (UAL, 2021), where the focus moves towards shared practices in the first and experimental approaches to sustainability in the latter.

Recent studies carried in institutions across the globe (Williams et al., 2019) provide an overview of the current state of fashion education. It shows that while there is generalised interest in enacting new approaches and methodologies into current fashion design curricula, the little availability of targeted information, scarcity of time to develop new courses or activities, and a lack of institutional aims linked to environmental concerns restrict the implementation of change. As a result, students' efforts often remain in the scale of material choices, such as more sustainable fibres (cf. MacArthur Foundation, 2017) or less harmful pattern cutting practices, such as zero waste (Rissanen, 2013).

Interested in contributing to this discussion, this exploration asks about ways to support students in discovering and reflecting upon other forms of supporting a shift from an industry that does harm to an industry that does good, departing from their personal experiences as clothes wearers. It defies the current fashion design focus, which emphasises the imagetic dimension of clothing, often leaving aside its experiential dimension (Valle-Noronha, 2019: 33-46). Can a careful attention to the practices of wearing, including its material and experiential dimensions, shift the ways one designs?

MAKING FUTURES FOR FASHION DESIGN

Fashion design is always looking forward through the practices of trend forecasting, understood as essential and frequently performed by professionals in the field (Choi et al., 2014). Due to this, trend forecasting often features as an essential subject or content within fashion education curricula in institutions across the globe (Gaimster, 2012). Aligned to this, the futurology course, offered to third year bachelor students at the Department of Fashion Design at the Estonian Academy of Arts, has historically taught and practiced trend forecasting. Here, I explore the course in its 2019 version. The course was organised in five meetings, spread over the course of a semester and a total of 36 academic hours (see Table 1 below).

Table 1 Summarised version of the course schedule.

Day	Content of the class	Homework
1	**Introduction** Course Intro Video "Powers of Ten" Delivery of Diaries Group formation	Start wearing diary, watch the 3 selected 'future scenario' videos and choose a scope with the group
2	**What I Wear Workshop** Discussions based on literature + wearing diaries Future scenario planning workshop (in groups)	Develop the scenario and start designing your final project. Read literature
3	Interim presentation and Peer Discussion	
4	Group Consultations	
5	Final Presentations	

In summary, the course's learning outcomes are stated as:

- Develop critical awareness on contemporary issues and discourses in fashion design practices
- Practice systemic thinking, reflecting on design and designer's agencies and their societal and environmental impacts
- Get acquainted with methodologies to identify and approach trends in fashion and its ecologies

According to the Enciclopædia Britannica "Futurology, in the social sciences, is the study of current trends in order to forecast future developments" (2021). Within the course context, the urgent call for rethinking fashion industry practices has led to a provocation that challenges the general understanding of fashion forecasting. Instead of departing from examples of historical shifts of trends or an analysis of catwalks vs. streetwear, the course starts from the statement that the most relevant forecast today is that of climate collapse. Through this, it prompts students to rethink how trend

forecasting could or should be carried in the field of fashion design to nurture better futures.

The introductory class focuses on presenting the current practices in the fashion industry, followed by the notion of scalar thinking, illustrated by the video 'Powers of Ten' (Eames Studio, 1977). Building a parallel with the video, the discussion with students revolves around how wearing practices may affect positively or negatively the fashion system. At the end of the first day, wardrobe studies are briefly presented to students as a means to carry research in fashion and are instructed on the 'wearing diary' method. They all take home a physical diary—a notebook with a set of questions about their wearing practices that should be filled at least once a week for the duration of the course. The Figure 1 below illustrates a spread from the diaries.

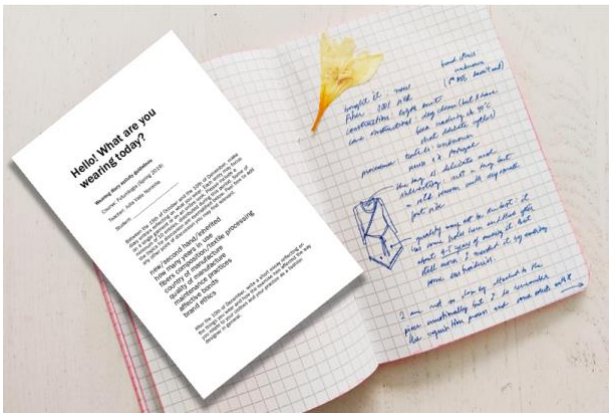

Figure 1 . Example of a wearing diary with the set of questions and instructions in a loose sheet.

The instructions asked students to make diary entries discussing topics such as: garment age, period in use, fibres composition/textile processing, country of manufacture, quality, maintenance practices, affective bonds and brand ethics. A number of digital resources that could help students in evaluating the environmental footprint of their garments was provided together with course literature.

Alongside this individual activity, students formed groups to design a product or service that targets a specific issue, making use of future scenario planning methods. At the end of the course, they are expected to present their outcomes.

FROM PERSONAL TO INDUSTRIAL PERSPECTIVES: SCALING THOUGHTS IN FASHION DESIGN

The wearing diary activity sought to support the development of critical reflection on wearing practices, drawing from findings in my doctoral dissertation (Valle-Noronha, 2019). It built on previous works in the burgeoning field of wardrobe studies (Cwerner, 2001; Fletcher and Klepp, 2017; Skjold, 2014) that identify the wardrobe as a space for investigations in the field of fashion studies. Concomitantly, the experiential dimension of clothing — how one feels about the clothes one wears — becomes relevant and an alternative way to explore clothing, overcoming the prevalent focus on image.

When the fashion design student becomes aware of the intricate factors behind the environmental impact of a garment, his practice in the scale of designing is prone to change, affected by the reflections on the intimate, personal scale. For example, knowing that fitting issues may affect the longevity and intensity of use of a garment may suggest new ways of fitting clothes, encompassing longer wearing experiences. Additionally, finishing processes that add to the environmental footprint of a garment (e.g. prints, embroideries, etc.) may be reimagined through different surface design approaches.

On a positive note, students stated becoming more aware of how small design decisions affect the final environmental impact of a garment. On a negative note, they also stated an increased sense of self-criticism consciousness, which may have prevented them from wearing or cherishing garments that carried in them clearly unsustainable practices.

Looking at fashion design from the perspective of dressing practices may enable the realisation of subtleties hardly perceived when disconnected from the notion of experience and increase criticality in design practice. Some examples discussed in the class environment include caring, adapting, and mending instructions, the under-exploration of clothing tags for communicational purposes, clothing care services beyond laundering, mending and ironing, amongst others. From these discussions, new actionable solutions may emerge, under industrial or more artisanal scales.

DISCUSSION AND FUTURE DIRECTIONS

The limitations of this exploratory paper are found especially in the small number of times that the course has been running under the exposed format (2) as well as the reduced number of participating students (between 4-6, directly reflecting the low student:tutor ratio at the institution). Even though students have stated a growing awareness of processes that foster or hinder environmentally friendly practices, tracing how exactly such changes in awareness may have affected the design work, nevertheless, is extremely difficult.

The paper hints to the field of wardrobe studies, with a particular interest in investigations of wearing experiences and practices, as an umbrella of methods to be explored not only for research purposes but also for educational and professional outputs. The main reasoning lies in the fact that few methodologies have been crafted specifically to the field of fashion design,

with wardrobe studies being one of the few examples. This particularity opens up a series of opportunities as it looks closely and deeply to fashion from within the field itself and may be able to allow access to deeper and more transformational change opportunities. Additionally, it indicates the little explored field of experience to be further utilised and investigated, in terms of educational approaches. One example is the substitution of fitting sessions for experience sessions, with the aim of assessing the quality of a garment (Valle-Noronha, 2019: 243). In this way, the intention of the paper revolves around a proposal and provocation rather than a definite solution on how to improve fashion education for more responsible futures.

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NORDES 2021

Paper Session 1

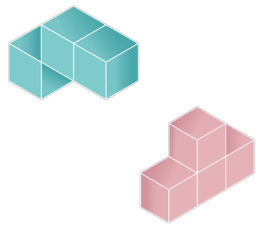
Rankings and Other Values

Session Chair | Andrea Botero

Envisioning Large-Scale Effects of Teaching Values in Design
Anne Linda Kok, Eva Eriksson and Elisabet M. Nilsson (F)

Scaling up Diversity and Inclusion: From Classroom to Municipality
Annukka Svanda, Martina Čaić and Tuuli Mattelmäki (F)

NORDES 2021



ENVISIONING LARGE-SCALE EFFECTS OF TEACHING VALUES IN DESIGN

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ABSTRACT

In teaching, there is an increased awareness about the role that values play in design. In this paper, we envision potential large-scale effects of teaching values in design in higher education. In doing so, we practice what we preach, as we ourselves perform the envisioning method we normally teach our students. By applying this method to our teaching, we are scaling up the definition of "learning outcomes" from classroom-level results to societal outcomes. Specifically, we envision these potential outcomes by creating value scenarios on the basis of four topics – stakeholders, time, values, and pervasiveness. The contribution of this paper is twofold. On the one hand, it demonstrates the potential large-scale effects on people and society of teaching about values in design in higher education. On the other hand, it demonstrates the advantages of using value scenarios as a method to understand the effects of your own teaching.

INTRODUCTION

The design, implementation and appropriation of digital technologies and interactive systems impact society on many different levels, from the immediate personal experience to long-term systemic effects (Nathan et al., 2008). Through their work, designers thus play an important role in shaping society regardless of whether they have an explicit intention to do so. If designers lack an understanding of the broad impact and long-term effects of their designs, they run the risk of inadvertently causing more harm than good in society.

Ethics and values are embedded in and also supported by technologies and interactive systems (Knobel & Bowker, 2011; Tromp, 2011). Designers are always biased by a particular way of seeing the world and by their sociocultural backgrounds (Haraway, 1988). Design never derives from nowhere, and designers are never value neutral (Søndergaard & Hansen, 2017; Suchman, 2002). Previous researchers have thoughtfully addressed values in design, including value sensitive design (Friedman & Hendry, 2019), values in design (Nissenbaum, 2005), values at play (Belman et al., 2009; Flanegan & Nissenbaum, 2014), and values-led participatory design (Iversen et al., 2012). Each of these approaches provides a different lens, whether they focus more on values in the design *process* or on values in the designed *product*, and whether they focus more on *designers'* values or on *stakeholders'* values. They have primarily been developed for research and development purposes, offering methods and tools for designers to consciously work with values in their design practices.

However, not only professional designers but also students who are training to become designers need to develop knowledge and skills to work with values, to challenge established ways of working and to explore and offer ethical alternatives through design (Bødker, 2003). Teaching about values in design is currently gaining momentum (Hendry et al., 2020). However, when reviewing our own universities' curricula, we see that this is not yet incorporated in a structured way.

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The crux of teaching values in design is that we equip students with the knowledge and skills required to consider the broader context and implications of their designs, in order to educate students to be responsible designers. For example, students can be asked to generate value scenarios – inspired by Friedman and Hendry (2012) and Nathan et al. (2008) – in order to imagine and analyse the potential widespread consequences, long-term effects, and societal and ethical impacts of their own or others' designs. However, considering such matters of scale, what about the broader context and large-scale effects of our own teaching? We believe it is important to keep a broad view not only when designing digital technologies and interactive systems, but also when designing teaching and assessment activities and curricula. Therefore, we aim to scale up the definition of "learning outcomes" in design education from one that refers mainly to individual or classroom-level results, to one that includes the bigger impact of educating responsible designers. As such, we pose the following research question: *what might be the large-scale effects of teaching values in design?*

By answering this research question, the contribution of this paper is twofold. Firstly, we demonstrate (through envisioning) potential large-scale effects on people and society of teaching about values in design in higher education. Secondly, we demonstrate the advantages of using envisioning as a method to understand the large-scale effects of your own teaching.

BACKGROUND

TEACHING VALUES IN DESIGN

As mentioned in the introduction, there are several established approaches for addressing values when researching or developing digital technologies and interactive systems (see e.g., Friedman & Hendry, 2019; Nissenbaum, 2005; Belman et al., 2009; Iversen et al., 2012), but there are only few examples of how values in design can be taught in higher education (for an overview, see e.g., Hendry et al., 2020).

In order to create facilitating conditions for teaching values in design, we have developed approximately 30 teaching activities and 12 assessment activities targeting teachers in higher education who wish to teach their students about the role values play in design. These activities are the output of a cross-European project aiming at developing an open educational resource (OER). The OER may serve as a teaching toolkit and an inspirational model for teachers when planning courses addressing the topic of values in design. The teaching and assessment activities offered by the OER may be appropriated by the teachers to make them fit with their particular courses in various educational settings, across different levels and disciplines. The project does not only focus on developing conceptual knowledge about values, but also and more importantly, on educating students to become responsible designers.

The teaching activities are structured around three main pillars and learning goals for teaching about values in design: 1) ethics and human values; 2) people and stakeholders; and 3) technology and context (Eriksson et al, 2021). The learning goals related to each pillar, presented in Table 1, represent a selection of competencies required to become and be able to act as a responsible designer (Eriksson et al, 2021).

The teaching activities cover the entire design process and range from activities such as a lecture on theoretical background on values and ethics, to an exercise in identifying one's own values as a designer, to envisioning the broader implications of (one's own and others') designs.

Table 1: Learning goals in values in design in higher education (Eriksson et al, 2021).

Pillars	**Learning goals**
Ethics and human values	Recognise and describe different values Critically reflect on how values are manifested in designs
Designers and stakeholders	Identify and describe direct and indirect stakeholders of a design Elicit stakeholder values Identify possible tensions between different stakeholder values and imagine how to mediate these tensions in a design
Technology and design	Integrate values into the design process Analyse and critically reflect on the impact of a design (draft) and its manifested values in context

ENVISIONING

Envisioning is an approach "to support long-term, emergent, systemic thinking in interactive design practice, technology development, and system deployment" (Nathan, 2008, p. 1). When considering values in design, this kind of long-term, large-scale thinking is crucial to understand the potential implications of the values embedded in a design as well as the values affected by the design. This is no simple endeavour, because the impact of any design on society is not inherent in the design itself; rather, it is dependent in part on how the product is appropriated by individuals and society (Nathan, 2008).

Nathan et al. (2008) suggest four topics to consider for envisioning: *stakeholders, time, values,* and *pervasiveness*. In terms of stakeholders, envisioning focuses on the effects of a design on both direct and

indirect stakeholders. In terms of time, envisioning concerns the potential long-term implications of a design, many years into the future. The topic of values explicitly calls the designer's attention to the values held by the designer, the design, and the stakeholders. Finally, pervasiveness refers to widespread adoption and use of a design. By considering the combination of these four topics, we can attempt to envision the large-scale effects of a design.

Envisioning, as in the paper by Nathan et al. (2008), is done through creating value scenarios. Value scenarios integrate the four envisioning topics with scenario-based design (SBD) (Rosson & Carroll, 2002). Traditional SBD scenarios tend to be written as narratives in order to identify user needs, detect usability issues, and support communication. However, SBD often fails to take into account indirect stakeholders, negative consequences, long-term effects, and pervasiveness of a design (Nathan, 2008). By considering the four envisioning topics in scenario development, SBD is scaled up to include large-scale effects.

ENVISIONING AS A TEACHING ACTIVITY

Inspired by envisioning as a research method (Nathan et al., 2008), a teaching activity that we have developed is "Envisioning future scenarios". In this teaching activity, envisioning prompts are used as a tool for developing value scenarios. Each envisioning prompt draws students' attention to a particular socio-technical issue that is important yet easily overlooked (e.g., diverse geographics, political realities, obsolescence).

The activity requires students to envision at least one use or user scenario that goes beyond what they would normally describe as the intended use of their product. By doing so, they may rethink their designs and design decisions. The activity creates conditions for students to reach the learning goal "Analyse and critically reflect on the impact of a design (draft) and its manifested values within its context" (see Table 1).

The teaching activity has been piloted successfully with students in three different international contexts, which indicates that this newly developed teaching material can in fact be appropriated to work in various educational settings.

METHOD

As we aim to practice what we preach – or rather, practice what we teach – we performed an adapted version of this teaching activity ourselves, in order to identify the large-scale effects of teaching values in design, and answer our research question.

We first developed a traditional SBD scenario to assess the implications of teaching values in design (Rosson & Carroll, 2002). This is not typically part of the envisioning teaching activity, but allowed us to make a comparison between the SBD approach and the value scenario approach. We then developed two value scenarios, as described by Nathan et al. (2008), using prompts divided into the four envisioning topics to guide us. The prompts derive from our teaching activity and are based on the envisioning cards developed by Friedman and Hendry (2012). However, we reformulated the language in the prompts, shifting the focus from interactive systems to teaching values in design. The prompts we used are as follows.

STAKEHOLDERS

- *Identify and list direct stakeholders.* In what key roles will individuals interact directly?
- *Identify possibilities of non-targeted use.* Who might use the teaching for nefarious or unplanned purposes? In what ways?
- *Identify and list indirect stakeholders.* What are five roles that will be affected by the teaching but will not directly interact with it?
- *For each role from above, consider stakeholder benefits and harms.* What are the anticipated benefits? What are the potential harms or downsides?

TIME

Reflect on future trends. Imagine five years into the future. The teaching has been widely adopted and is part of daily life for both direct and indirect stakeholders across society. Consider the implications for:

- how people do their work;
- how people make and maintain friendships and family relationships;
- physical health and wellbeing;
- those who cannot afford the teaching;
- norms and social expectations.

VALUES

- *Choose desired values.* Create a list of three values the teaching should ideally support.
- *Consider values at stake.* Create a list of five values that are implicated by the design under consideration.

PERVASIVENESS

- *Consider masses of direct stakeholders.* Building from the earlier stakeholder activities, imagine a person in a given direct stakeholder role. Now imagine 10 such individuals. Then 100 individuals. Then 1000 individuals. What will emerge from widespread use?
- *Consider masses of indirect stakeholders.* Imagine 100 to 1000 individuals in an indirect stakeholder role. What large-scale interactions emerge now?

- *Identify implications of widespread use.* Imagine use in a particular place. Then imagine use in five such places. Then 100 such places. How might teaching values in design change as the use spreads?
- *Consider widespread geographic locations.* Imagine use across regional geographies (e.g., rural areas).

By first developing a traditional SBD scenario and subsequently developing a value scenario using the above prompts related to the four envisioning topics, the contribution of this paper is twofold. We are able 1) to envision the implications of teaching values in design and draw valuable lessons from that, and 2) to demonstrate the advantages and added value of using envisioning (over traditional SBD) to think critically about teaching in the design domain. By reflecting on the value scenarios we created, we discuss the development of future curricula and teaching activities for values in design.

RESULTS: ENVISIONING FUTURE SCENARIOS

In this section, we will present the results in two steps. First, a traditional SBD scenario is presented, with a focus on the short term. This is followed by two value scenarios, based on time, values, stakeholders and pervasiveness. Finally, the content of the scenarios is explicitly linked to the envisioning prompts described in the method.

The characters in these scenarios who have had an education in values in design are assumed to have the competencies of a responsible designer, i.e., these characters have achieved the relevant learning goals (see Table 1).

TRADITIONAL SBD SCENARIO

Alice and Bob are two students who are about to finish their first semester of their master in interaction design. Bob has a bachelor's degree in computer science, and Alice in architecture. They are both happy to have developed their knowledge and skills in designing interactive systems over the course of the past semester, especially in regards to materials, form and function. However, they have been less successful when it comes to users' evaluations of their designs.

After hearing about their concerns, an older student gives Alice and Bob a tip about an interaction design course with a focus on values in designing technologies. Alice and Bob, in spite of their very different backgrounds, decide to take the course, and it soon proves to be a good decision. In addition to their previously gained knowledge and skills in designing interactive systems, they have now also developed practices such as identifying and taking consideration to what is important to a range of different stakeholders and envisioning future consequences of their designs. They experience an increased awareness of the role they themselves play as designers in future technologies and practices. They are also more aware of how to incorporate what is important to those who may be affected by their designs. After taking the course, Alice and Bob are more successful at considering stakeholders in their design process, and their designs receive more positive evaluations from users. Although working with what is important to a range of different stakeholders might not always be without conflicts, they have managed to develop strategies for dealing with such value-based tensions in a constructive rather than detrimental way. As a result, they even founded a start-up company with the technology they designed as part of their master's thesis – a collaborative balance trainer for rehabilitation of older people – in partnership with the physiotherapists who had been involved as users in the project.

FUTURE VALUE SCENARIOS

Scenario 1: The Pioneer (Carol)

Carol recently graduated from college and quickly managed to find work as a designer at a large company in the telecom sector. Most of Carol's colleagues are many years older than she is. Carol thinks their approach is old-fashioned: no analysis of long-term societal effects of the design is requested and decisions are based purely on expected profit. But Carol's education has instilled a sense of responsibility in her – she knows it's the designer's moral duty to consider stakeholders from the start and consider potential negative effects of the products she's designing. Unfortunately, Carol's manager doesn't want to provide her with the time and budget to do this. Carol feels increasingly stressed because she wants to do *right* – it's what's expected of her, by her old teachers, by her friends from college, and by herself. She repeatedly tries to educate her colleagues about the importance of addressing values, which results in her becoming somewhat of an outcast within the team. But Carol feels like she can't give up. She starts working unpaid overtime to be able to work with values in design. She keeps asking people from her personal network to help her out by giving stakeholder feedback, which is starting to put a strain on her relationships with friends and family. Her final designs are very successful, and Carol is proud of what she has achieved, but at what cost?

Ten years down the road, Carol has recovered from a severe burn-out. She could not cope with the feeling of responsibility to change an entire company's approach on her own as a junior employee. After her burn-out, she took the time to try to find a company whose vision already matched hers. She succeeded and is now happily part of a younger team of designers. In the

meantime, Carol's old company has changed drastically. Even though Carol paid a high price for the changes she was trying to make, she demonstrated how successful a values in design approach could be. After a while, her colleagues and even her manager couldn't deny that. After Carol fell sick, they thus started looking to hire another employee who knew about values in design. And within a few years, every single new hire had those skills; this was easy enough for the company, because values in design had become a standard ingredient in most design and engineering programs. Having several young voices within the company and a more open mind, the company made time and budget available to work with values in design. This approach was so successful that by now, the company refuses to hire any designer who does *not* know how to practice values in design.

Scenario 2: The Critic (Dave & Erin)[1]

Dave, a designer without an education in values in design, comes up with the idea of developing a technology that would support parents when taking care of their infants. Together with Erin, a friend from college who *has* studied values in design, Dave gets into contact with a large international company that produces all sorts of baby care products and starts sketching ideas for supportive technologies. After a couple of years, this process results in a working prototype of a smart diaper, that detects when it needs to be changed. The diaper status can be viewed using a mobile app, which also allows the parent who is not with the child to check on the status. During the process, Erin, coloured by what she was taught at university, starts to question the rationale behind the product and the values it is based upon. She recognises the trade-off between the ability to make informed decisions versus values such as intuition, trust, independence, and interdependence. She claims that the product sends the message that modern parents are incapable of communicating non-verbally with their children about their needs. She also fears that the system might create a sense of insecurity among parents. By using this technology, they might start to question their own capability to take care of their newborns and believe that they need technology to assist them instead of trusting their own instincts. Dave gets increasingly frustrated with Erin's criticisms, because it is delaying the release of the product. Dave continues to see great commercial potential in the product, and the company eventually decides to bring it to market.

It turns out that Dave was right: the product became a success. Just a couple of years later, the new standard is that parents check their smartphones for the status of their infant's diapers, instead of asking them in person, looking them into the eyes, and checking the diaper by lifting up the child. The parent-child relationship is mediated by this "smart" technology. The infant misses out on the opportunity to learn how to communicate needs, since the technology takes care of that kind of communication with the parents. Erin realizes that her initial ambition when she joined forces with Dave – to do good and support parents – has failed, and that the company failed in analysing the long-term societal consequences of their design. Erin starts a movement reclaiming the rights for parents to follow their instincts instead of relying on technologies that create a distance between them and their children.

CONSEQUENCES IN TERMS OF STAKEHOLDERS, TIME, VALUES, AND PERVASIVENESS

This section explains how the consequences we envisioned in our scenario relate to each of the four envisioning topics: stakeholders, time, values, and pervasiveness. By making this link, we are able to answer our research question: *what might be the large-scale effects of teaching values in design?*

Both scenarios consider key *direct stakeholders*: students as future practitioners. Scenario 1 demonstrates that value-sensitive designers may face resistance due to money concerns and tradition (*values*). In this situation, Carol has obtained a strong sense of responsibility (*values*), which eventually leads to negative consequences for her mental health and interpersonal relationships (*time; indirect stakeholders*). However, the scenario also shows that over time, a cultural shift occurs. Carol's company recognises the benefits of working with values in design, and the way designers work changes (*time*) as all new graduates know how to do so (*pervasiveness*). As a result, those who cannot afford to take a course on values in design may have a harder time finding a job (*time*).

Erin's scenario demonstrates the importance of considering values in design. Erin wants to respect (*values*) the values of consumers (parents and children; *indirect stakeholders*), such as trust and interdependence, but realizes that the smart diaper goes against these values. However, her co-worker (*indirect stakeholders*) resists her objections: considering values in design can lead to friction or conflict when different designers have different priorities (*time*). This also illustrates that even when a lot of people are well-educated designers like Erin (*pervasiveness*), a designer like Dave may still successfully market and sell a product. Nonetheless, it is implied that if Erin worked together with like-minded designers, their products may

[1] This scenario is loosely based on an existing "smart diaper" product which is currently on the market.

play a role in safeguarding what is important to consumers (*time; indirect stakeholders*).

DISCUSSION

ENVISIONING VS. TRADITIONAL SCENARIO-BASED DESIGN

The contrast between the traditional SBD scenario and the value scenarios based on envisioning prompts demonstrates the advantage of using envisioning as a method to consider the consequences of one's teaching. While the traditional scenario considers mostly the immediately obvious and desirable consequences of teaching values in design for direct stakeholders, the value scenarios – by incorporating direct and indirect stakeholders, time, values, and pervasiveness – open our eyes to less obvious, unintended, concrete, long-term and large-scale effects, both good and bad. It demonstrates that design education is definitely a matter of scale: individual classroom outcomes are not the only important consequences one's teaching may have (on students nor on society). Rather, the way education shapes students continues to play out beyond the classroom and throughout their professional lives. Envisioning has helped clarify in what ways students as well as indirect stakeholders (such as the people for whom they create designs) could be affected by teaching.

LESSONS LEARNT

Crucially, then, we should translate the insights gained from the envisioning activity to concrete improvements to be made to our teaching. What have we learnt? What should we pay (more) attention to when teaching values in design?

Calibrate expectations and ambitions

We should *protect our students from biting off more than they can chew*. Values is a topic that may evoke strong emotions in a person and as such, it may drive students' motivation (Schwartz, 2012). Carol's scenario illustrates the risks of students being overly ambitious, and while we should foster their self-esteem, we should also manage their expectations. This is especially relevant for the first generation(s) of students in values in design. One opportunity to do this is through internships, during which students often get their first insight into the job market and corporate culture. Teachers can guide students in how to balance their ambitions of being responsible designers with the reality in actual practice. In the transition from a focus on considering stakeholder values in student projects to facing the practices of traditional corporate cultures, there might be a clash, as the role of values in design might not be prioritized, or even known in the company. The role of the teacher, then, is to help the student to not take on a responsibility to change the whole work culture, or even make a point of this way of thinking – but rather to try to set an example, to the degree this is possible within the company and, most of all, within the boundaries of the mental health of the student.

In addition, we should *protect ourselves as teachers from being overly ambitious.* Dave's scenario demonstrates that it only takes one designer to bring a product to market that *isn't* designed according to the principles of values in design. Ideally, we would like to reach all design and engineering students with our teaching and create conditions for all students to understand the importance of values in design (e.g., by teaching its background and purpose rather than only its methods). At the same time, we must also learn to accept that we cannot reach everyone, and that some students or designers may be uninterested in or disagree with our methods.

Reduce the discrepancy between education and industry

Industry might not be prepared to receive a whole generation of designers who want to work with values in design. Carol's scenario demonstrates that current professionals may be reluctant to change their ways of working, at least initially. As teachers, we can help facilitate the transition in two ways.

First, we should *create conditions for industry to learn about values in design*. This can be done by offering further education for people already working in industry, and through further outreach to industry and alumni through workshops and exhibitions. The role of values in design could be highlighted in discussions with the reference group that many educational programs have, which typically consists of people from industry. Also, thesis proposals about values in design could be developed in collaboration with industry.

Second, we should *prepare students to deal with resistance when introducing values in design (and the critical thinking that comes with it) to others.* Both scenarios show that other designers may not always be open or susceptible to criticism regarding values in design. To give students as many tools as possible to overcome such resistance, we should teach them how to demonstrate and explain to others the importance and benefits of working with values in design. This means a curriculum shouldn't focus exclusively on applying methods for working with values in design, but also on communicating the underlying motivations and advantages.

Foster a culture of responsible design long-term

Aided by this emphasis on communication, we should aim to *create a culture of questioning each other's designs and listening to each other*. Dave's attitude towards Erin's concerns is not the one we want to instil in our students. Instead, we should encourage critical

thinking and teach students how to handle criticism of their own work as well as how to provide constructive criticism to others. One way of doing this is to introduce students to methods for running design critique sessions (Baumann, 2004) that specifically address values. In doing so, students learn to put into words the relevant aspects of their own and others' designs from a values perspective. They build a value vocabulary which they can use for communicating in a nuanced and grounded way when they critique design proposals. Achieving this kind of culture within the design community will require a "critical mass" of responsible designers who are both interested in and capable of initiating and running such conversations. We can look to the previously mentioned avenues to spread awareness about values in design both in industry and in education to help achieve this.

Make education inclusive and open

As much as possible, we should *make teaching materials publicly available*. Carol's scenario shows that those who do not have an education in values in design may eventually experience negative consequences (e.g., trouble finding a job). As a result, we should make the threshold for teaching and learning about values in design as low as possible. This can be done by making teaching materials available for free, and additionally, by offering case studies and testimonials from other teachers to be used as guidance and inspiration. This is something we already aim to do through the open educational resource we are developing. To further promote teaching values in design, we could initiate a professional teacher network on teaching values in design, to allow teachers to exchange ideas and spread the word. In addition, we could offer free online courses or make the teaching materials easily adaptable for self-study, to also allow individual students to pursue an education in values in design, even when this is not part of their curriculum or when they cannot afford to take a course.

ADVANTAGES OF ENVISIONING: A SUMMARY

In summary, we have shown that envisioning (through value scenarios) is a useful way to understand the potential large-scale effects of your own teaching, and that valuable lessons can be drawn from it.

In our case, envisioning allowed us to formulate examples of how the competencies of a responsible designer (see Table 1), and thus the outcomes of our teaching, can have an impact beyond the classroom. As demonstrated in Scenario 1, Carol's ability to *identify and describe direct and indirect stakeholders of a design* and *analyse and critically reflect on the impact of a design*, gave her the role of being a pioneer that initiated a movement towards a culture of responsible design at her company. In Scenario 2, Erin's ability to *critically reflect on how values are manifested in design* and to acknowledge the importance of *integrating values into the design process* gave him tools to reflect on his own responsibilities as a designer of new products.

The envisioning activity provided us with a critical perspective on our own teaching: we realised the potential negative consequences of our teaching, and this allowed us to formulate ways to help mitigate these consequences. Conversely, the scenarios also illustrated potential positive consequences. Carol's scenario showed how values in design could become widely accepted in the future, implying that our teaching will not pass by unnoticed. Dave's smart diaper exemplified the risks of *not* practicing values in design, emphasizing the importance of teaching values in design. Finally, both scenarios clearly demonstrated the importance of educating a *critical mass* of responsible designers, which we hope will motivate our fellow teachers to design future courses and curricula with values in mind.

LIMITATIONS

Of course, our scenarios are by no means a complete overview of the potential consequences of teaching values in design. Several envisioning prompts have not been completely considered – for example, what are the consequences for teachers (direct stakeholders), employers, manufacturers and retailers, the environment, equality (indirect stakeholders), etc.? Scenario 2 gives a brief idea of what the potential consequences could be of *not* teaching values in design, and how parent-child relationships may be different had Dave also considered family values. However, the consequences of (not) working with values in design will be different for each design project.

Other examples of envisioning prompts that are not included in our scenarios, but that are nonetheless highly relevant, are the prompts about teaching values in design in particular places (such as vocational schools) or in widespread geographic locations (such as in different cultures or rural areas). The different knowledge systems of the West, the East and indigenous cultures and "ways of seeing" present very different ways of understanding human values (Lent, 2017), which can affect the way of working with values in design.

It would also have been possible to write a more utopian scenario, outlining all the potential positive differences value-sensitive designers could make in the world. This is no doubt a valuable exercise to demonstrate the importance of teaching values in design. However, we believe that slightly more pessimistic scenarios are both more realistic and more educational – they have allowed us to identify potential risks and ways to mitigate them, rather than encouraged us to go forward unencumbered.

As a final remark, we are aware that as designers of educational resources, we can never envision and imagine the full implications of our designs. We are also aware that over time, the political significance of artefacts as well as educational approaches will change (Tromp et al., 2011; Winner, 1980). However, we acknowledge that as teachers and designers we are shapers of society, and as such we strive to be as responsible as possible. Envisioning has the potential to be a tool that can help in such an endeavour, although we should acknowledge that while envisioning can be applied by anyone, people may draw different conclusions depending on their own values.

CONCLUSION

In this paper, we have envisioned potential large-scale effects of teaching values in design and drawn valuable lessons from that. By doing so, we have demonstrated the advantages of using envisioning through value scenarios to think critically about teaching in the design domain. We believe that envisioning the effects of our own design teaching practice can help us become better teachers, because it allows us to account for otherwise unforeseen consequences of our teaching. We highly recommend other teachers do the same, by applying envisioning to their teaching, on whatever subject (also beyond the field of design) and seeing what they find.

We will continue to have discussions about what we have learnt from the envisioning activity in this paper, as well as about other envisioning prompts, in the hopes of educating responsible designers in a responsible way, to have a positive impact beyond the classroom, on a larger scale.

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NORDES 2021

SCALING UP DIVERSITY AND INCLUSION: FROM CLASSROOM TO MUNICIPALITY

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ABSTRACT

This paper investigates opportunities for scaling up the diversity and inclusion of international residents at the level of municipality service offerings. The starting point is a set of small-scale service design projects actively involving municipal representatives and university students. This collaboration was part of a service design course at Aalto University addressing challenges faced by the municipality of Espoo, Finland. Through triangulation of three data sources i) pre-course meetings, ii) email surveys during the course, and iii) semi-structured interviews with participating municipal representatives after the course, this paper offers insights on how small-scale service design collaborations can facilitate the scaling up of international diversity and inclusion within public services. Our findings identify prerequisites for scaling up (i.e., exposure and impetus for change, diversity and inclusion immersion, and personal empowerment), but they also highlight institutional hindrances (i.e., institutional inertia, reframing and reverting, and implementation paralysis) that warrant further investigations.

INTRODUCTION

Diversity and inclusion of international residents are globally relevant, timely, and pressing topics. Extant research repeatedly demonstrates that the organisations with less marginalisation (e.g., not pressing certain groups of people in less-deserving positions) and more diversity, have higher productivity and competitiveness (Cox & Blake, 1991; Jayne & Dipboye, 2004). Accentuated by the Covid-19 pandemic, the European economy is in an urgent need to boost growth and the European commission calls on all national policies to find sustainable ways to strengthen the economy (European Commission, 2020). The United Nations 2030 agenda calls for reduced inequalities (UN, 2015) and the Universal Declaration on Cultural Diversity (UNESCO, 2001) underlines the importance of cultural diversity to fight against racism, xenophobia and intolerance and to support the realization of human rights (UN, 1948). While positive attitudes towards growing cultural diversity are increasing globally

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(Economist Intelligence Unit, 2009), anti-immigration right-wing populism is simultaneously spreading across Europe (e.g., BBC News, 2019). While migrations within and towards the European Union are increasing, municipality policies and politics uncover discriminating practices, such as neglecting the human rights of certain groups of immigrants and lack of educational equality (Dancygier, 2010; Moreno-Lax, 2018).

With the above issues in mind, this paper addresses the challenge of scaling up diversity and inclusion of international people in the context of the municipality of Espoo and its public services. Diversity and inclusion are key to successful business growth (Hunt et al., 2020) which understandably functions well as a motivation in the context of business organisations. While the European Union actively emphasizes the importance of diversity and inclusion, municipalities have a tendency to be very slow in implementing systemic changes. Furthermore, immigration matters are a sensitive political topic, constantly being pulled in two directions. On one side, social-democratic politicians support integration and advocate the ground-level importance of equality to build sustainable futures. On the other side, the anti-immigration politics are increasingly trying to blame international residents for diverse problems including unemployment, criminality, and decrease of national security (Dancygier, 2010). These issues, among others, increase the challenge of achieving and scaling up successful cases of diversity and inclusion at a municipal level.

We investigated this phenomenon in Espoo, which has one of the highest percentages of international residents in Finland. In particular, the percentage of the international population has been rapidly growing, making integration of the international population one of the key priorities and strategies towards sustainable futures (Espoo Story, 2017). In this context, the term ‘international residents’ refers to those residents who do not speak the country's official language as their mother tongue and have a foreign nationality.

Service design has been identified by many as a successful practice to develop service offerings towards more human-centered, productive and valuable ones (e.g., Kimbell, 2009; Mager, 2009). Yet, making change and scaling up solutions in public services has been identified as a problematic topic in design literature. For example, research conducted within the DESIS Network (Design for Social Innovation and Sustainability) recognizes scaling up social innovations and transformative changes as a challenge which calls for further investigation (Cipolla, 2018). Authors who have studied design collaboration with municipalities claim that it is challenging to have a long-term impact through service design practices if the projects are short-term, clients are not committed, and public institutions lack tools and practices to implement the residents’ needs (Hyvärinen et al., 2015; Pirinen, 2016). Yet, according to Deserti and Rizzo (2014), achieving systemic change through design is possible if the culture of the organisation is developed simultaneously towards the same goals as the intended change. Also, Vink et al. (2019) suggest that reshaping the mental models of those who are part of the organisation contribute to innovation. They propose focusing on enabling conditions, such as coaching, participation and supporting physical materials, to allow a shift in people’s own assumptions and beliefs. The shift can be facilitated through practices of experiencing surprises, realising multiple perspectives, and alternative futures (ibid). Nevertheless, we lack the knowledge on whether small-scale service design projects with municipalities can set the stage for scaling up diversity and inclusion.

To address this problem and research gap, we observed the prerequisites and hindrances of scaling up through a university course in service design that is organised in partnership with civil servants from the City of Espoo. The enrolled, master level students had a background in design, and most of them had previous experience in collaborative and human-centered design. It was a highly international cohort with 16 students from 11 different countries and only five local students. In addition to the learning objectives that focus on service design related themes, the course has an additional thematic component which changes each year. In 2020, the main topic was internationalisation which was opened up and explained to mean the integration of international residents to service development and the diversity and inclusion of international residents in service offerings. The choice of topic was agreed with the municipality, and was intended to i) address the topical situation the municipality is facing with an increasing number of international residents, and ii) overlap with the research questions of the first author, who acted as teaching assistant in the course.

Figure 1: Residents participating in city planning set up by the student team. (Photo: Jelske van de Ven, Emma van Dormalen, Austen Arnould and Virve Boesch)

The course ran over six weeks with a highly intensive schedule including literature and lectures along with the

project work (see Table 1). The project work was done in five groups of three to five students and each group addressed a design brief of their own (Figure 1). The briefs included international residents' participation in urban planning, attracting international talent, facilitating employment and onboarding processes, as well as rethinking the concept of a local museum to become more inclusive. In 2020, due to the Covid-19 pandemic, the course was organized mainly remotely using Zoom and Miro platforms. Table 1 depicts the design project phases, related group work activities, and anticipated interactions between students and municipal partners.

Table 1: Course phases and interactions between students and municipal partners by weeks (W).

W	Phases	Activities	Collaboration
1	Dive into the topic	Forming teams, theme explorations; first provotype concepts; field study plan	Meeting with municipal partners
2	Field research	Project focus, background & literature research	Contacting diverse stakeholders, including service customers, and providers
3	Frame your action	Making sense and exploring by observation, interviews, co-design, preliminary findings, stakeholder insights, and initial ideas	Contacting stakeholders, field studies. Mid-term review of preliminary findings
4	Insights and ideas	Elaborations, further making sense and exploring, design interventions	Participating in co-creation interventions
5	Synthesizing and design interventions	(Continuation of the field research), analysis, personas, design directions	Receiving feedback on findings and design directions
6	Finalising	Finalising design ideas, learning portfolio, deliverables	Preparing for the final presentation and feedback session
	Final deliverables	Group presentation, Final report, Executive summary	Detailed feedback

For this paper, we focused on studying the municipal partners and their expectations, learning, and experiences. We collected data before, during and after the course from all the 13 municipal representatives who participated in the course as owners of the five different project briefs. In this paper we opt to call them partners to highlight the co-creative nature of service design. Before the course the partners were observed in a series of meetings organized to develop the briefs, during the course weekly emails were sent to the partners to reflect on the topics of service design and diversity and inclusion, and after the course semi-structured interviews were conducted with all the participating partners. Through this data collection we aimed to obtain a finer-grained understanding of the individual and systemic prerequisites that lead towards change.

CONCEPTUAL BACKGROUND

SERVICE DESIGN AND MUNICIPALITY COLLABORATION

This paper focuses on diversity and inclusion through a service design intervention. Therefore, we investigated recent literature on service design projects with municipalities. We can recognise that triggering change through collaboration is a challenging topic. Stickdorn et al's (2018) characterisation of service design practice includes experimenting, prototyping, tackling with uncertainty, making action and learning from it, and highlights the iterative and reflective process of service design. Yet, traditionally municipalities are not well-equipped for experimenting and have a tendency to be slower in the process of change compared to the private sector (Pirinen, 2016). This may lead to a gap and, thus, to misunderstandings in the culture of practices between service design and municipalities (Vaajakallio et al., 2013). There are, however, examples of how service design and municipality collaboration has led towards a change when organisational capabilities, structure, routines and culture were taken into consideration during the planning of different phases of transformation (e.g., Malmberg, 2017; Yu & Sangiorgi, 2018). However, Pirinen (2016), who focused on co-design projects, claims that: "a university-led service co-design project remains a superimposed activity with low impact on actual design decisions or core activities in the client organisations and that the utilisation of co-design greatly relies on individual, committed participants" (p. 27). In the same vein, Hyvärinen et al. (2015) recognize that public organisations lack the tools and practices to have the residents' needs and wishes implemented in the development of services.

Transformative service research highlights the importance of human-centeredness and improvement of wellbeing (Sangiorgi, 2011). Fisk et al. (2018) propose transformative service research as a model towards more inclusive design and more valuable services for all

as it is "enabling opportunity, offering choice, relieving suffering and fostering happiness" (p. 835). Moreover, this idea seems to be aligned with i) the previously mentioned suggestion by Deserti and Rizzo (2014) of simultaneously developing the culture of an organisation and the service offerings (to be more diverse and inclusive), as well as, ii) the reshaping of mental models proposed by Vink et al. (2019). To sum up, facilitating the interactions between the municipality culture and its legacies and service design practice on one hand, and focusing on committed individuals on the other hand, can lead to successful impact towards change. Considering this, we can distinguish that research from the municipalities side on the prerequisites leading towards change can be fruitful for developing services that support the diversity and inclusion of international residents.

DIVERSITY AND INCLUSION OF INTERNATIONAL RESIDENTS

Diversity and inclusion of international residents are topical issues in many countries and municipalities and it has not yet been fully explored by design research. Inclusive and universal design are well-researched topics that have greatly contributed to the development of artifacts and services to become more suitable for marginal user groups such as elderly, young people, and disabled (Ostroff, 2011). This has added to our understanding of how the viewpoint of users that are different from ourselves, contributes to more equality as well to products and services that have a better usability in general (Clarkson et al., 2013). Existing research shows that service design is a functioning practice to build equality through inclusion in service systems (Fisk et al., 2018), yet research on racial inclusion is underrepresented despite its timeliness. Currently in many European Union countries service systems are affected by disturbances to scale up diversity and inclusion, such as racism towards foreign nationalities in the educational system (Kurki, 2019) and discrimination in recruitment processes based on foreign family names (Ahmad, 2020). Also as aforementioned, the political atmosphere is strongly affected by the anti-immigration debate and those who aim to support the realisation of human rights. The topics related to inclusion and diversity of international residents are strongly based and biased by assumptions (Blum, 2002) which makes scaling up of services that support diversity and inclusion more important yet challenging.

SCALING UP

Existing literature on scaling up highlights examples from public sector (e.g., healthcare) and private sector (e.g., retail) where emerging behaviour of key actors, as well as 'learning by doing', are identified as important factors for scaling up (Paina & Peters, 2012; Subramanian et al., 2011). In service design research, the topic of scaling up is less rigorously researched, yet the topic of change is presented from different angles. According to Andreassen et al. (2016), it is possible to develop organisation-level change through service design and user-centered practice as they enable the participation of all stakeholders in the organisation. Junginger and Sangiorgi (2009) suggest that to create lasting transformation and to scale up change in an organisation requires in-depth knowledge of the organisational structure. They add that small changes may have a long-lasting impact, but to gain deeper transformation requires longer term collaboration and strong commitment. Di Pietro et al. (2017) propose, based on research conducted with two private sector companies, a framework of four key drivers of scaling up service innovations: "effectuation as the basis for creating the value proposition; sensing and adapting to local contexts; the reconfiguration and alignment of resources and forms for collaboration between actors; and values' resonance" (p. 146). Through their work they highlight the importance of change of values and sense of benefit for the different participants of the service to be able to scale up innovation. Yet the prerequisites for scaling up for these settings remain under-researched.

To sum up, service design practice has been identified as a positive stimulus for scaling up inclusion and initiating change. Still, more research is needed to understand its potential for scaling up diversity and inclusion of international residents in municipalities, especially when social anti-immigration movements try to pull away from such a change.

METHODOLOGICAL APPROACH

This paper leverages data gathered from a 2020 autumn edition of a service design course that involved an intensive collaboration between master level students from Aalto University and diverse municipal partners from the City of Espoo in Finland. The partners were six service managers, three service planners, two specialists, one business coordinator, and one assistant. The course includes group work for tackling a practical project with the aim to innovate municipal services through a human-centered, holistic, and iterative approach, following the way Blomkvist et al. (2010), among others, have coined the key characteristics of service design approach.

Since for this paper we focus on motivations, learnings, and experiences of the involved municipal partners, the research process started before the course was even launched, already in spring 2020. Within the municipality, first, a call for partnership was published to which municipality representatives volunteered for. For this collaboration, the briefs were framed around the current issues that match the overall topic of the course

and that offer a meaningful learning experience. Once the briefs were selected, partners were i) tutored on how to reformulate project briefs and prepare necessary background materials, ii) advised on how to work with students and how much time they should dedicate for the project involvement, iii) introduced to service design mindset, processes, and methods, and iv) informed about what to expect from the collaboration. The latter one included making municipal partners aware that in a student project, the students are expected to reformulate the brief, and as it is a learning process, they will face uncertainties. The partners were also invited to contribute to student groups' learning process by giving feedback, answering questions, joining co-design workshops, and feeding insights (as visible in Table 1). Below, we outline the course's briefs addressing the topic of international diversity and inclusion:

Brief 1: Rethink the concept of a local museum with the mindset of togetherness

Recently, a local museum experienced a decrease in the number of monthly visitors, particularly from the target group of international residents. This project focused on exploring potential avenues to ensure a cosy, safe, and homely environment for diverse municipal residents. The main idea was to bring people together regardless of their origins thus creating a new concept of 'home-internationalisation'.

Brief 2: Integration of international students into the workforce

With the influx of international students at the leading local universities, the municipality recognized the need to smoothen student's integration into the workforce already before, but also after their graduation. This project focused on finding ways to facilitate students' connections with local companies and public sector providers with the aim of increasing their employability.

Brief 3: 'Starter-kit' for companies to hire international talents

Following a successful example of a starter-kit offered to new parents, this project explored how similar offerings can be designed for the context of international recruitment. The main focus was put on the 'ingredients' (i.e., physical items) of the starter-kit necessary for both public and private sector employment.

Brief 4: Digital support for job acquisition for entry-level national language speakers

An important part of unemployed international residents has learned speaking the national language but may have insufficient written proficiency. This project focused on how digital application and tools could support companies in hiring internationals with still inadequate language requirements for the job position.

Brief 5: Engaging non-national language-speaking residents in the neighbourhood urban planning

All neighbourhood residents have the right to participate in the development of the area in which they live. However, due to the multiculturality of local residents, it is becoming increasingly difficult to capture everyone's voice. This project focused on finding scalable long-term solutions for participatory urban planning.

DATA COLLECTION AND ANALYSIS

The research process employed multiple methods to collect relevant data: (1) pre-course meetings, (2) weekly e-mail surveys collecting municipal partner's reflections on the topic of integration, inclusion, diversity, service design approaches, and student collaboration, and (3) semi-structured interviews with the municipal representatives who participated in the project (see Table 2). We opted for multiple data sources and their triangulation (Bowen, 2009) since it increases reliability and trustworthiness of the research findings (Eisenhardt, 1989).

Table 2: Triangulation of data sources.

Brief	Municipal partners	Pre-course meetings	Survey responses	Semi-structured interviews
1	3	3	20	3
2 and 3	2	2	14	2
4	4	3	25	4
5	2	4	9	2
General partners	2	3	9	2
Total	13	15	77	13

PRE-COURSE MEETINGS

Before the start of the course, we collected data during a series of meetings with the municipal partners (primary data) and based on the documentation they provided to develop the project briefs (secondary data). A total of 15 pre-course meetings were held with 13 municipal partners organized around the 5 projects. During each meeting, the responsible teacher and teaching assistant were present and were taking notes and making observations. Based on these meetings, the overall topic of internationalisation was reframed to focus on

'diversity and inclusion of international residents. Consequently, five project briefs were developed based on the meetings and documentation provided by the partners (e.g., background information about current functioning of their services, current levels of international diversity and inclusion etc.). All the brief owners had similar requirements for providing documentation. The resulting brief documents contained the following categories: the challenge clearly explained, the motivations behind it elaborated, context of the challenge, expectations of the results, relevant contact persons, and background material related to service in question and challenge (e.g., brochures, strategy reports).

E-MAIL SURVEYS

Throughout the course, on a weekly basis, we surveyed municipal partners about their opinions, attitudes, and certain aspects of their collaboration experience (Leedy & Ormrod, 2010). Surveys were sent via email and contained a set of weekly unique open-ended questions. Respondents were encouraged to share their personal viewpoints without conforming to what they thought researchers wished to hear. Only one reminder was sent to nudge the partners to fill in the survey. Main topics covered by the survey were: i) interest for participation and expectations, ii) opportunities and challenges of international diversity and inclusion, iii) status quo of diversity and inclusion in their organisations, and iv) the role of service design in 'change making'.

SEMI-STRUCTURED INTERVIEWS

After the course, we conducted 13 semi-structured interviews with all the participating municipal representatives to allow them to reflect on the entire collaboration. Main topics covered by the interviews included: i) course organisation, ii) valuable takeaways and eye-openers, iii) future of diversity and inclusivity in their organisations, iv) value of service design, and v) overall satisfaction with student projects. The interviews were conducted via Zoom, by the first author, and lasted 30-60 minutes with an average length of 40 minutes. Each interview was recorded with informant's permission and later anonymized, transcribed, and translated for analysis. Each of the authors read the transcripts independently and followed a thematic analysis (Braun & Clarke, 2006) while coding. Subsequently, the authors met for a joint analysis session in which they shared their initial codes and reflections. Finally, the codes were aggregated and further fine-tuned into a set of themes.

FINDINGS

PREREQUISITES FOR SCALING UP

Analysis of the multiple data sources contributes to our understanding of how small-scale collaborative projects can instigate transformational processes with a larger vision at the municipality level (Manzini & Rizzo, 2011). Our research uncovers three prerequisites or enablers for scaling up that have emerged throughout the collaboration, namely:

1. Exposure and impetus for change

Municipal partners felt ready for opening-up and receiving an outside-in perspective. They frequently emphasized the importance of learning alongside and from the design students, 'getting their hands dirty' through this collaborative applied project, and practicing systems thinking zooming-in and -out approach to encourage municipal transformation. Finally, they trusted that the involvement of diverse stakeholders in the co-design process will ensure the creation of novel value propositions triggering institutional change as well as create opportunities for diversity and inclusion. As indicated in the following quotes:

"Contacts and collaborations with international experts should be a constant so-called 'hidden agenda' for the course. This would, for example, greatly develop the language skills and diversity of the representatives of Espoo. Being part of this course serves as an exposure tool." (Participant 5)

"I look forward to new, innovative, and 'outside the box' solutions to our challenges, as well as engaging and inspiring work with students." (Participant 10)

"Being part of the course is an opportunity to get a new perspective on issues that are a little too close for us to see them clearly." (Participant 2)

"[What concrete came up with the collaboration?] The pain points of communication and interaction [with international residents] quickly came to the fore, which are not specific only to the international people of Espoo, but to everyone, they came up really quickly, really amazing." (Participant 1)

2. Diversity and inclusion immersion

Insights collected through both email surveys and semi-structured interviews emphasize the importance of the multicultural environment to which partners were immersed throughout the course collaboration. Since the Master level students represented a very diverse set of cultural backgrounds and the official language of the

course was English, municipal partners felt that the topic of diversity and inclusivity of international residents was an integral part of the course, service design process, and project outcomes. Furthermore, partnering up and collaborating with a multicultural mix of students served in a way as a service prototype for how the municipality wishes to expand and transform their service offerings. Here we include a couple of quotes highlighting this theme:

"In connection with the theme of internationalisation, multilingualism must always be brought to the fore. [...] It was nice to see a little different way of working and be surrounded by an international crew of students...and peek into the university. The international team supported the topic perfectly... and we also encouraged them to take advantage of it." (Participant 8)

"[What does internationalisation mean for you?] Expanding our own ideas, hearing new ideas, and exchanging ideas. Collaboration and learning from others. Now we need to share with those from our organisation who were not involved in the course that service design works and that such a diverse group of students was really effective, especially considering the short time spent on the project." (Participant 2)

"This [collaboration] clearly showed that we need to involve customers more in the development process and this especially in foreign language services, too much is subject-object thinking." (Participant 4)

3. Personal empowerment

At the individual level, municipal partners felt empowered with the new knowledge, skills, and capabilities acquired through being a part of our service design course. They reaffirmed that this collaboration activated their change mindset and that they are better equipped for abandoning their silos thinking and becoming advocates of service design for transformation. Moreover, many informants shared some unintended positive consequences for their personal development, among which, practicing English language, managing diverse teams, dealing with uncertainty, and recognizing the importance of visual communications. As suggested in the following quotes:

"Service design is interesting as a theme or form of development. This spring, my own job description changed from customer work and training to design and development. I feel that what I have learnt throughout the course could also be useful for my own work and that we could adopt new ways of planning and developing our operations within our organisation." (Participant 3)

"An important revelation for me was the understanding that participation needs to be the same regardless of the background. When I innovate services to make them accessible for the special needs segment of clients, then it serves the majority better as well. Solutions that help the international audience also support the 'basic residents' too." (Participant 1)

HINDRANCES TO SCALING UP

While our analysis uncovered prerequisites for scaling up evident among our informants after only a short-term collaboration with the University, some challenges were identified as well. These barriers or hindrances to scaling up seem to be activated as an opposing force for each of the outlined prerequisites (see Figure 2), namely:

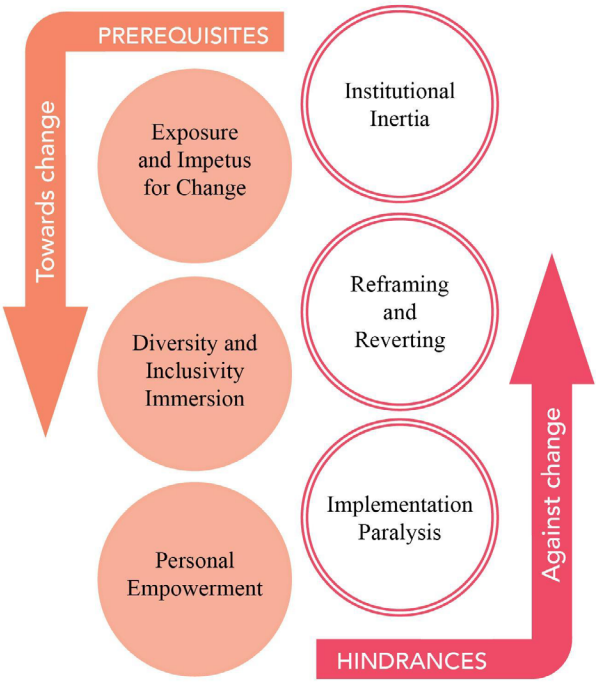

Figure 2: Prerequisites and hindrances to scaling up.

1. Institutional inertia

Inertia or "a tendency to do nothing or to remain unchanged" (Oxford Dictionary, 2021) was commonly referred to as the most disabling characteristic of municipality level functioning. Our informants reported that, oftentimes, there is no willingness to change and that employees lack energy, while managers lack common vision, resulting in conflicts and absence of incentives to transform the system. Furthermore, those who try to make changes and innovate processes get overpowered by institutional inertia. Here we include some quotes which highlight this theme:

"Openness to change requires energy, maintaining good energy is always challenging. Conflicts arise easily and one must find energy to resolve them." (Participant 2)

"The biggest challenge is that some people have not been able or willing to accept the new situation [the influx of immigrants], resulting in oppositions within the organisation." (Participant 6)

"To change something in the public sector!? [laughs]" (Participant 7)

2. Reframing and reverting

As we collected insights on a weekly basis throughout the course, we also noticed that some participants had difficulties accepting design students' framings of the challenges in the early stages of the project. This finding resembles what Lee (2020) coined as 'frame failures', however, in our paper observed from the perspective of municipal partners rather than design students. Along with attempts of reframing, we recognized elements of reverting, where municipal partners tried to return to their old ways of doing and abandoning their open-minded approach held before the course. As indicated in the following quotes:

"The 'discover' phase [of the design process] was surprisingly extensive. At first, I was worried that the students would expand the perspective so broadly that they would try to solve too big a whole at once. They, however, returned to roughly what we had originally presented." (Participant 1)

"Does orthodox service design exist? I am opposed to this kind of thinking e.g., 'in service design, it is customary to think or do things this way'. I still do not understand what can really be expected from service design in the end and what are the subsequent processes towards changing reality and certain ways of working." (Participant 4)

3. Implementation paralysis

Municipal partners seemed to be puzzled with how to move the projects into their implementation phase. Commonly cited reasons for the implementation paralysis included: lack of resources, unskilled staff, additional help needed to bring the projects and design capabilities forward, and the slowness of change at the municipalities in general. The latter one caused many informants to feel powerless and trapped in their institutional modus operandi. The following quotes emphasize the theme of implementation paralysis:

"The course came at an excellent time, but in order for its results to be taken forward within the organisation, additional help is needed." (Participant 5)

"Espoo has so much to change and the necessary processes are not always in place. There is not enough staff to take the responsibility for these things...and even though the findings and our collaborative work were very important, unfortunately, they may not go forward." (Participant 11)

"The challenge, of course, is resourcing. [...] Our project interventions would produce better results for all…but the development phase would require inputs." (Participant 1)

DISCUSSION AND CONCLUSIONS

This paper contributes to the timely discussion on diversity and inclusion of international residents in the European Union. We discussed this phenomenon in the context of service design projects done in collaboration between University students from highly international backgrounds and the increasingly multicultural municipality of Espoo. We first looked at previous research on service design and institutional change, as well as barriers and enablers of employing service design in the public sector (e.g., Deserti & Rizzo, 2014; Hyvärinen, 2015; Pirinen, 2016 Vink et al, 2019). Our findings resonate with their work regarding the potential use of service design towards institutional change. This study contributes to the earlier work by addressing, in particular, the questions of scaling up change in municipalities with small exemplars of service design practice.

To understand the potentials of change we observed the presence of three prerequisites: exposure and impetus for change, diversity and inclusivity immersion, and personal empowerment. Simultaneously, we identified the presence of resistance to change in the organisation in the form of hindrances that paired with the prerequisites and created opposing forces (Figure 2). We refer to the moments when these opposing forces occur as leverage points, which are best described as places "where a small shift in one thing can produce big changes in everything" (Meadows, 1999). We believe that they offer an interesting potential for further research and our aim is to investigate whether they can be manipulated as 'acupuncture points' to ease the scaling up of diversity and inclusion in municipalities, and also, to study the role of service design in the process. These questions will be addressed in our continuing collaboration with the municipality. Particularly, the focus will be put on institutional hindrances since they were identified as the barriers to scaling up. Diversity and inclusion are not hindrances

themselves but the institutional challenges are preventing them from coming to the fore.

The intensive course offered an example of how service design students and municipality representatives can work together towards equality and human rights, and speculate how these efforts could be scaled up. On the one hand, this University-Municipality collaboration confirmed that the students' application of service design practices, such as collaborative workshops and engaging multiple stakeholders, offered a quick immersion to the topic and personal empowerment for the representatives of the organisation. On the other hand, the openness of the briefs, and design students' process of reframing and experimenting created a forum of co-learning, exposure, but a cultural clash, too, leading to reverting and paralysis. The course is a small-scale intervention and it cannot be considered as the solution for tackling the issues of diversity and inclusion in a municipality level. However, our findings suggest that it offers a valuable perspective that shows potential for new initiatives. For example, after the course the municipality organized an event where the outcomes of the course were presented to a wider audience. This subsequently led to new initiatives in the municipality that are currently in progress.

Stuedahl and Mainsah (2019) suggest that in the context of co-design, designers require knowledge on cultural diversity to be able to better understand and engage with culturally diverse groups of people. Our study indicates that the culturally diverse team of students as designers helped the representatives of the municipality to be immersed in the topic. This finding calls also for further investigation to be confirmed, however shows yet a potential for change towards inclusion.

Finally, when further working on this fruitful University-Municipality collaboration to support the change towards a more diverse and inclusive society and investigate the role of service design in this change, we are aware that courses and research that are funded by the public sector and municipal bodies include political drivers and political turns are part of democratic dynamics. In municipal decision-making, scale can influence the priorities and question our plans for future studies, as well as the motivations of scaling up, to respond to the United Nations sustainable development goals to "Reduce inequality within and among countries" (UN, 2015, Goal 10).

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NORDES 2021

Paper Session 1

Scaling Exhibitions

Session Chair | Andrea Wilkinson

Object/Display/ Architecture: Integrating Scales in Museum Exhibition Design
Ane Pilegaard (F)

From "Bugs" to Exploratory Exhibition Design – Transforming Design Flaws in Users' Experiences
Kristina Maria Madsen and Peter Vistisen (E)

NORDES 2021

OBJECT/DISPLAY/ARCHITECTURE: INTEGRATING SCALES IN MUSEUM EXHIBITION DESIGN

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Even though it is widely recognized that museum objects, display design, and museum architecture greatly affect each other when it comes to museum exhibitions, their actual integration – during both the process of developing exhibitions and in the final result – is often lacking. This paper will explore an alternative approach to museum exhibition design, in which object scale, display scale, and architectural scale are integrated and worked with as a single malleable design material. Based on the analysis of a student project conducted at the MA program Spatial Design at the Royal Danish Academy and drawing on theoretical perspectives on fluidity and temporality within the fields of contemporary architecture and interior design, the paper will investigate the potential of an exhibition design practice that works in the object/display/architecture *nexus*.

INTRODUCTION

The physical makeup of museum exhibitions consists, roughly speaking, of three main elements: museum objects, exhibition display, and museum architecture. Most museum and exhibition design professionals will probably concur that exhibition makers must consider all three elements when producing exhibitions, since they necessarily affect one another. Likewise, within museum research, there is a shared understanding that exhibition design, of course, affects our perception of objects on display (for instance, Staniszewski, 1998; Klonk, 2009; Tzortzi, 2015), and that museum architecture – for instance, a museum building's grandeur (or the opposite), its institutional program, layout, and location – has a great impact on the museum experience as a whole, on the configuration and experience of the exhibition design, and on the singular object encounter (for instance, Giebelhausen, 2003, 2006; Forgan, 2005; MacLeod, 2005, 2013; Tzortzi, 2015). However, although the interconnection between museum objects, display design, and museum architecture is widely acknowledged and new co-curating practices are continuously emerging, museum exhibition making is still characterized by disciplinary divides (McLean, 2018). Thus, it is typically the curator who chooses and interprets the objects and develops exhibition content, while the exhibition designer gives form to this content and creates a spatial setup that frames the objects on display. The architecture, which is more permanent and, most often, does not have an architect to actually speak for it (although, it might be argued that many museum buildings are so prestigious and honored that their architectural masterminds are ever-present), is a very solid presence that can be quite difficult to confer with, especially if the museum building is listed. One apparent outcome of this, one might contend, is that museum architecture is conceived of as a simple container that envelopes the exhibition design, and that the exhibition design, again, envelopes the objects, sometimes with the use of vitrines, which can be seen to enforce the box-inside-box configuration. Of course, the different containers still affect what they contain and, indeed, most curators and exhibition designers will develop exhibitions – their content and form – based on the specific rooms in which they will be located, however focusing perhaps more on square meters and room layout than on architectural detailing, tectonics, and materiality. We do see examples of (permanent) display design that has been developed

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alongside the museum architecture, or architectural transformation, such as the Castelvecchio Museum in Verona, which was renovated by architect Carlo Scarpa between 1957 and 1975, and which is one of the most acclaimed examples of a museum design that integrates interior architecture and display design. Nonetheless, exhibition design that is developed *within* museum architecture, rather than *from* or in *correlation* with museum architecture, is still much more dominant, at least when it comes to temporary museum exhibitions.

According to architect Michael Brawne, who has written extensively on museum architecture in relation to display design principles, exhibition design functions as an "enclosure" in the same way that museum architecture does; an enclosure that "mediates in scale between the object and the space" (Brawne, 1982, p. 39). Thus, we might also consider this issue a matter of scale. We have the object scale, the exhibition design scale, which is somewhat similar to an interior design/furniture scale – of course, depending on museum typology and the size of museum objects on display – and then we have the architectural scale. But what if we start mixing the scales? What if we challenge the compartmentalizing practices in which museum architecture and display design are understood and developed as containers and enclosures? This paper will present an example of what such an approach to exhibition making could look like.

As studio tutor at the MA program Spatial Design at the Royal Danish Academy, I often supervise students who work with museum exhibition design. During spring 2020 two of my students, Liv Sofia Engelbrecht Dannevang and Emilie Kabel Allin (who will be referred to as L&E), did a collaborative project on museum exhibition design as their master's thesis, in which they mixed the scales of museum objects, display design, and museum architecture in very concrete ways. Their project, which entailed a proposal for a new (permanent) exhibition design at Møn's Museum – a small local historical museum at the island of Møn in the Region of Southern Denmark – will constitute the empirical case of this paper. The analysis will not focus on the design proposal as such, nor how it transforms the current museum experience, but will rather concern L&E's design methods and how these affected the final design proposal. The analysis will refer to L&E's own words about their design process, which were written down in a project report (a 15-pages document that they submitted together with their final design proposal), but will also add new perspectives which were not part of the initial thought process. Notions of scale were not a strong focal point within L&E's project formulation, but have, in hindsight, shown to be crucial to their approach. Thus, in the present paper, matters of scale will be used as a lens through which L&E's work is conceptualized and put into perspective in relation to a broader discussion on museum exhibition design.

The analysis will examine the different ways in which L&E have worked with the integration of scales. Firstly, it will look into the *adjoining* of object and architectural scales that some of L&E's initial concept models and analytical sketches demonstrate. Here the concept of display becomes the pivotal point by which objects and architecture meet and change positions. Secondly, the analysis will examine the way in which L&E have taken things *in and out of scale*; how, for instance, they have turned architecture into hand-sized objects (*out of* architectural scale) and, thereby, *into* the human scale. Thirdly, the analysis will explore how L&E have bridged between *interior and exterior scales*, and how they have included the aspect of temporality into their mixing of scales.

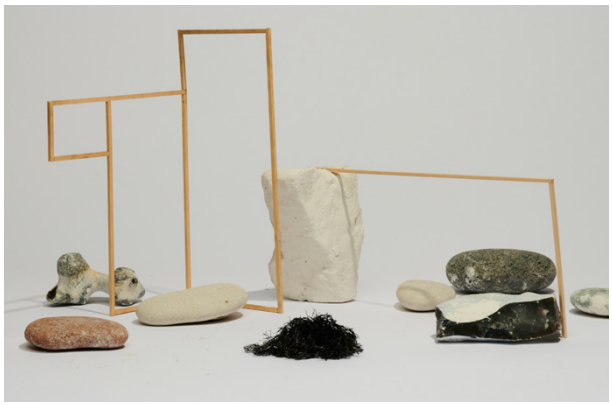
As mentioned above, these design methods can be seen as a parting from exhibition making practices, where museum buildings and display design function as mere containers for the objects on display. This movement away from 'container practices' and towards more fluid dealings with spaces, materials, and temporalities can also be witnessed in contemporary interior design practices more broadly. In order to reflect upon L&E's exhibition design practice in relation to these broader interior design tendencies, I will be drawing on philosopher Elizabeth Grosz, who has dealt with matters of temporality and fluidity in her writings on architecture, as well as interior design researcher Suzie Attiwill, who brings Grosz's thinking into the field of interior design. Finally, I will argue that working with exhibition design as a matter of temporal flow of spaces and materials, rather than sticking to the conventional 'boxing' and separation of scales, shows a great potential in terms of advancing exhibition making practices that are explorative, inventive and open-ended.

ADJOINING SCALES

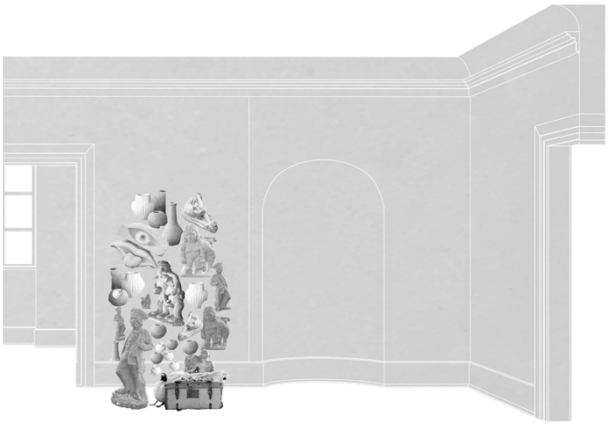
One of the first explorations that L&E made in their design process was a series of conceptual models in scale 1:20 that investigated different architectural elements of the museum building (an eighteenth century merchant's building in the small provincial town of Stege), such as arched niches, doorways, and paneling. At one point these cardboard and wood models were combined with various stones that L&E had collected from the surrounding landscape of Møn, and a series of tableaus were created and photographed. In their project report, L&E explain how the concept models at first represented the display, and how the collected stones represented the museum objects, but also that during the process of working with these tableaus the roles of the concept models versus the stones would interchange. Thus, in some instances, it looks as if the stones inhabit the architecture of the models (see Figure 1), and in other instances the models and the stones seem to be mingling and interacting on more equal terms (see

Figure 2). What L&E recognized during the process of working with these tableaus is that it was not just the architectural models that framed and structured the stones, but that the stones were also able to support and display the architecture; for instance by highlighting architectural formats (through similarity), but also fragility (through contrast) (see Figure 2) (Dannevang & Allin, 2020, p. 19).

Another example of this interchanging relation between objects and architecture – with display as the pivotal point – can be found in a series of collages, where L&E placed objects from the museum collection directly into the architecture of the museum building, for instance in a niche in one of the rooms (see Figure 3). In some ways, this resembles common display techniques like, for instance, in-built wall vitrines, but without the actual exhibition hardware such as vitrine glass and frames. They then moved the object group away from the niche and out onto the floor, but kept the arched shape of the display (see Figure 4). As L&E explains, the group of objects then become a "freestanding figure referring back to the niche behind it," thereby activating this particular architectural detail (ibid., p. 28). Again, it is a matter of an oscillation between 'architecture displaying objects' and 'objects displaying architecture'.



Figures 1–2: Concept models in scale 1:20 and stones. Photos: Emilie Kabel Allin.



Figures 3–4: Conceptual collages. By Liv Sofia Engelbrecht Dannevang and Emilie Kabel Allin.

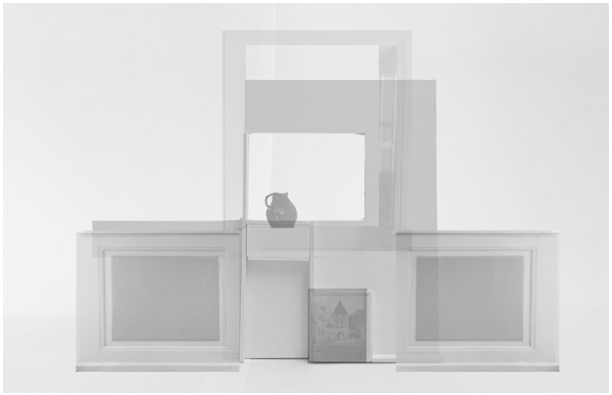


Figure 5: Analytical collage of current display at Møn's Museum. By Liv Sofia Engelbrecht Dannevang and Emilie Kabel Allin.

This interest in the 'co-existence' of objects and architecture can also be found in L&E's analyses of the current display design at the museum where, for instance, they notice how the specific placement of two objects – a jug placed on a windowsill and a painting leaning against the window niche panel – makes objects and architecture "frame one another equally" (see Figure 5). This, they explain, partly has to do with the fact that there is no distance between the two; that the objects are in "direct contact with the window niche"

(ibid., p. 27). However, it also has to do with the perspective from which we look at the display. L&E describe that if we focus on the jug and painting as the exhibited objects, the architecture is merely what is "holding" and "framing" them, but if we begin to look at the architecture as an object on display, then the jug and the painting become determining factors in the display due to what they "see" (and what they touch, one might add) of the architecture, namely the specific materiality and detailing of the window niche (ibid., p. 27).

What L&E did in this initial phase can, I believe, be understood as a *joining* of objects and architecture that collapses the divide between object and architectural scales. Thus, the scale of display design that, according to Brawne, would normally mediate between them – a perspective that somehow maintains their separation – has now been turned into a pivotal point: that by which they adjoin and change positions. Display, then, is not so much a matter of inserting a new material layer into the exhibition. It is not a matter of introducing a "middle scale enclosure," as Brawne puts it. Rather, it is about managing the relation between objects and architecture in a way in which they inform and support each other's material and spatial particularities.

Of course, such a strong focus on the architecture of the museum is not necessarily appropriate for all museum exhibition productions. For instance, a scenographic effect where the surfaces of the museum architecture are covered with different kinds of 'backdrops' and 'settings' might be sought for, or a 'black box' aesthetics where the architecture disappears in the dark periphery of the exhibition space. There might also be a wish to treat the architecture as a present but otherwise noninfluential enclosure, as demonstrated by the 'white cube' aesthetics of modern art museums. Finally, the exhibition might be intended to travel, which makes the display/architecture integration more difficult to pursue. Nonetheless, an approach like L&E's, which uses museum architecture as a productive asset rather than as a necessary, but otherwise unimportant enclosure, is still highly relevant. First and foremost, because it takes the predicament of museum exhibition design, namely that objects, display design, and architecture will necessarily affect each other, and turns it into the primary driver in the exhibition design process. In the following we shall dive further into L&E's ways of working with the museum architecture and its relation to the display of museum objects, focusing on the way in which objects and architectural elements are brought in and out of scale.

Figure 6: Fragment models in plaster and glass, scales 1:1, 1:5, 1:10, and 1:20. Photo: Liv Sofia Engelbrecht Dannevang.

Figure 7: Fragment model (copy of room paneling in glass, scale 1:20) placed in 1:20 cardboard model. Photo: Emilie Kabel Allin.

IN AND OUT OF SCALE

After the initial analyses and explorations of the relation between museum architecture and object display at Møn's Museum, L&E began an extensive modelling process where they copied and interpreted details in the museum architecture in plaster and glass (see Figure 6). With these *new* objects (L&E named them "fragment models") they could develop spatial and material compositions for their exhibition design. Some of the fragment models were created in scale 1:20 in order to fit the 1:20 cardboard model that L&E had made of the exhibition rooms (see Figure 7). Others were in scales 1:1, 1:5, and 1:10, meaning that they produced different mixings of scales when combined with the 1:20 cardboard model and when juxtaposed. For instance, a 1:1 model of a skirting board became an obtrusive yet evocative element within the cardboard model (see Figure 8). Some of the fragment models were direct copies of architectural details, while others demonstrated a more abstract interpretation of the architecture, for instance when the partial curve of a niche was used as the outset for producing a series of new shapes and compositions (see Figure 9).

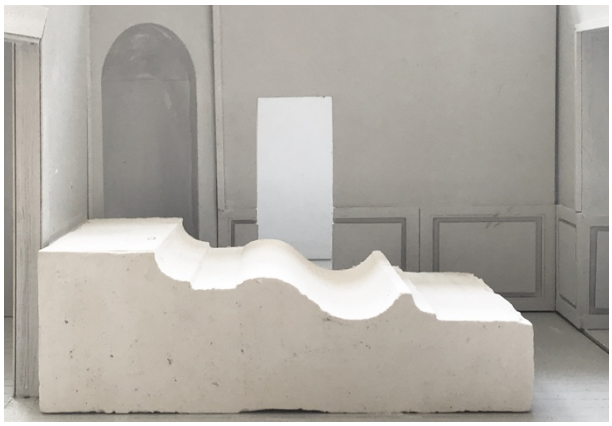


Figure 8: Fragment model (copy of skirting board in plaster, scale 1:1) placed in 1:20 cardboard model. Photo: Emilie Kabel Allin.

Figure 9: Fragment model composition. Photo: Liv Sofia Engelbrecht Dannevang.

Figure 10: Composition of fragment models and (Photoshopped) perfume bottles from the museum collection. Photo: Liv Sofia Engelbrecht Dannevang.

What I wish to highlight here, is how the architecture is fragmented and reassembled in ways that cut across object and architectural scales. Partly because architectural details and elements are turned into objects that can be handled within the human scale (all of these models are approximately 10x15 cm – that is, possible to handle with one hand), but also due to the way in which objects from the museum collection have been inserted (Photoshopped) into the model compositions; for instance, in ways in which the similarity between object shapes and architectural shapes, such as the similarity between perfume bottles and architectural profiles and a niche, are highlighted (see Figure 10). According to L&E, the main purpose of this mixing of scales was to explore possible encounters between objects and architecture in a manner where the spatial and material components of the museum were treated in a non-hierarchical manner (personal communication, August 7th, 2020). Architecture and museum objects became part of the same design material that could be manipulated and constructed without adherence to (proper) scale.

Drawing on Jane Bennett's (and through her, Deleuze and Guattari's) thoughts on "assemblage" (Bennett, 2010), L&E wished to make room for a joint venture between all sorts of material objects – human and non-human alike. They saw their experimental compositions (as well as their final design proposal) as assemblages in which objects and materials affected each other; in which they enhanced various aesthetic qualities in each other and, thereby, changed each other (Dannevang & Allin, 2020). Here, I believe, it also mattered that the architectural details and elements were reproduced in a scale that allowed them to create a group of similar sized objects and, furthermore, that these objects would fit the human hand. The fragment models could easily be handled and moved around in the process of trying out different compositions. In relation to L&E's work with Bennett's concept of assemblage, which, despite Bennett's emphasis on very quotidian aspects of materials and things, can still be difficult to grasp in relation to actual design practice, I believe that this process of interpreting and working with architectural details by turning them into hand-sized objects, was an important step to take. Elizabeth Grosz speaks about a similar matter in her writings on architecture, when she describes how:

> We stabilize masses, particles large and small, out of vibrations, waves, intensities, so we can act upon and within them, rendering the mobile and the multiple provisionally unified and singular, framing the real through things as objects for us. (2001, p. 173)

By working with the museum architecture as objects in their hands, it became possible for L&E to turn their more fluid and abstract ideas about how the architecture could enter into assemblage with museum objects and display design into something very solid and real (see Figure 11).

Through this method of taking things in and out of scale, L&E treated museum architecture not as a simple box providing a certain quantity of square meters and wall space, but as an object – or objects – with which

the exhibition designer can engage more fully. In the final design proposal, this has resulted in, for instance, display design detailing and exhibition furniture, such as stools and a table (see Figure 12), that repeat or are developed from the profiles, paneling, and niches which the fragment models explored. Some of these architectural details have been put back into their proper scale, while others, for instance the stools, which were designed with an outset in the abstract compositions with niche curves (see Figure 9), have settled in a new (furniture) scale.

INTERIOR AND EXTERIOR SCALES

Another way in which L&E have integrated scales in their approach to museum exhibition design can be seen in their attempts to connect the interior and exterior(s) of the museum. According to architectural theorist Albena Yaneva, who takes an actor-network theory approach to architectural production, museum interiors and exteriors are typically treated and cultivated as separate spaces within museological research. She explains how New Museology, with its focus on social and political aspects of museum institutions, along with material culture approaches to museum object collections and display, "share the assumption that the exterior is separated from interior (…), the museum is considered as a visual embodiment of external, past or present social reality" (Yaneva, 2003, p. 117). This tendency, I find, has a very concrete counterpart within museum practice, namely the numerous curtained and blocked windows that can be seen in many museums. Of course, there is a very practical reason for this, since museum objects often need to be protected from daylight due to preservation concerns. However, in some instances, this window blocking might also testify to a general disinterest in the immediate exterior and site-specificity of museums. Although the ways in which museums connect to and function as part of overall urban schemes has often been highlighted (for instance, Giebelhausen, 2003), and the architecture of some modern art museums, such as Louisiana Museum of Modern Art in Denmark, strongly relate to the outdoor environment in which they are placed (Tzortzi, 2015), concern for the spatial and material particularities of museum sites is, I believe, still lacking. Museum exhibitions are generally considered and designed as (fictional) spatial entities that transport the museum visitor to someplace else – another time, another site.

In L&E's exhibition design proposal, however, looking out the windows is just as important as looking at the museum objects on display, and one of their designs points directly to this. Namely, the installation of pivoting, textured glass panels that they have proposed in the reception area and which emphasizes and

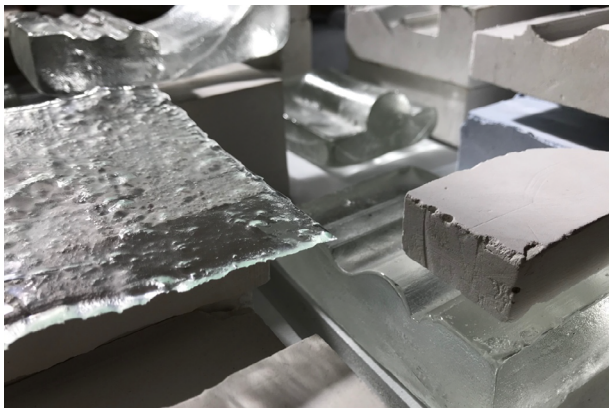


Figure 11: Material assemblage of fragment models and textured glass. Photo: Emilie Kabel Allin.

Figure 12: Design proposal visualization, exhibition room. By Liv Sofia Engelbrecht Dannevang and Emilie Kabel Allin.

Figure 13: Design proposal visualization, reception area. By Liv Sofia Engelbrecht Dannevang and Emilie Kabel Allin.

enchants the basic activity of looking out windows (see Figure 13). The same kind of textured glass is used all through the exhibition design and comes to function as the general 'filter' through which both the interior and the exterior of the museum are seen. Thus, the window installation in the reception area conveys the notion that exterior views are on display in a similar manner as the actual museum objects. Furthermore, the overall organization of the exhibition design has been done with close attention to particular exterior views within the

various rooms. Thus, the part of the exhibition that deals with the history and architecture of the town of Stege in which the museum is placed, is located in a room that has very clear views of the old town gate which is immediately adjacent to the museum building. This concern for the immediate exterior of the museum building can also be seen in the way in which L&E have included this exterior into their design proposal drawings (see Figure 14). Just as the museum objects are shown in the drawings, so are the adjacent exterior buildings.

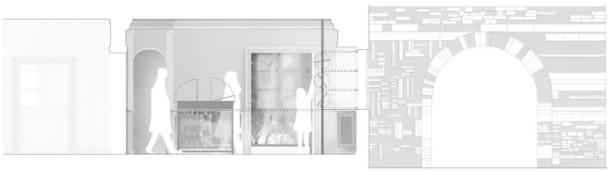


Figure 14: Design proposal section drawing. By Liv Sofia Engelbrecht Dannevang and Emilie Kabel Allin.

Figure 15: Glass experiments. Photo: Liv Sofia Engelbrecht Dannevang.

Figure 16: Analytical photo sketches of interior and exterior spatial sequences. By Liv Sofia Engelbrecht Dannevang and Emilie Kabel Allin.

Another way in which L&E have dealt with the site-specificity of the museum is in their work with textured glass, which they cast on materials found in the landscape of Møn, such as sand, gravel and stones (see Figure 15). By including the cast shapes of these materials in the exhibition design proposal, they reproduce the textures of the surrounding landscape within the museum exhibition space which, again, can be understood as an integration or superimposition of scales; scale understood not as a numeric feature, but rather as a matter of locality and domain. This superimposition of different domains can also be found in L&E's analyses of routes and spatial sequences. Based on Gordon Cullen's "serial vision" method (1961, pp. 17–20), they analyzed the characteristics of spatial sequences within the cityscape scale, the museum interior scale, and the local landscape scale (see Figure 16). Not only did these analyses give L&E an understanding of various spatial experiences in relation to movement, it also gave them insight into the similarities *between* these experiences when comparing the different scales. Variations between *exposed*, *enclosed*, and *sequenced* spaces were detected in the interior as well as exterior scales, and these characteristics became an important factor for developing the spatial layout of the final exhibition design proposal, which shows a particular concern for movement and tempi (Dannevang & Allin, 2020, pp. 22–24).

This way of approaching museum exhibition design as a temporary process – not only in relation to the design phase, but also when it comes to museum visitor experience – can be seen as another way in which L&E's project departs from common exhibition making practices. This is not to say that temporality is not a general concern when it comes to museum exhibition design. On the contrary, exhibitions are typically thought of and conceived as sequences of materials and meanings that gradually unfold as the museum visitor moves through the exhibition spaces (for instance, Bal, 1996; Duncan & McCauley, 2012; Kossmann, Mulder & den Oudsten, 2012; Tzortzi, 2015). However, in L&E's design process, spatial configurations, tempi, and intensities have not been developed within a self-contained exhibition space sphere, cut off from the exterior land- and cityscapes, as typically seems to be the case within museum practice. Rather, L&E have allowed the exterior scales to permeate and run through the museum architecture and display design. In this sense, L&E's approach links to contemporary tendencies within architecture and interior design, where spatial design is considered more a question of tapping into temporal flows than of creating or functioning within static containers.

STATIC CONTAINER VERSUS TEMPORAL FLOW

In her proposition for a renewed understanding – a new history – of interior design that emphasizes temporality rather than enclosure, interior design scholar Suzie Attiwill points to "the shared dominant structures of both history and interior design: containers and enclosures, be they boxes of categories or boxes of architecture" (2004, p. 2). Furthermore, she highlights museums as "three-dimensional histories" where this

"boxing" practice is particularly evident (ibid., p. 4), which resonates with this paper's critique of museum 'container practices'. What Attiwill proposes instead is the comprehension of interiors as temporal events that are not limited by the concept of enclosure and, therefore, are not separated from exteriors: "The interior as a concept of enclosure is *inter*vened and opened – becoming a dynamic spatial and temporal condition between things where interiors and exteriors are in constant production" (ibid., p. 6). With this (Deleuzian) approach, "the emphasis is not on finding and fixing meaning but on *making* sense, on producing and inventing" (ibid., p. 7); an approach that is also highly relevant when it comes to exhibition making (which can, of course, be understood as a type of interior design). The exhibition design *process*, I believe, can be a very important key to this, because designerly ways of working are all about experimenting, making, and inventing, rather than knowing and fixing, which, on the other hand, can be seen as essential attitudes within traditional curatorial work. However, it should be noted that the discipline of curating is, indeed, developing, and that new and less static formats and approaches are continuously emerging. Also, there is, of course, an element of 'fixing' within the design process too: at some point lines have to be put down on paper, and more or less static objects are produced. However, according to Grosz, this process of turning fluid material and ideas into solid things can also be understood as a "slowing down of the movements, the atomic and molecular vibrations, that frame, contextualize, and merge with and as the thing" (2001, p. 170). Attiwill continues this line of thought when she describes how interior design can be a matter of framing forces and flows:

> Interior design is re-posed as a process of framing situated in the flow of movement where selection and arrangement involve acts of separation as contraction that slow the fugacious exterior down and enable a temporary, provisional consistency – a "fabrication of space," an interiorization in the midst of movement. (…) This involves a shift from the current function of arranging materials and objects in relation to a given structure and space to one that addresses relations and forces situated in a fleeting, contingent exterior. (2018, p. 268)

I believe that L&E's exhibition design project is a good example of such a "framing in the flow of movement." It should, of course, be noted that the interior/exterior relation that Attiwill speaks about is quite different from the more literal museum interior/exterior that I have pointed to in the previous section. Attiwill's point is that interior and exterior are not defined by being inside or outside a given building, but rather that interiors are the result of interiorization in the midst of the exterior. Nonetheless, such an interiorization is precisely what I find in L&E's project. Due to their mixing and moving between scales they have renounced common exhibition making practices that simply arrange museum objects within an already given spatial frame, and according to their approach, any differentiation between museum interior and exterior is basically irrelevant. They have interiorized *across* scales.

Figure 17: Design proposal visualization, exhibition room. By Liv Sofia Engelbrecht Dannevang and Emilie Kabel Allin.

A further demonstration of the interiorization that Attiwill speaks of can be traced in L&E's description of their display design as "an instrument" that emphasizes and supports the "interwoven relationships between objects, architecture and site, and not least the visitor's engagement" (2020, p. 33). Their work with textured glass exemplifies this very clearly. In L&E's design proposal, glass is not simply used as a material for containing and protecting museum objects, as is the case with the typical museum vitrine. Rather, it is used as a design element that activates the architecture, the objects on display, and the museum visitors. It varies in transparency, from completely clear (non-textured) to almost opaque, which has a range of different effects. Firstly, it emphasizes and activates the temporal aspect of encountering objects on display, because in many places the museum visitor has to walk around or inside the display installations in order to see the objects more clearly (see Figure 17). Secondly, these objects are 'changed' due to the shifting textures and levels of transparency, which challenges the conception of glass in museums as something that is *simply there* due to preservation and security reasons, but which is otherwise unimportant. It often seems as if glass in museums is seen as a 'necessary evil'; as something that we cannot do without, but which should be as invisible and unobtrusive as possible. Contrary to this, in L&E's project, glass is worked with as an active material that affects object interpretation in very concrete ways. Thirdly, L&E's textured glass displays move beyond the simple containing principle that we know from typical museum vitrines and other kinds of museum glass enclosures. Rather than containing objects within museum architecture and functioning as a material layer between the object scale and the architectural scale, the

textured glass connects and changes both architecture and objects. Of course, some of the glass panes do contain what they display, since the objects, like most other museum objects, need to be protected from curious hands, dust, and climatic fluctuations. Nonetheless, these containing glass panes are still part of a larger, uncontained configuration of spatial and material mutations.

Thus, in coherence with Attiwill's thoughts about a *new* interior design, L&E have allowed a fugacious fluidity (what Attiwill conceptualizes as the exterior) to direct their design process, and when they separate spaces and objects, for instance by inserting textured glass panes, it is not a separation that leads to disinterest between the two parts. Rather, the separation – or the 'slowing down' – functions as a contraction that makes spaces and materials (objects, display, architecture, and site) affect and inform each other. Following on from such a perspective, it can also be relevant to consider L&E's exhibition design project in relation to a burgeoning (although not entirely new) attitude within exhibition making where the *experimental* potential of museum exhibitions is emphasized. Exhibitions are seen as experimental setups that develop new knowledge, not only prior to the exhibition opening (as the typical research-based exhibition will do), but also during the exhibition period, often based on interdisciplinary collaboration (for instance, Basu & Macdonald, 2007; Loeseke, 2018; McLean, 2018; Bjerregaard, 2020). The way in which L&E's exhibition design functions as a 'slowing down' of temporal, spatial, and material processes that integrate otherwise compartmentalized scales, might be a fruitful approach when it comes to advancing such interdisciplinary, experimental practices within exhibition making.

CONCLUSION

Within contemporary museum practice, exhibition design often functions as a separate material layer that is inserted between object and architecture scales. Museum architecture performs as a container that envelopes the exhibition, and the exhibition design performs as a container that envelopes the objects on display. However, as L&E's approach to exhibition design has demonstrated, alternative practices are, of course, possible – practices that integrate museum objects, display design, museum building, and site, and find new ways of utilizing the aesthetic potential of the object/display/architecture nexus. In the case of L&E's exhibition design proposal for Møn's Museum, a main driver in such an integrative practice has been the mixing of scales that took place during the design development phase. As this paper has shown, this mixing of scales has been carried out in three different ways: 1) by *adjoining* object and architecture scales through the use of 'display' as their pivotal point, meaning that objects and architecture display each other interchangeably; 2) by taking things *in and out of scale* and, for instance, turning architecture into objects that can be handled and worked with in the same way as museum objects, thereby allowing them to be part of the same material assemblage; and 3) by superimposing and connecting *interior and exterior scales*, based on the emphasis on views, movements, and the material textures that flow amidst them.

All of these design methods have, in some way or other, resulted in a parting from more rigid 'container practices' within the field of museum exhibition making. That said, it must, of course, be noted that L&E's work has been based on circumstances that are quite different from a typical museum exhibition production. First of all, they have had complete freedom in terms of object arrangement as well as budget and timeframe. Working within an academic study context is, naturally, very different from working within the limits of a 'real life' project. On the other hand, having more access to the building, object collection and, not least, being able to collaborate more closely with curators, as would have been the case with a 'real life' exhibition project, would undoubtedly have benefited their process. Even though there might be a great potential in breaking with strict disciplinary divides between designers and curators and in developing exhibition form and content hand in hand, or even better, not distinguishing between form and content at all, including curational knowledge in the exhibition development process, is, of course, paramount. Furthermore, having the opportunity to work directly with the actual, physical museum objects and being able to place them directly into the material assemblage of the design process would have been of great value. Unfortunately, due to COVID-19 restrictions, such on-site collaboration and exploration was much more limited than L&E envisioned when they began the project in February 2020.

Nonetheless, L&E's project demonstrates that there is a great potential in integrating scales and domains when developing exhibitions. Their project proposes a way in which display design functions not as a material layer *between* objects and architecture, but rather as the place where architecture and objects *meet*; where they affect and change each other, and where objects and architecture affect and change the display design. This is done, first and foremost, by breaking existing boundaries between object scale, display scale, and architecture scale, and between museum interior and exterior. Rather than remaining within conventional confines, L&E's approach to museum exhibition design demonstrates a practice of exploration and inventive making – a practice where exhibition content and form are not set beforehand but evolve and manifest themselves in the midst of a fluid and uncontained object/display/architecture nexus.

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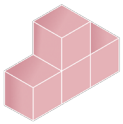

FROM "BUGS" TO EXPLORATORY EXHIBITION DESIGN – TRANSFORMING DESIGN FLAWS IN USERS EXPERIENCES

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ABSTRACT

In this paper we explore the potentials in observing how users creatively explore or hack an exhibition design and transform or scale these "abnormalities" in the users microinteractions into new explorative exhibition designs. Can we apply this notion of observing exploring user interactions and transform these microinteraction into drivers for user experience based on strategies of emergent gameplay? If we acknowledge these findings from the design process as potential enablers of superior user experiences for the end-user, and not simply as 'bugs' and 'anomalies' to be avoided or 'patched', there is a potential for scaling, transferring, and transforming new insights into new design potentials. To this end, observing hacking and creative play in user interactions might lead to a new understanding of user experiences and how unintended microinteractions can transform into foundation user experiences in an exhibition design.

INTRODUCTION

Back in 2017 Nintendo released *The Legend of Zelda: Breath of the Wild* (BotW) (figure 1) – the most recent game in a long running series of adventure role playing games. The game received much praise for its emphasis on exploration in an open and responsive world, which gives the players a set of relatively simple game mechanics, but which through a robust physical rule set achieves a wide range of gameplay situations that diverge from the games story (Gray, 2017). Furthermore, the game makes little effort to nudge users back into its pre-configured story structure, but rather lets users spend hours exploring mechanics and their possible consequences and has confidence in players to be stewards of their own experience from individual non-scripted choices during exploration.

Figure 1: Still from Legend of Zelda: Breath of the Wild – a user exploring the boundaries of what can be physically manipulated in the game's terrain. Copyright © Nintendo.

BotW, and similar games like Grand Theft Auto, Minecraft, The Sims etc. creates an alternative way of approaching and understanding user experiences in an open story world that gives users the power to personalize their experiences through emergent gameplay not scripted (or maybe even conceived) by the designers. While the degree of potential emergence differs, there is a clear pattern among current bestselling games towards giving users a simple set of mechanics to combine in personalised ways (Gray, 2017).

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Furthermore, a tendency in this wave of digital game design strategies is for the designers themselves to change their mindsets towards how to embrace unexpected user behaviour and experiences. In the past, if a player did something not planned, or found a different solution to a problem in a game, the game designers would usually label this as a 'bug' to be fixed. Today, this level of experimentation is not only allowed, but actively encouraged, and is often later transformed by the designers from a bug into a feature of the system (Brown, 2016). By focusing on these instances, of creatively exploring a storyworld, designers can identify new and unintended user interactions and experiences within our designs. One could argue, that by focusing on these "abnormalities" in user interactions, we focus on microinteractions. Saffer (2013) describes microinteractions as "… the functional, interactive details of a product […]; they are the design" (Saffer, 2013; p3). Which in this context should be understood as the unintended exploration and use of the system or user experiences interaction potentials. The potential in discovering new design and user experiences for exhibition designs lies here in observing the unintended and transforming these into a foundational user experience. As Saffer (2013) underlines; focusing on microinteractions is the way to create a superior user experience. This leads us to ask how can we transform and scale users creative exploring microinteraction to be the foundational user experience in exhibition design? Can we apply this notion of observing exploring user interactions and transform these microinteraction into a foundational user experience based on strategies and criterion of emergent gameplay?

A FOUNDATION IN EMERGENT GAMEPLAY

The characteristics of emergent narratives in virtual environments has been explored by both Aylett's (1999) and Swartjes' (2010). They argue that the foundation for providing the potential for exploration can be connected to the idea of creating space for emergent narratives in open world games. In game design, open world games leave the creation of the narrative to the gradual emergence of how a user plays the game—as opposed to the user progressing through a firmly set narrative structure (Juul 2002). Thus, in open world games, players can either follow a structured narrative or explore the game mechanics possible impact on the open world game by setting their own quests and paths.

This notion has been the foundation of studies to further research and expand the potentials of understanding and designing for exploration in digitally augmented exhibition design, as a specific approach, inspired by theory on narratives for open story world games (Madsen & Vistisen, 2019; Madsen, Skov & Vistisen, 2020). The landscape of exhibition design is currently undergoing fundamental changes; from static one-way communication, focusing on enlightening visitors, to interactive participatory exhibitions focusing on personalising meaningful experiences (Drotner et al., 2011; Skot-Hansen, 2008).

This 'flux' in the field makes it a relevant context for discussing how we can observe exploring user interactions and transform these microinteraction into a foundational user experience based on strategies of emergent gameplay.

These studies on designing museum exhibitions as a space for exploration to encourage curiosity and active participation identify both four design strategies (Design driven: *by design* & *by re-design* and User Driven: *by creative play* & *by hacking)* and four criterion (*user-mindset, agency, storification*, and *narrative closure*) (Madsen & Vistisen, 2019; Madsen, Skov & Vistisen, 2020).

The *Design Driven* strategies *By design* and by *re-design* are strategies of emergent interactions, focused on creating potential for emergent interactions based on active intervention from the designers. **By Design:** Is a strategy for designing for emergent user experiences that encourage emergent behaviour by applying the four principles of emergent interactions to the design process. We see the by design strategy as the most fundamental, but potentially also the most challenging for enabling and encouraging emerging interactions. This strategy is applied when the purpose of a design endeavour is to make exploration the preferred reading for users – to find their own meaningful experiences, not because of structure but despite structure. **By re-design:** A strategy for redesigning an existing exhibit inspired by the emergent discoveries from the user driven strategies; *by creative play* and *by hacking.* We see re-design as the potential adjustment of an existing design, based on observed emerging behaviour amongst users e.g. microinteractions, and allowing users to further explore the boundaries of an exhibition. This strategy can be fuelled by insights of user studies that may be derived from the user-driven strategies; by creative play and by hacking.

Whereas the *User Driven* strategies are strategies focused on analysing and understanding emergent user behaviour in experiences, and based on this design research, assess whether or not to promote the emerging interactions into features through either *by Design* or *by Re-design strategies*. **By creative play:** *Creative play* represents the emergent interactions that happen by accident while users interact with the context they are in, negotiating their understanding of their options. By creative play is the accidental occurrence of emergent interactions that can happen when users play with or in an exhibition space. Creative play is emergent interactions that happen by chance while users interact with the context that they are in, negotiating their understanding of the user experience and playing with

the agency given to them. **By hacking**: *Hacking* is when the users understand the rules but decide to do the opposite, or at least to challenge the mechanics of their experience. The final design strategy comes close to the original game design strategy of using 'bugs' to let novel and unexpected use potentials emerge. This strategy is based on emergent interactions arising when a user challenges the structure of an exhibition to create alternative interactions - making an intended oppositional reading that can result in, for the designer, an unexpected 'hack'. Here users understand the structure and its preferred readings, but decide to do the opposite or challenge the mechanics.

Within user-centred design there are many different approaches and methods to generate user insights from different types of user observations. Some are represented in Sanders (2008) map of design research, visualising an extensive overview showing the biggest area as being user-centred design. Thus, a well-developed and researched area, with many approaches. Nevertheless, what we are aiming at with this paper is to provide a framework for opening up the approach to both identifying new user potential through hacking or creative play behaviour and understanding the users mindset towards the interactions.

Based on the research question and the thematic of scalability, we will explore the potentials of the user driven strategies creative play and hacking, and how these can be used to identifying microinteractions and potentially superior user experiences to be scaled and transformed into foundational user experiences in exhibition design based on a case study.

CASE STUDY: FROM INTERACTION "BUGS" TO EXPLORATORY EXHIBITION DESIGN

The following section will present examples from an existing interactive exhibition design process, and how the frame of microinteractions revealed new experience potentials from observed user-driven emergent interactions. The context is the danish aqua zoo 'North Sea Oceanarium' and the collaborative design process of building a new didactic learning space about the food chain and physiology of different marine animals. One of the designed installations focused on the oxygen capacity for marine animals. The guests were asked to hold their breath while holding down a big button which activated a count of time. Meanwhile, an oxygen bar would visually indicate how the guests compared with different animals (e.g. whales, dolphins seals etc.), and provided an augmented reality effect projected on the guest's face each time they surpassed one of the given animals (see figure 2).

As such, both the macro user flow, as well as the microinteractions of the specific task where rather specific, and seemingly well-understood in the initial rounds of user testing. However, when examining the first months of user analytics data from the exhibition, collected through the data analytics back-end of the digital installations, and analysed through quantitative analytics (Vistisen et al 2019) a strange pattern occurred. It seemed that the majority of users did manage to reach the final oxygen level (the sperm whale), and thus held their breath for much longer time, than was observed during the normal user testing. The data thus showed a discrepancy between an observed interaction, and the tracks they left behind in the data, leading us to inspect the pattern further for what micro-interactions might be at play in the context of use.

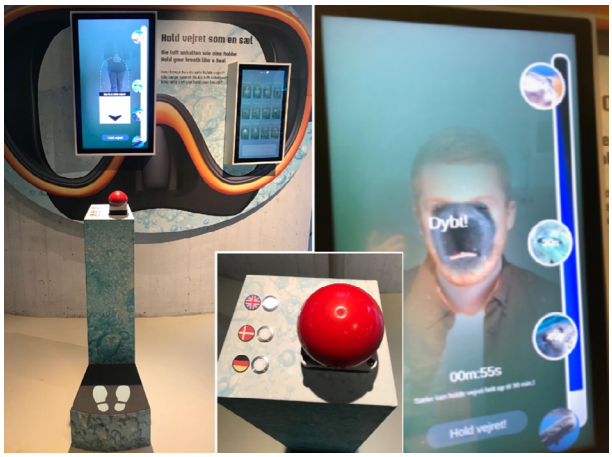

Figure 2: The 'Hold Your Breath' installation, with the big red button acting as the initiating microinteraction along with the embodied interactions of the guests.

When observed in context it was revealed that the microinteraction of holding down the big button was being re-interpreted by the users from an individual interaction of 'duration of holding my breath', to a collective interaction of 'pretending to be the unlocked marine animals'. The guests 'acted' as if they held their breath, blowing their chins up and pretended to follow the rules, while triggering the interaction, getting the desired feedback. The subtle change of 'acting' upon the rules instead of 'following' the roles showed to be enough of a microinteraction change, to radically redefine the meaning of the exhibition item to a social experience of groups (pretending to) holding their breath together and engage with the digital content in shifts.

This shows us, that the subtle 'hack' of one subtle microinteraction could change the entire feedback loop of the user experience. This situation would normally have promoted a redesigned iteration of the exhibition with more digital nudging towards actually following the rules of holding your breath and get the didactically correct badge, to ensure that the microinteractions work effortlessly as Saffer's (2013) ideal for the concept describes. But through the observed emerging 'hack' and the social empowerment it led to, the 'bug' of the

exhibition item was instead promoted to an active encourage way of using the installation by the personnel at the aqua zoo. This show us, that while the ideal microinteraction is effortless and subtle in both its triggers, its mechanics, and feedback one should take careful notice to whether the feedback loop creates potentially beneficial side-effects, before 'patching' the design through another iteration.

A similar user 'hack' occurred in another part of the new interactive exhibition design, with the design of a 100m2 interactive LED screen. The exhibition installation was able to simulate the food chain and behaviour of marine animals, with the users taking the role as a mackerel in a touch-screen controlled game on the big screen (figure 3).

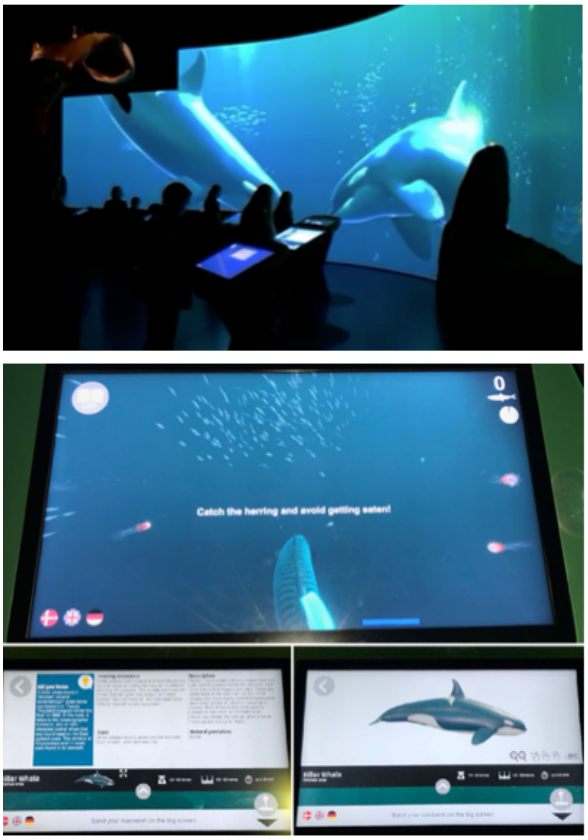

Figure 3: Images of the 'Big Ocean Window' installation. The big 100 m2 interactive LED screen (top) is interacted with through eight big touch screens (middle) which besides the game-based mackerel also includes a lexicon feature (bottom).

An important element in the design was a build in lexicon feature which should be always accessible through the press of a button in the user interface of the touch screens. This was emphasised by the aqua zoo as detrimental to ensure that the digital installation did not just entertain, but also educated the guests. However, from our data analysis of the first 200.000+ use sessions of the installation we saw that only 7% of the guests had interacted with the lexicon. When observing the guests, it was revealed how the majority thought the lexicon button was a shortcut to choose a different marine animal than the mackerel, which was not possible in the design. This misinterpretation led some guests to initiate what we would label creative play in context around the installation, acting as observers and 'watch dogs' for the other guests playing the digital came. One guest, wanting to play as an Orca, thus began to spot the Orcas on the big screen in relation to the mackerels of the other players, warning them about possible dangers. The play, between guest playing and guest observing did also on multiple occasions turn into competitions and collaborations between guest who did not know each other prior to engaging with the installation. This social play outside of the digital game became an indicator, that the microinteractions of accessing the lexicon could be the starting point for a completely new social experience in the area of the exhibition. However, differently from the 'Hold Your Breath' installation this 'bug' of the lexicon was also a source of initial frustration for many guests, until the realisation of the potential social game. Thus, we here see an example of an emerging user-driven behaviour which could benefit from being approached from a design-driven perspective to transform the 'bug' into a re-design which fully encourages the social play, while avoiding misunderstandings of the digital game.

DISCUSSION

When the perspective on design flaws or bugs is changes to an exploratory approach to new insights on users emergent experiences in a context, we, as designers, are given an opportunity to understand, how user naturally interact with e.g. an exhibition design to learn and explore history. Whether this challenges the intended design through a user's creative play in the an experience or by deliberately hacking the intended microinteractions to their own experiences benefit, as seen in the cases presented.

By using the user driven strategies of emergent gameplay from a design perspective, we enable the mindset of being aware of contradictory user interactions, that can provide new insights on user experiences. While further connecting the idea of microinteractions to these strategies, the focus is set on even the smallest interactions in an exhibition design as a whole. The idea of focusing on microinteractions and contradictory user interactions, might in some way be redundant, since this should be a part of empathising or observing a situation and user behaviour. But the point here is, that if the focus is shifted towards not just observing user experiences and interactions, but actively observing for what is not intended user interaction, even at the microlevel, there is a potential to discover new types of user experience and learning potentials in contexts such as exhibitions, as identified through the

cases above. This might not always be of significant in all types of exhibitions or user experiences, nevertheless, we do argue that being aware of the design flaws as a potential can be fruitful creating or re-designing exhibitions designs, especially when discussing the topic of scalability in design. If we can identify contradicting microinteractions that supports a superior user experience, why not exploit this and scale from a microinteraction to drivers for the user experience in an exhibition.

Furthermore, the strategies discussed in this paper, by creative play and by hacking, has four underlying criterion. These can function as a tool to analyse the hacking microinteraction and pinpoint what is the driving factor in this type of interaction. Is it linked to the experiences agency, the storification, the users mindset or is it connected to the desire for closing the narrative. Thus, providing not just a frame of awareness of identifying contradicting interactions, but also helping to understand the driving factor.

A closing point of discussion is the context of this study and types of user experiences; museum exhibitions. The theory underlying the strategies and criterion for emergent gameplay or exploration, is taken from the world of games (Aylett, 1999; Swartjes, 2010) and through case studies connected to and tested in connection to museum exhibition design (Madsen et al, 2020; Madsen & Vistisen, 2019). Thus, an interesting perspective is moving the strategies beyond museum exhibition design, and exploring the strategies application in other design contexts.

CONCLUSION

Inspired by game design theory and microinteractions, the user driven strategies *by creative play* and *by hacking* provide an insight into how we can be aware of emergent user interactions throughout the design processes and let them be the foundation for transforming or scaling new types of user experiences. We argue that if we as design researchers are willing to loosen the structure of our designs, it provides us with a space for observing unintentional behaviour, microinteractions and uses that can inspire further research and redesigns. And if we acknowledge these findings from the design process as potential enablers of superior user experiences for the end-user, and not simply as ‘bugs’ and ‘anomalies’ to be avoided or ‘patched’, there is a potential for scaling, transferring, and transforming new insights into new design potentials. To this end, observing hacking and creative play in user interactions might lead to a new understanding of user experiences and how unintended microinteractions can transform into foundation user experiences in an exhibition design. The above presentation of the cases illustrates the potential for observing microinteractions effortlessness and subtleness in both its triggers, its mechanics, and feedback to identify whether the feedback loop creates potentially beneficial side-effects, before ‘patching’ the design through another iteration. By identifying these unforeseen playful or hacking microinteractions in users emergent experiences, we can as designers can transform and scale these identified user experience potentials into the underlying drivers of exhibitions design instead of fixing or removing the experience “flaws” of a design.

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NORDES 2021

Paper Session 1

Resistances

Session Chair | Liesbeth Huybrechts

Value, Design, Scale:
Towards a Territories and Temporalities Approach
Guy Julier and Elise Hodson (F)

Counter-Framing Design: Politics of the 'New Normal'
Sharon Prendeville and Pandora Syperek (F)

NORDES 2021

VALUE, DESIGN, SCALE: TOWARDS A TERRITORIES AND TEMPORALITIES APPROACH

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ABSTRACT

This paper presents a preliminary exploration of some of the challenges in locating and articulating value in design, such that values beyond econometrically measured ones are considered more effectively. We take value in design – in its fullest extent – to be multiple, unstable, emergent and contingent. As such, it presents numerous forms beyond financial ones that are often difficult to articulate, let alone recognise. For design, giving closer attention to the territories and temporalities of value may help in this quest. Here, rather than taking 'bounded' frameworks for value measurement, we propose moving with and through the design project, revealing forms of value as they occur. Exploring and surfacing these is also part of the historical work of breaking free from contemporary neoliberal orthodoxies that govern value.

INTRODUCTION

It barely needs stating that new forms of design practice and research are constantly opening up. This is common design knowledge. Most recently, transition design, transformation design, organisation design and social design have gained increased impetus, bringing in wider and more complex sets of outcomes. These often challenge econometrically-loaded forms of value recognition. The question of value in design has therefore received new, albeit limited, attention.

This paper presents a preliminary exploration of some of the challenges in locating and articulating value in contemporary design. In it, we take value in design – in its fullest extent – to be multiple, unstable, emergent and contingent. This therefore requires multiple ways of locating and articulating design. Giving closer attention to the territories and temporalities of value may help in this quest. We see this need as stemming from a contemporary historical juncture where notions of value may be reframed as new social and economic forms emerge or are designed. Exploring and surfacing these is part of the work of that transition. Examples are used to illustrate theoretical points in this paper. However, the narrative follows mostly a theoretical and conceptual line of argumentation.

In order to give better focus to this paper, our primary design sector interest stems from the sticky problems of value in *social* design where outcomes are not necessarily so readily identifiable in the bottom line of sales or customer numbers. As a growing field of activity, we recognise that the social design sector presents one of the most challenging sets of considerations for assessing and accounting for value (Kimbell & Julier, 2019). Our arguments are applicable elsewhere, though. We also note a growing enthusiasm in business circles for 'purpose-driven' activities where, also, drivers and motivations may be more varied to include societal, environmental, well-being and other values that are less connected obviously to monetary-based calculation (Quinn & Thakor, 2019; Largacha-Martínez, 2020). In any case, we recognise that economic processes include, or are dependent upon, many forms of exchange that are not necessarily monetary-based (Gibson-Graham, 2008). Mainstream capitalist practices are reliant on non-monetary systems of care, reciprocity, social dependency, informal know-how, emotional dispositions and so on to exist. Social design and 'purpose-driven' business necessarily and explicitly enfold these into their economic logics, perhaps more so than mainstream commercial thinking. The territories and temporalities – the scales – through which these non-monetary systems run are that much more challenging to consider.

We view current, dominant notions of value as framed within a logic of neoliberal capitalism that has gained increasing traction over the last 40 years. An important

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element of neoliberalism since the 1980s has been the rise of systems of measurement and audit in order to track value and performance, but also anticipate and leverage future value (Strathern, 2000). This is to be found in mundane registers of everyday life: for instance, in notions of the quantified self that are attached to personal health and fitness (Ajana, 2017), the workplace (Moore & Robinson, 2016) or in the disciplining of citizens into calculative dispositions in the contexts of home improvements (Rosenberg, 2011) or educational games (Martin, 2002). It extends through public sector orthodoxies of New Public Management where 'best value' requires tight calculation of input-outcome financial benefits in pursuit of social goals (Martin, 2000). The measurement of value also emerges, for example, in the competition of cities and nations in various forms of ranking: happiest country, most secure, best place to live and so on. Design practices are also subject to regimes of tracking and auditing, for example, in the management of workflows in the studio (Dorland, 2009; Sloane, 2017).

If we are to believe some pundits (e.g., Mason, 2015), it might just be that this dominant conception of value, and its measurement and control, may go away as neoliberalism gradually crumbles, giving way to a new order where value also has different meanings or modes of articulation and measurement. Perhaps we will stop talking about value altogether if we realise that this draws us inescapably back to neoliberal logics and should thus be avoided. Or, as others suggest, we are living in an era of 'zombie capitalism' or 'necroeconomics' where high neoliberal forms are still functioning, despite multiple reasons why they shouldn't (e.g., Harman, 2010). In which case, dominant understandings of value may continue unquestioned.

Whether social goods or outcomes can even be expressed in terms of 'value' has also been questioned. Praetorius (2015) argues that this leads automatically to their calculation within financially-dominant regimes of valorisation. She notes that this results in a dichotomous stand-off between the 'real' economy and the values-based activities of care. Equally, Miller (2019) makes a case for ceasing to separate economic, social and environmental valorisation, suggesting that one might more usefully think in terms of 'livelihoods'. Here, one just gets on with the making of life and communities as deeply entangled practices. Economic, social and environmental categories are merely enfolded into everyday existence without externally imposed targets and measurements.

For this paper, however, we seek a transitional approach. We neither fully reject nor embrace orthodoxies of audit, measurement and valorisation. Instead, we accept a need to recast how valorisation is conceived and explore and show a fuller panoply of design impact. Our approach is also informed by a need to consider institutional logics (Thornton & Ocasio, 2008) and even the obduracy of socio-technical systems (e.g., Hommels, 2020) within neoliberalism. With this knowledge, we can consider pathways to alternative practices and motivations.

Our lens onto these challenges starts from a disciplinary position based in the nascent field of Design Culture Studies as both a form of enquiry into worlds as they are but also as they might be (Fallan 2019; Julier forthcoming). We focus on a need to understand the empirical and ideological conditions of design and designing as a necessary starting point for design practice.

In terms of value in design, we recognise the multiple understandings of value that are pursued by Ouden (2012). This work provides a set of useful frameworks for enquiry. However, these are just frameworks and we note the absence of engagements with specific, historically-located, socio-material and policy contexts in texts such as this that sit closer to management, marketing, innovation and organisational studies. Our treatment leans on a critical view onto context such that understandings of value and its measurement are taken to be situated and discursive at multiple scales. It is this situatedness of value that provides starting points for exploring its implications and parameters. This provides for messier and more contingent approaches than the cleaner and broader canvas found in Ouden (2012). Our observations have some resonance with Heskett's (2009) conclusion that design value has to be viewed at micro-economic levels. The difference, though, is that our quest, ultimately, is not framed around value as perceived by Heskett in its economic context. But if we are to step outside this framing, where does one start?

Before we explore social value and design in more depth, let us examine where design, and indeed creative industries, as reflected in research and policy work, might currently be in terms of conceptions of value.

ORTHODOXIES OF VALUE AND DESIGN

The growth of design over the past 30 years throughout the industrialised world has coincided with new regimes of value measurement and audit (Julier & Moor, 2009). In design, value has been expressed in terms of design's ability to, for example, generate profit, improve public services, support social innovation, and more broadly, address complex global problems. The value of design for economic and social good has been advocated by designers and governments since at least as early as the 19th century (Ehn et al., 2014; Mulgan, 2014). The most recent *Design Economy* report by the Design Council (2018) continues similar promises: design can "make life better," address "seismic economic challenges and change;" drive "growth, innovation and jobs," and

create "better places, better products, better processes and better performance" (pp.3-4). While positive results are reported from investments in design, it can be challenging to credit the design process with specific outcomes. Many designers struggle to describe the value of their work to clients, and clients maintain that they have no measures in place to assess the impacts of their use of design. This has been repeatedly noted by the UK Design Council's own surveys of corporations, and it is of increasing concern for governments that have invested in design over the past decade (Design Council, 2004; 2007; Sheppard et al, 2018).

What to value and how to value it are continuously debated. Value is an arbitrary concept defined by particular views of need, desire and relative worth within differing social and economic contexts, inseparable from values, ethics and morality. No universal measure can represent its complexity (Boztepe, 2007). Similarly, the lack of any universal definition of design has contributed to studies that often fail to address what constitutes design or what is being observed and measured (Moultrie & Livesey, 2009). Design practices reproduce economic and social values (Boehnert, 2018), yet there is "no established theory of value that can guide design" (Boztepe, 2007, p.55).

Empirical research on the value of design has traditionally focused on financial measures and the value that investing in design brings to the client (e.g., return on design investment, number of new products and patents, integration of design in corporate strategy, overall brand value), the design profession (e.g., numbers of design graduates and designers hired), or the economy more broadly (e.g., growth in exports, contribution to GDP). Measures like the Design Index (Design Council, 2004), International Design Scoreboard (Moultrie & Livesey, 2009) or the McKinsey Design Index (Sheppard, 2018) document the financial health of the design sector and reinforce design's potential for innovation and improving the bottom line.

The underlying message is that design equals economic growth. Design is used to 'add value' so that companies no longer compete for consumer attention based on lowest price but instead based on what their products and services offer. It is notable that in studies of the value of design for the public sector, the emphasis may be on citizens and social goals, but success is often measured in economic terms, "deliver[ing] more for less" in the form of reduced spending and use of services (Design Council, 2010; Design Commission, 2013). While financial data are seen as more objective, and the methods for collection and analysis are more established and consistent than qualitative measures of value (Hoo Na et al., 2017), prioritizing exchange value presents a limited view of design, particularly when it comes to measures of social design impact.

Nevertheless, new research is emerging that recognizes the need for new understandings of design value. The Design Council (2020) is exploring how social and environmental impacts of design might be captured by combining quantitative data based on monetary value with qualitative case studies that account for diverse perspectives of value and the "invisible 'ripple effects'" of design. We look forward to *Design Economy 2021* in which these methods will be further developed and applied.

Looking more widely, towards creative industries policies wherein design sits, value continues to be expressed in terms of (financial return on) investment. In European Union policy and briefing documents (e.g., Barcelona Design Centre, 2014; European Commission, 2017), creative industries continue to be defined according to a framework of sectors that was originated in 1997 (Creative Industries Task Force, 2001). These are then described in terms of their contribution to GDP and number of businesses created. Their 'value chains' are then demonstrated, where the linear course from ideation, through production and promotion, distribution to consumption is shown. This may be all very well for discreet cultural goods such as novels, fashion garments or original music recordings. However, even these produce multiple, heterodox impacts such as reading groups, social media following or fan bases. Value chains may be more complex things: increasingly so when outcomes are not discernible in terms of 'sales' or 'customers' but in terms of societal goals such as well-being, civic cohesion or health.

MEASURING SOCIAL VALUE

Early versions of design consultancies that worked towards explicitly social goals frequently promoted themselves in terms of their effectiveness in making financial savings for their clients (e.g., Innovation Unit, 2015). This was also driven by policy reports that argued that by taking a research-led, user-centred approach, efficiencies could be made (Lehki, 2007). Here we see design enmeshing with broader policy approaches with regards to social value.

This 'bottom-line' approach has no doubt been attractive in the context of austerity, where welfare organisations have struggled to carry on delivering services on radically reduced budgets. It nonetheless causes their valorisation to be maintained within the narrow constraints of monetary value and, even, financialised attitudes. These mindsets have recently become further reinforced by the insidious rise of social impact bonds as a viable financial model for welfare delivery (Jackson, 2013; Dowling, 2017). Here, investors provide money for schemes towards achieving social goals – less homelessness or obesity, for instance

– and then reap increased dividends if these are met. This 'betting on welfare' has the capacity to promote various forms of performativity. This may be where, for example, schemes are designed to produce positive scorecards within fixed, often narrow, timeframes, no matter how these are achieved.

Such approaches as those mentioned above additionally have the effect of individuating inputs in pursuit of social goals, themselves measured along time-restricted axes. Thus, an input becomes a particular 'intervention' – a piece of urban design or a peer-to-peer skills sharing system – whose impact is evaluated in quantitative terms such as changes in local land-value or number of visits to the doctor. This approach reduces the object of measurement to a singularity, often ignoring its entanglement with multiple influencing factors and objects such as socio-economic levels, job security or demographic balance (see Herrick, 2008). Evaluation methods can also be restrictive by missing more experiential indicators that may be better understood through qualitative approaches and articulated beyond numbers (Mansfield et al., 2020).

Scholars of design studies have theorized concepts of value that move beyond orthodox financial definitions to consider different forms of exchange, use, emotional and symbolic value but little has been done to test these theories in practice or to address the value of service and experience design (Shove et al., 2005; Boztepe, 2007; Sanders & Simons, 2009; Heskett, 2017; Boehnert, 2018). Empirical research on the social value of design includes Hirscher et al.'s work on multiple forms of value (social, economic, environmental, knowledge, emotional, experiential) in relation to fashion, as consumers move from "value users" to "value co-creators" through "social manufacturing" (Hirscher et al., 2018; 2019). Yee et al. focus on the value of the design process as a working method in social innovation projects for the third sector, but the study does not assess the impacts of design on project outcomes (Yee et al., 2015). Hoo Na et al. (2017) examine the influence of design on "social value creation" in the corporate context, analyzing the effectiveness of existing tools. They note that measures used by NGOs (where social value is core to their operations) are not necessarily appropriate for business and conclude that tools need to be developed that combine qualitative and quantitative (financial) assessments.

Evaluation tools developed for social innovation, sustainability and health may offer alternative ways to assess the value and impacts of design, such as innovation scoreboards, lifecycle assessments, impact mapping, and other methods that capture value beyond the bottom line (New Economics Foundation, 2008). For example, social return on investment prioritizes what is valuable to stakeholders, using money as a proxy for the value of impacts that may have no clear financial value (Nicholls et al., 2009; Richards & Nicholls, 2015).

Elsewhere, attempts have been made at value measurement using complex aggregations of both quantitative and qualitative data. This is particularly noticeable in grey literature rankings of places according to broad notions such as 'happiest', 'good growth' or 'security'. For example, the World Happiness Report ranks countries according to GDP, life expectancy, generosity, social support, freedom and corruption levels. This therefore links qualitative observation, for example on measures of subjective well-being, with quantitative data from economic and health sources (Helliwell et al., 2020). Other rankings, such as the 'Good Growth for Cities' report in the UK, build indices on statistical data. In this case, employment levels, income, health, work-life balance, new businesses, housing, transport, skills, environment and income distribution are surveyed and combined according to different weightings for each (Hawksworth et al., 2019).

Such indices are typified by their abilities in aggregating wide and varying datasets in a given territory at a given moment or timescale. These are effective in revealing the mutual dependencies of social, economic and environmental factors. They shift discussion of value beyond the bottom line of GDP, as several authors encourage (e.g., Raworth, 2017; Mazzucato, 2018; Pilling, 2018). They produce overall senses of 'value' of a location in terms of its attractiveness as a place to live or to invest in. Needless to say, there are elements of subjectivity or ideological bias in such assessments. By giving separate elements weightings in the calculation, different notions of what is of value among those doing the reckoning surface.

These measurements of value are, however, undertaken *post hoc*: they provide clues as to whether public policies are working or not and, indeed, what is privileged therein. Their focus on outcomes avoids the tricky thinking of how value is produced or what might produce value. It takes considerable analysis, historical understanding and speculation to work out the actual cause and effect of these relations, as, for example, Dorling and Koljonen (2020) demonstrate. Furthermore, fixing the location of value to territories such as nations or cities may even be arbitrary, missing opportunities to think about their relationality to peripheries, in-between spaces, diasporic associations, competing neighbours and other geographical scales.

Equally, these rankings are invariably annual and competitively conceived affairs. They therefore become ends in themselves, fixed to temporal cycles that make them subject to performative actions on the part of those being measured. They miss the complex, multi-speed, open-ended unfolding of everyday practices that

produce value. This is where we might turn back to a critical interrogation of value and seek some new pathways for thinking about design, scale and value.

BEYOND ORTHODOXIES: DESIGN, TERRITORIES AND TEMPORALITIES

Notions of value have been problematised in the social sciences to provide a range of critical perspectives to take us beyond econometric thinking. These are useful for conceptualising alternative approaches to thinking about value in design. Graeber (2001) summarises three fields of value: first, what is good and proper ('values' in a sociological sense); second, in economic terms of what the desirability of something may be; and third, in a symbolic or semiotic sense of how something differentiates and signifies. These pretty much cover what design tries to do, although often with different emphases at different historical times (e.g., see Whitely, 1994). The rise of consultant design in the social sphere in the last decade has attempted to align these three spheres more evenly (Koskinen & Hush, 2016). These broad observations nonetheless do not help in beginning to define tools, methods and grounds on which value in social design is determined and articulated. In this final section, we explore two starting points namely thinking about territories and temporalities.

The vogue for stakeholder mapping in service, social and strategic design takes onboard the idea that design touches into relational networks of actors who have different priorities and motivations. It attempts to try and understand the ways by which design can intervene into these such that different needs are addressed and new relationships brokered (Kimbell, 2014). In so doing, it sets territories of consideration and intervention. The project decisions made as to who is included into stakeholder maps also defines the extensity of where design value is considered. Actors outside this 'map' may be impacted, but the value of this is not directly measured by the project. Nonetheless, the value measurement may be situated against measurements outside it. Thus, for example, the carbon saving that is evaluated in a new community food network may be interpreted as a contribution to global carbon reductions. There is a co-articulation of different registers of impact here (Marres, 2016).

This is where being aware of the territories of value in design may come in handy. This concept is derived from the notion of 'geographies of responsibility' (Massey, 2004). Here, the territories of intervention are made explicit while recognising the relationality of different scales. This might be conceived as a 'Russian doll' effect where, equally, different forms of value may be at work between the actual location of design intervention and its layered hinterlands. To return to the food network example, sociality and well-being may be key drivers in that specific community, while in regional terms, environment and health may be impacts that are valued and measured. The key issue here is that the design intervention instigates a set of socio-material impacts. It is the empirical fact of that intervention that provides the starting point for valorisation at different scales, in different territories, through different geographies of responsibility.

If value is multiple and contingent in this territorial sense, then it is also mutable and unstable in temporal senses. Heinich (2020) suggests that value is never static. Drawing on Kopytoff (1986), she notes how different types and registers of value emerge at different points in the life of something. Design comes into play along temporal axes in different ways. For example, it produces value *in potentia* as 'intensities' (Lash, 2010) in the form of plans, blueprints, guidelines or other forms of intellectual property. Subsequently, though, different forms of value come into play through practice (Shove et al., 2005). This means that both the quantities and qualities of value may change at different stages in the 'life' of a design process and outcome. New, unanticipated and, even, unknowable forms of value may emerge at distinct points as a design project is formulated, executed and rolled out. Conception and deliberation, implementation, adaptation, routinisation and reconstitution all have their momentary significances.

The implications of this territories and temporalities thinking for design and value are twofold. First, we are encouraged to abandon *bounded* framings for the determination and measurement of value. This means that we cease to place spatial or temporal constraints such as in the case of 'happiness in such-and-such a country in a year'. Similarly, the traditional econometric approach to value chains takes value as a calculation of the same thing (money) at different points along the life of a product or service within particular timeframes and across defined geographies. Rather than 'following the money', we recognise the changing kinds of value that take place in different locations and times in the life (and afterlife) of a design object or project. This perhaps resonates with Bryson and Rusten (2010), in their critique of actor-network theory in the context of design. They observe that design is focused around the processing of projects such that focus is given to its varying objects and contexts. These have different *lives* at different moments, challenging the flattening that actor-network theory is prone to. Following from this, we might pay attention to their changing empirical conditions that are rendered almost kaleidoscopic in the on-going emergence of different value registers.

Second, part of the design project itself can include deliberation towards and reflection on what value means in its various manifestations (Julier & Kimbell, 2019).

Where multiple stakeholders and collaborators are engaged in the same project space, conflicting accounts of value will almost certainly be at play. These are shaped by respective institutional bureaucracies and dispositions. Building shared understandings of the different registers of value that may occur and ways of accounting for them would be part of the project. Understanding its context in terms of externally-imposed expectations of value may also figure. Finally, it may be accepted that other forms of value may reveal themselves along the way. Some may never be knowable, though.

CONCLUSION

The question of value in design has become something of an 'elephant in the room' lately. This connects to wider issues of what is important in life as the neoliberal paradigm of the last 40 years falters in the face of climate chaos and biodiversity loss, demographic imbalances, inequalities and extractivism and, of course, the global Covid pandemic, to name but a few. Designers, but also policymakers, heterodox economists and activists, have called for a wider set of values to be recognised, assessed and described beyond the bottom line of money. What is meant by this has remained hazy. Certainly, other measurement systems exist, not least in the fields of environmental impact assessment. But in situations where heterodox values work together, there has been little progress in academic or policy thinking.

This is important to address. We might not bother, trusting that some other sense of how good or bad something is may emerge through historical change. This would consign a passive role for those who study design and its impacts, though – waiting to see what happens. Instead, grappling with value is a way of effecting change by bringing alternative possibilities and evaluations into consciousness and practical use.

Through this paper, we propose a design-focused approach to value wherein the unfolding of the project or programme becomes the spine through which value comes into view. We advocate following the sinews, fluxes and pulses that make up the vectors of design action and engagement. Methodologically, this would involve exploration of actual and anticipated value within the design process. It may also require close observation – ethnographic, even – of the unfolding of the project in open-ended and unbounded ways. This contrasts with some other approaches that, in aggregating different forms of value, focus on outcomes of various activities over fixed times in pre-defined locations. It represents a preliminary and notional direction for further consideration of and experimentation with value beyond the bottom line.

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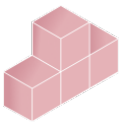

COUNTER-FRAMING DESIGN: POLITICS OF THE 'NEW NORMAL'

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ABSTRACT

In this paper, we introduce the concept of counter-frames in relation to discourses of sustainability, and elaborate on it in correspondence with participatory design practices. We present our analysis through the lens of the 'new normal' in the wake of the pandemic, to demonstrate and unpack the complex and conflictual nature of emergent frames and counter-frame debates, evident within the field of sustainability. The paper draws on participatory activities and interviews with social movements and grassroots organisations. We present initial reflections on the ways in which design can productively engage with and address counter-frames, as they both fill in and open up spaces for political debate in which new paradigms may be carved out of obsolete discourses and worldviews. A core contribution of paper is a re-articulation of how we understand frames in design and the acknowledgement that any counter-/framing is doing political work.

INTRODUCTION

In 2020, Sir David Attenborough made public his views on the need to 'curb the excesses' of capitalism if we are to meet the interlinked challenges of ecological protection and human flourishing. The pronouncement was perceived as a radical departure from what is acceptable in mainstream British discourse. In fact, it directly challenged governmental guidance issued less than two weeks earlier, advising schools against teaching materials from anti-capitalist groups. More recently, successes by the climate action group Plan B whose climate litigation stopped a proposed Heathrow airport expansion, have been overthrown – attributed to competing priorities between economic and ecological imperatives. Yet, not long after Attenborough's announcement, several UK councils declared a Climate Emergency. These examples represent but a few of the competing actions surrounding the entanglement of framings of ecology and the economy, functioning and emerging at different scales and levels in recent years.

A 2020 New Economy Organisers Network (NEON) report observed that at the outset of the COVID crisis, activism around climate mobilisation all but faltered, whereas campaigns on escalating housing and migration emergencies increased – a window into the ways in which social issues play out and are divided between different social groups. Paying attention to fragmentation and separations and the challenge of cross-cutting antagonisms within movements was at the heart of Mouffe and Laclau's (1985) original post-Marxist thesis. More recently, Mouffe's (2020) call to mobilise against the fraught, fragile and reductive ways in which discourses are developed would mean tackling the ecological crisis through the formation of heterogenous groups for a 'Green Democratic Transformation'. To the extent that the pandemic is understood to have brought converging crises resulting from climate change as a 'threat multiplier' into sharp relief, it consequently too demonstrates the need for intersectional responses (Heglar, 2020). In this paper, we consider some of these complexities, tensions and contradictions manifest within sustainability discourse through the lens of collective action and its use of frame theory, and the implications of such theories for design research and practice.

A frame is a description, a 'take' on a social or political problem or issue, that identifies the originators of the problem and implies solutions, e.g. 'climate change'. Frames present a way of viewing issues that are 'constructed products' (Snow and Benford, 2000), that are linked to the culture of a given context and its

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institutions. Yet, frames are made in practice through a social interaction process of *framing*, which involves assigning meaning to experience in a 'dynamic' 'negotiated' and 'contested process (Snow and Benford, 2000; Della Porta and Diani, 2014) of debate and social action. As such, counter-frames are frames developed in a response – a 're-take' – to critique or challenge already existing frames, e.g. 'climate emergency'.

Frames do signifying work by accenting certain elements of what is being discussed. In social movement studies, framing is a generative process that emphasises aspects of an issue which informs how that issue is observed and comprehended by collective action movement/s and their stakeholders (Snow and Benford, 2000). Illustratively, the declaration of a 'climate emergency' counter-frames an inactivist frame of 'climate change', towards an urgent action-based re-articulation of social and environmental issues.

Within a given field, actors can be understood to shape discourse through distinct, dialogic and interactive frames which can inform (and evolve) an actor's position on a given issue. Yet, frames are also critiqued as being 'surface effects' (Jameson, 1976), disavowing the terms upon which debate is built (privilege of actors, reproduction of social structures) which necessitate understanding *alongside* values, ideology, and epistemology (Mignolo, 2009). Understanding frame contradictions and conflicts as rooted in historical phenomena and as contextually-made (Hallgrímsdóttir, 2006), together informs distinct interpretations of a given phenomenon and establishes a given field as a site of contention, where power and culture underwrite dissensus and conflict between dominant and incumbent groups (Fligstein and McAdam, 2012).

In design research for sustainability, we observe how design engages with distinct and hegemonic sustainability frames – such as an ecomodernist 'technical fix' frames – the understanding of which can open new design knowledge that better interrogates these more fundamental questions and responds to the stagnation in the field of sustainable design (Wilson and Bhamra, 2020). Knowledge on the formation of and relationship between distinct positions and how frames carve out political space is underdeveloped in design, but has the potential to inform more critical design discourses on sustainability.

Our overarching aim is to develop new conceptual opportunities and *working* concepts for design as a critical/political practice. We approach this by using theories of framing and collective action developed in social movement studies, to re-articulate and re-conceptualise understanding of frames in relation to design research and practice. Our early-stage results are based on participatory activities, semi-structured interviews and desk research conducted with social movement actors, grassroots organisations and community and citizen groups. We bring to the fore implications and opportunities for design by engaging with the complexities and contradictions that manifest through frames and counter-frame debates on the 'new normal' – as they mobilise resistance across different scales – in relation to established discourses of sustainability.

Established design theory and practice addresses frames through a process of consent (Schön, 1983; Dorst and Cross, 2001). Indeed, while frames and counter-frames might be erroneously interpreted as dualistic, acknowledging the beliefs and underlying ideologies that correspond to distinct and competing frame positions, as well as the variety of groups mobilising around multiple contentious frames provides an initial orientation on the complexity of positions at work. To this end, a core contribution of this paper is a re-articulation of how we understand frames in design and the acknowledgement that any framing is doing political work.

FRAMES AND COUNTER-FRAMES IN DEMOCRATIC DEBATE

Different theoretical origins of framing exist. From media and communication studies framing is understood as individualistic based on cognitive schema that allow for internal sensemaking (Goffman, 1986). In social movement studies and political theory frames are formed through 'group-based social interactions' (Snow and Benford, 2000), through public debate, political action and dialogic social processes. Framing is a well-established aspect of 'democratic politics and public debate' (Aklin and Urpelainen, 2013 citing Druckman).

By comparison, recent work on framing in design theory departs from the foundational views as established by design scholars (Schön, 1983; Dorst and Cross, 2001). In their conception, within a given specific design brief, the frame of an issue is established and set, then reworked by expert designers through well-established practices of 'reframing the problem'. Recently, critiques re-interpret this work as having limited critical consideration of the worldviews of the individual designers and their capacity for authentic reflexivity (Agid, 2012), and of broader understanding of the politics of frames (Keshavarz and Maze, 2013). Exploring the broader literature on frame theory and its critical interpretations has the potential to engage with such critiques.

In this paper, we take it that frames and counter-frames are made in practice through contextual and historically-contingent socio-material processes and practices. Counter-frames are developed in response to existing established frames and 'oppose earlier effective frames'

(Chong and Druckman, 2011), which arise conflictually between opponents involved in political debates.

Frames and counter-frames in communication studies, informed by developments in cognitive psychology, are considered as positive or negative. For example, environmental movements have long emphasised the 'negative externalities' of inaction on structural unsustainability. Conversely, frames on climate policy may positively link climate policy to enhanced quality of life, job creation, as well as partisan issues like national security, human rights and social justice. In the US, the Trump campaign linked action on climate policy as a threat to labour movements. This means that frames and counter-frames interact and change over time, in accordance with ideological positions of political entities that put out frames and counter-frames. To this end, frames and counter-frames emerge from across the political spectrum. Studies suggest that conservatives become more opposed to climate policy when negative effects such as global warming are emphasised in communication (Hart and Nisbet, 2012).

Importantly for design theory and our intention to problematise the conception of frames in design, the blurred interrelation between frames and ideology has been discussed (Oliver and Johnston, 2000; Snow and Benford, 2000). While closely linked to ideology, frames are proposed as distinct from ideology as they work across ideological positions; they are understood as based upon and extensions of established ideologies (Snow and Benford, 2000). Frames are more readily observable than ideology, and on account of this have the capacity to do 'remedial' work in instances of discord – where a person's ideology is confronted by conflicting life experience, and as well as this have the capacity to ameliorate tendencies of 'reification' of ideologies (ibid) – because changes in frames and the process of making and unmaking frames are observable. Lakoff (2010) in a call to revisit how we frame the environment, describes how 'systems of frames' are the basis of ideological understandings.

Crucially, while frames are discrete signifiers identifiable as a descriptive term, they are also linked to deeper social structures by playing out different ideologies. Frame alignment happens when 'values, beliefs...goals and ideology are congruent and complementary' (Snow and Benford, 2000). At the same time, the established understanding that frames can mobilise social groups from across the political spectrum, i.e. from different ideologies presents implications and opportunities for how we understand and apply critical and participatory design practices. Design scholar Le Dantec (2016, p. 24) states, 'frames can be argued to reinforce... entrenched authority structures', setting out how, through the endorsement of a given frame, we license who participates and who has a voice; in doing so endorsement or acceptance of a given frame by effect calls on a particular public.

RESEARCH APPROACH

This research takes a critical perspective to problematise the status quo drawing on concepts from participatory design, theories of collective action and discourses of sustainability. Our interest is in how design can respond to the dissensual nature of democratic politics. Challenging whether consensus within democracy is even feasible or desirable, seeing it instead as a hegemonic practice of new liberalism, Mouffe (2019) has influenced design scholars through concepts of adversarial design and agonistic publics (Björgvinsson, Ehn and Hillgren, 2012; DiSalvo, 2012). We extend and contribute to this earlier work on design theory taking the strategic aspect of Mouffe's conceptualisation, to look at how we deal with emancipation and power relationships in design. To this end, the study draws on a conflictual conceptual approach i.e., counter-frames as manifest in unfolding democratic debate and through collective action for sustainability to support emerging work on design and social movements (Bieling, 2019)

The paper presents the early-stage insights and analysis from the first phase of a major funded project investigating the politics of design with a focus on counter-framing practices and strategic action; 'Counter-Framing Design' funded by the UK Arts and Humanities Research Council. Frame construction occurs through processual and dialogic interactions (Della Porta and Diani, 2014) , which implies a temporal and processual approach (Fligstein and McAdam, 2012). Our research design takes a processual structure (Past, Here&Now, Future) for data-gathering activities while acknowledging that creating the conditions of a decolonised practice requires extended timeframes (Tunstall, 2013). This paper presents initial observations and insights from the first stage, the 'Past: field-mapping' stage of the research based on emergent discourses in the wake of the pandemic. The results are presented discursively.

The scope of the research is defined to focus on the work and activities of UK-based grassroots communities and social movements, engaging with the discourse of the 'new normal', by organising for a 'Green New Deal', to 'Build Back Better', or 'New Economics' through community building, collective action, and building new social and cultural institutions.

The paper includes insights drawn selectively from the early-stage analysis of 15 semi-structured interviews (selected to represent diverse field actors), supported by early participatory engagement with field actors through meetings, events and email exchanges. Desk research and critical discourse analysis also inform the research. A summary of the data and activities is shown in Table 1. This data is analysed to specify the field of action in

detail, whilst identifying frame and counter-frame positions and strategic actions and practices. The analysis allowed us to identify framing practices, issues of conflict and debate within the current context of sustainability and the pandemic, strategic actions of challenger actors, relevant policies, and incumbent actors with stake in the field.

Table 1: Summary of Activities and Data

Activities	**Description (Jun '20-Jan '21)**
Semi-structured interviews (15)	Collective action groups, community leaders and grassroots/citizen organisations campaigning on issues of: Climate justice; Housing rights; Immigration Rights; Universal Basic Income; Art & Culture; Commons; Digital Rights Activism.
Engagements through community events	Online community organising events on issues such as mutual aid, climate justice, police discrimination, migration, public space.
Desk research and critical discourse analysis	Critical analysis of selective materials (policy and research reports, position papers) linked to the communities of engagement and from which frame positions are extracted.

DESIGNING COUNTER-FRAMING STRUCTURES AND SPACES OF RESISTANCE

Our intention is to conceptualise and understand the ways in which design can productively engage with and render useful the conflictual foundation of counter-frames. Here we share initial reflections on socio-material design concepts we observe from the research undertaken on emergent discourses and associated framing and counter-framing practices – storytelling, navigating and constituting complexity, and organisational design and design tactics.

STORYTELLING

Drawing on research debating the efficacy of data inducing pessimism in the public communication of climate change (Chapman, Lickel and Markowitz, 2017), environmental and social change organisations are increasingly leveraging storytelling as a strategic method in their work.

Storytelling can be harnessed as an intrinsic aspect of framing. For example, in a recent report providing actionable methods for 'how to win the case for a better system', 'Framing the Economy' is equated with telling a 'new story' to replace the dominant, damaging narrative that scapegoats outsiders and resulted in a majority vote for Brexit (NEON, NEF, FrameWorks Institute, 2018). By deploying frames identified as effective in changing thinking and increasing support – e.g. resisting corporate power and fulfilling common needs – the study demonstrates how it is possible to craft new narratives, regardless of ideological divides. Whilst ensuring inclusivity and accuracy, they assert that narratives should connect problems with solutions. Within organisations with whom we have conducted interviews and other fieldwork, personal storytelling is deployed instrumentally to achieve policy change, through the act of members and affected individuals telling their stories before stakeholders and power brokers as an effective method of producing significant change.

Science writer Sonia Shah emphasises the centrality of storytelling to responses to the pandemic, arguing that the stories we tell determine how we proceed from the crisis (Shah, 2020). For example, by counter-framing the virus from an external, attacking 'other' to a fully predictable pathogen to which humans must respond with agency based on historical experience. This observation can inform how grassroots organisations respond and recover post-pandemic.

The methods of framing within storytelling are important: a report on 'Communicating Climate Change and Migration' claims, 'It matters who gives the message, as much as what is being said,' arguing that in light of widespread mistrust in climate scientists, trustworthy communicators are essential, and placing value on the power of personal testimony (UKCCMC, 2012) – David Attenborough, for example, is a case in point. The authors advocate for campaign materials that 'encourage some kind of interaction or participation beyond signing a petition' as yielding deeper engagement, in particular when mobilised at times when there are clear opportunities to still establish the dominant frame of the debate.

This points towards the performative role of material and participatory engagement beyond linear textual narratives and with respect to time scales. Haraway (2016, p. 12) writes, 'It matters what matters we use to think other matters with. It matters what stories we tell to tell other stories with', linking the framing potential for storytelling to the specificity of material realities. A member of one climate activism group interviewed emphasised how storytelling taps into a universal cultural. Rather than merely utilising text or verbal narrative, this group employs visual art, theatre, sound, music and poetry as constitutive of narrative. Through multi-dimensional stories and image, they seek counternarratives to 'terror and apocalypse', to create a sense of collectivity to 'nurture', 'restore', 'stabilise' and 'replenish', through acts of contestation.

Schultz (2018) looks to Indigenous storytelling practices, for using 'design fictions' in participatory contexts. These manifest in 'cultural expression with agency', in which everyone can contribute in order to navigate issues of colonialism, climate change and the 'fusion between people and things'. As such, stories can function as mechanisms for overcoming division and

manifesting intersectionality. As Neuhold-Ravikumar (2020) suggests, stories are currencies of understanding. Thoughtfully applied, multi-layered and carefully constructed storytelling methods offer generative tools for design to respond to conflicting frame positions thereby opening up spaces for political debate.

CONSTITUTING AND NAVIGATING COMPLEXITY

During the interviews, participants conveyed the hurdles and challenges they face when trying to build capacity within new organisational forms and the challenges to engaging with established institutions, their norms, procedures, and practices. Institutionalised frames or 'field frames are frames that dictate the rules of the game, what is appropriate and what is not, through norms and cultural practices of the institutional/field environment (Lounsbury, Ventresca and Hirsch, 2003). This occurs to the extent that procedures of participation developed for public engagement with institutions are institutionalised within such normative cultural practices (Kelty, 2020, p. 251).

Examples of corrupted participatory design processes now circulate within the academic and practitioner design community (c/f Mattern, 2020) – whereby for instance agencies are contracted by local governments to 'co-design' new public services or community regeneration programmes only to find that at the final stages community interests are drowned out by vested and more powerful ones.

In one instance an interviewee reflected on the colossal underspend of a national fund set up to support community housing initiatives, established as an outcome of the campaigning work undertaken by this group and its peers. However, the community organisations the fund was set up to support were unable to avail of the fund due to a lack of consideration of, or sensitivity to, different forms of cultural and institutional practices and underestimating the capabilities of such organisations in engaging with formalised public funding services. Furthermore, the participant conveyed the political skill and language involved in framing practices, when both campaigning, and engaging and negotiating with government funders. For instance, certain terminology perceived as either too socialist or too fiscally liberal could close down discussions. This interviewee perceived certain framings of affordable housing as problematically tapping into ideological differences that only led to inaction. Conversely, treating frames as a workable concept in a situation of debate and negotiation had the capacity to lead to action in the face of ideological difference, resulting in the set-up of the fund.

New social movements are fraught spaces where complex debates around perceived taboos play out between groups. Through the research we identify a range of counter-frames that mobilise social groups around different issues, such as affordable community housing, climate justice, racial justice and migration rights. The lines of separation between issues are sensitive and serious. Groups within the climate movement have been panned for poorly thought-out calls to actively disobey the law, to the disbelief and offense of race movements (Cowen, 2019). Similarly, the intersections between migration and climate action are such that those most affected by the issue of climate-induced migration are of such a vulnerable domesticity that acting out, or being asked to act out, would be highly inappropriate. Furthermore, alarmist and politically co-opted discourses of 'climate migration', deflect attention from the realities of migrants living under the conditions of UK's hostile environment policy. One interview reveals the challenges of an 'intersectional movement': a self-identified feminist engaged with feminist scholarship reported her retreat from any explicit discussion of feminist debates within her climate activist community, for fear of 'tearing the group apart'. These conflicts reveal the dangers of attempts to smooth over such dissension within movements and even individual groups.

Alongside the organising work that emerges out of and through counter-frames and discourses, the sentiment amongst participants, is that tackling siloed policy thinking is essential to address the broad challenges that the pandemic has surfaced. Design is also understood to play a role in engaging with the complexity of layers of interdependent and parallel policy interventions necessary, as organisers voice their struggles with building intersectional movements.

ORGANISATIONAL DESIGN AND DESIGN TACTICS

Concepts of organisational design are used to support emergence of new forms of organisations that mobilise social groups around a given counter-frame. Relatable frames generate interest and engage publics within activities, eventually leading to the formalisation of some of these social groups into organisations that continue mobilising and organising in new and more structured ways. This is a common trajectory of those grassroots entities that we engaged. For example, certain groups utilise systems such as sociocracy or holocracy as democratic decision-making structures.

Some of the inspiration comes from the legacy of the Occupy movement, which protested corruption of allegedly democratic states; other methods are developed according to the needs of a particular group. Alongside the different ways in which social issues are carved up between, amongst and within groups, these organisational forms also impact the degree to which engagement or collaboration may occur between groups organizing around different issues. This can be due to fragmentation within groups and a lack of understanding of who makes decisions, as well as a degree of informality that is sustained even after a group formalises.

While social movements have long used age-old techniques for organising their work, recent integration of creative methods has seen new strategies deployed

that give distinctive attributes to movements. At the same time, COVID protests have been described as 'pre-modern' (Gerbaudo, 2020). Due to the makeup of different social groups, these take different forms and some of the innovation in practices offer more or less of a departure from traditional modes of organising. Designers play a central role in generating movement actions through the integration of 'design groups'. For instance, movement communities conceive recurring motifs that become iconic artefacts or novel and innovative mechanisms of communication of issues representing movements across geographical scales. One interviewee called this 'the magic design challenge', highlighting the influence of design for the group, considering, 'how do you make things that are … iconic and can be replicated' (interviewee).

Paradoxical to the source of some tensions between climate and race group tactics already mentioned, recently Malm (2021) has called into question the practice of 'strategic nonviolence' of climate action groups, which stand in stark contrast to the events of the summer of 2020 in the UK (and across the US) which saw the toppling of the statue of the slave trader Edward Colston, in the British city of Bristol. However, this very conflict indicates biases in the perception of violence, depending on the cause being demonstrated for and who comprises the demonstrators. For example, looting during riots for the Black Lives Matter movement and in historical protests against police violence has been vilified as opportunistic, rather than a justifiable action against capitalistic control over the government and justice system (Osterweil, 2020). Meanwhile, activist groups have diverse membership, for example with members who are 'risk averse' and worry about 'getting a bad credit rating' (interviewee), thus demonstrating the makeup of movements and range of positions which need to be considered in organisational and participatory design approaches.

COUNTER-FRAMING THE 'NEW NORMAL'

A key issue around which different frame positions have emerged during the COVID-19 crisis has been the idea of the 'new normal'. The notion of going back to normal, and by extension the establishment of a 'new normal' in the wake of the pandemic emerged as frame debates, against which social groups have mobilised. As the launch of our research coincided with these so-called unprecedented events, responses deployed in dominant discourse have provided a productive area in which to examine counter-frames. In this section we elaborate on three tentative positions.

NEW NORMAL IS PLACATING

COVID has revealed deep structural inequalities, locally and globally. Meanwhile, groups perceive a 'rush to "return to normal", which they seek to counteract (Climate Outreach, 2020) through the development and foregrounding of policy frameworks and ideas in the making over recent years. Meanwhile, groups are cognisant of how the new normal frame is deployed to normalise both the status quo and undemocratic new measures being ushered in. As Asonye (2020) observes: 'By using this language, we reimagine where we were previously relative to where we are now, appropriating our present as the standard.' Maintaining a guise of normality privileges the elite for whom it is serving, whilst overlooking issues of homelessness, poverty, starvation, systemic health disparities, digital exclusion and labour exploitation: 'The "new normal" ignores these lived experiences of migrant displacement and exacerbated structural inequalities, fostering one-size-fits-all strategies based on privilege.'

At the same time, the 'new normal' provides opportunities for the long-term institutionalisation of allegedly temporary measures which ultimately benefit an elite, such as digitisation and increased governmental surveillance and the expansion of big tech's reach (Klein, 2020). As Asonye (2020) notes, 'the "new normal" valorises the promise of virtual engagement'. Such framing seems poised to 'quell any uncertainty ushered in by the coronavirus' (Asonye, 2020).

NEW NORMAL IS TRANSITIONAL

Some groups position the 'new normal' as a transitional state through which a process of learning and formation of new social institutions is unfolding, viewing this uncertainty and the resulting discomfort is exactly what is needed to motivate profound and lasting change. Post-COVID, the 'inequalities and absurdities' of the economic system are 'clearer than ever' (Büchs *et al.*, 2020). The disquietude of the new normal therefore urges acknowledgement of the need to transition to entirely new social systems.

While some problematic practices around digitisation of public services and surveillance are naturalised, transformative acts of public spending and investment demonstrate the possibilities of how public finances could be used for progress on green industrialism, such as through the variety of formations of the Green New Deal. These calls for largescale institutional and systemic transformations are the equivalent of 'a well-functioning immune system against unknowable risks' (Dark Matter Labs, 2020) – that is a direct contrast and move away from the 'small is beautiful environmentalism' of the 1970s, which has come under increasing critique in recent years (Srnicek and Williams, 2015). This demonstrates a significant shift of scale within the sustainability field informed and constituted by conflicting frames and counter-frames.

NEW NORMAL IS CO-OPTING

At the same time, some groups advocate to 'Build Back Better', implicit in which is the imperative to return to a prior state – to 'reset'. The appropriated slogan and

concept to 'build back better' through a business sensibility involves investment in a growth economy that re-establishes things as they were, but improved, by integrating concepts of 'green recovery', 'green industrialism' and 'green investment'. For example, in the 2020 American elections, Joe Biden's campaign slogan 'Build Back Better', brought new meaning to the 'new normal', given the criticisms of his platform largely proceeding with the status quo. In the time since, while committing to massive green investment during his first 100 days of office, assessments range from praise for bold action, to more sobering views of too little too late (Steffen, 2021).

The counter-frame is that through slogans and the details of policy frameworks such as 'Build Back Better' a sense of a return to a previous social order that is problematic and harks of a reformed and potentially strengthened establishment is contentious to those who see the crisis as an opportunity for transformational change. As a Dark Matter Labs (2020) report puts simply, 'Normal was the problem in the first place'.

NAVIGATING COMPLEXITY WITHIN THE NEW NORMAL

Nevertheless, in our interviews we discovered concern among some groups that by positioning themselves as not wanting to go back to normal they may alienate people. Relatedly, frames that emerge out of the grassroots are often appropriated and their meanings transformed by institutional actors and their practices. Counter-intuitively, perhaps, this risks representing a privileged position – that of a necessary disruption to society and economy – a luxury not available to many working people, especially those in marginalised groups. This speaks to the sustainability discourse of 'just transition', which foregrounds the necessary acknowledgement that for any societal transition there needs to be an acknowledgement of which livelihoods are lost and who stands to gain or lose. It also relates to broader criticisms of privileged positions prioritised within the sustainability field, including those issued at groups promoting civil disobedience that could lead to arrest, an outcome with widely varying consequences depending on race, class and other factors.

Similarly, rather than isolating the brief ecological benefit of the response to the pandemic, witnessed in reduced road and air traffic and corresponding wildlife activity, but which generated misanthropic rhetoric such as 'humans are the virus', that one group we interviewed associated with eco-fascism, the integration of social and ecological benefits of not returning to normal should be emphasised. Dark Matter Labs (2020) states, in contrast:

> Even a near complete shutdown of the global economy has resulted in only 5.6% CO2 emission reductions relative to the 7.6% required annually to keep within the 1.5°C temperature-rise target. While much has been made of the potential benefits of the pandemic on the environment, COVID-19 has also highlighted the limitations.

The crisis brings to the fore the centrality and entanglement of economics, ecology and society, which form the foundations of discrete positions on what is necessary for any sustainable future. These issues illustrate the making of frames and counter-frames in practice and the tensions and balance between lobbying for transformational social change through mobilisation across race, gender and class lines, in contrast with exclusions through perceived radicalism. It is these delicate lines along which counter-frames can be investigated and fruitfully explored.

COUNTER-FRAMING STRATEGIES FOR THE NEW NORMAL

Increased grassroots activity at different levels, from regional solidarity movements to formal charities to small local neighbourhood support groups, has flourished within the pandemic. Many organisations see the crisis as an opportunity to advance their visions of economies centred on wellbeing and sustainability. Underpinning these visions is the potential for new 'polymorphic' – an entity of diverse forms and dimensions rather than monolithic – social and economic models (Vidal and Peck, 2012), the creation of which can be supported through appropriate counter-frames of hegemonic economic discourses. Meanwhile, response to the coronavirus has demonstrated how rapidly change can take place: A member of Extinction Rebellion states:

> For decades, our government has told us that the systemic changes to our economic system needed to avert climate breakdown simply weren't possible. On the contrary, this crisis has shown us that when an issue … is a life-threatening emergency of global significance, the government is quite capable of responding quickly and rapidly reallocating vast resources. (Quoted in Quigley, 2020)

Despite criticisms of government action, the disruption to the economy forced by COVID sets a precedent for other necessary crises response.

As a report on climate and migration stresses, the right timing is essential to effective framing for social change, to pursue the 'window of opportunity' (UKCCMC, 2012) – the lacuna through which the public can be won over through the right arguments and with the right ideas. This is the point in time before frames become settled and institutionalised and thereby more difficult to disrupt. By the same token, several groups interviewed lamented being 'ten years too late' for necessary action on the climate crisis (interviewee).

Whilst such fatalistic/doomist perspectives are critiqued for breeding inaction (Lamb *et al.*, 2020), such observations also indicate the cruciality of good timing and effective framing. Many of the conflicting frames outlined here, for example between climate and social issues, have imposed obstacles to change, whereas the pandemic and its roots in zoonotic disease, spread due to destructive environmental practices, has demonstrated the necessity of addressing such interlocking frames. The crisis offers an opportunity for 'mainstreaming new social norms' which the group Climate Outreach (2020) establishes as critical to achieving action to address the climate emergency. This group outlines how action can only be achieved through a sense of desire rather than coercion, a distinction which depends on how issues are framed.

The disruption of the pandemic to normal life can foster understanding of those who do not have the privilege of normality, which in turn can be mobilised. Asonye (2020) writes: 'We should revel in the discomfort of the current moment to generate a "new paradigm", not a "new normal".' He suggests that by embracing the destabilisation and lack of so-called normality introduced by the pandemic, people might be urged to empathise with and to help those who are marginalised and excluded regardless of COVID-19, leading to policy dedicated to recognising the diverse realities of stakeholders. These disruptions and their revelations point towards how storytelling and other design tactics can be utilised for counter-framing in ways that go beyond some of the problematic narratives associated with the new normal.

DISCUSSION AND CONCLUSION

In this work we have presented an initial re-conceptualisation of frames and counter-frames in relation to design research and practice and elaborated on this conceptualisation by drawing insights from our empirical findings of working with social movements, grassroots communities, citizen groups and community organisations. Through early-stage analysis and insights based on these activities, we draw out implications and opportunities for design and articulate these through a presentation of the discourse of the 'new normal'. We articulate the constitution of select frame and counter-frame positions within this emergent discourse, and the observed complexities, contradictions and tensions therein. It is essential to emphasise, that each emergent frame and discourse is contested within its own conception. Alongside those contestations that we touch briefly on in this short paper, exist others – between competing discourses, or within sets of frames – that cannot be treated extensively here.

THEORETICAL IMPLICATIONS FOR DESIGN

Seeking out counter-frames by its very nature is an engagement with complexity and non-linear interpretations of social issues through the identification and acknowledgment of difference and power.

Participatory design scholarship has sought out ways to repoliticise its research and practice (Huybrechts et al., 2020). The concept of counter-frames is here presented as a *working* concept, meaning that it fosters the constitution of dissensus within a given context and thereby engagement with practices of resistance and the creation of publics/counter-publics and practices that are marginalised within the political sphere. It asks designers to engage publics in defining its politics and purpose and builds the spaces and structures into the process.

The aim of working with counter-frames, by seeking frames of contention or competing frames that may exist outside the initial bounds of a given design context furthers the goal of democratic design methods' practices and spaces. If participation's purpose is to reveal 'undemocratic forces and structures…in a design process' (Knutz and Markussen, 2020), by putting counter-frames in dialogue with design we build democratisation processes constitutive of dissensus. Yet, our work opens up new considerations for design in its correspondence with publics. Frames and counter-frames engage different publics differently, which are in dialogue – providing a meso-level of analysis of an evolving field uncommon in design theory. Importantly, endeavouring to find ways of doing design that constitute and/or navigate the tensions and debates between different positions opens possibilities for thinking and doing design critically – in practice.

Furthermore, more explicitly identifying distinctions in frames and counter-frame positions in relation to ideological and political motivations has the potential to enhance our understanding of participation. This is because collective action groups have used frame theory to develop understanding on how to effectively mobilise different social groups, by being responsive to ideologies and value systems. To this end, a core contribution of this paper is a re-articulation of how we understand frames in design and the acknowledgement that any re-/framing is doing political work.

SPACES OF RESISTANCE

The empirical context of the research problematises sustainability discourses through the lens of counter-frames, cutting across varying levels of scale. The character of the scalar concept is varied. For instance, the counter-frames of the 'new normal', provide insights about relationships inside groups such as mutual aid groups and collectives, to how these same groups externalise discourses outside of their actions towards moves for total societal upheaval and global transformation. Yet, investigating these counter-frames requires interrogation of the constitutive relationships between economy and ecology, the human and non-human leading us to more fundamental scalar questions of how frames speak to ideological foundations and

worldviews. How such relationships are understood to be constituted can be challenged through different and new scalar interpretations.

Matters of scale in sustainability have shifted and are contested within different field positions, articulated through frames and counter-frames. We note the shifts in contemporary critical sustainability discourse that stands in stark contrast with a call for downscaling and 'relocalising' of earlier environmental movements. In this paper, the scale of transition is made palpable through the debates of the 'new normal'.

Through their very conflicts, these counter-frames offer spaces in which 'new paradigms' may be carved out of obsolete discourses and divisions, via new methods including some of the strategies we outline, such as storytelling practices and other design tactics. Doing so, counter-frames in their essence both fill in and open up spaces for political debate. Taking this point seriously would also allow for overcoming an instrumental view on the potential of the concept of counter-frames.

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NORDES 2021

Paper Session 2

Futures (1)

Session Chair | Josina Vink

Troubling the Impact of Food Future Imaginaries
Danielle Wilde, Markéta Dolejšová, Sjef van Gaalen, Ferran Altarriba Bertran, Hilary Davis and Paul Graham Raven (F)

The Design Fiction Matrix— a Synthesis Tool for Grounding Fiction Scenarios in Real Facts
Peter Vistsen (E)

Temporal Scales of Participation: a Rift Between Actors and Spectators
Alicia Smedberg (E)

TROUBLING THE IMPACT OF FOOD FUTURE IMAGINARIES

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ABSTRACT

Global scale transformation is urgently required if we hope to stabilise socio-ecological systems. While design contributes to social and ecological un-sustainability, it can also play a pivotal role in bringing us towards more positive, inclusive ways of living and being within the planetary ecosystem. Experimental, co-creative design provides powerful tools for prompting critical thinking and inspiring new imaginaries. We engage with these possibilities, and explore their role in societal transition. We present an experimental food design workshop that aims to engender fantastical and plausible possibilities for regenerative (more-than- human) future food practices. We reflect on how to move from such imaginaries to 'implementable nows' that is, transformative innovations that might be enacted today. We provide inspiration and methodological guidance for designers interested in the social imaginaries brought forth through world-making efforts; leapfrogging the adjacent possible and reorienting situated practices towards better – socio-ecologically just – futures.

INTRODUCTION

Ecological and humanitarian crises are rendering life precarious on an unprecedented scale. If humans are to flourish within nature, we must urgently transition towards resilient and restorative futures. Such transition requires radical shifts in economic, political, social and material ways of living and being (Leach et al. 2013). The scale of this transformation is challenging to grapple with; the futures uncertain; notably different from life as we know it. Much work is being done in design to afford societal transitions (e.g. Björgvinsson et al. 2012; Escobar, 2018; Irwin, 2015; Light, 2019, Wilde, 2020). As part of this effort, we propose that robust transition requires a 4-step process, in which stakeholders: 1) imagine desirable futures that are resilient, regenerative and transcend current socio-technical constraints; 2) prototype towards these new imaginaries, engaging with contemporary practices and situated concerns; 3) negotiate infrastructuring challenges, to ensure they are working towards realistic alternatives; and 4) identify impediments to scaling out, to understand if and how promising experiments might be transferred – adopted and adapted – to other contexts of action (Wilde, 2020; Wilde et al., 2021).

Design is complicit in the planetary problems we are facing (Papanek, 1972), but also potent in provoking imaginative, reflective situations that can bring together diverse stakeholders in meaningful co-creative exchange (Hesselgren et al. 2018). Designers have long been experimenting with methodologies, theories and practices to stimulate transformative thinking and action (Maldonado, 1972). Such experiments are critically needed, at locally-situated scales. They must come from a place of humility, rather than (perhaps unconscious) hubris and acknowledge the planetary embeddedness of actions and their unimaginable impact, if we are to find a way forward.

We present a two-part workshop that engages the methods and techniques of experimental food design research (Davis et al., 2020; Dolejšová et al. 2020). The objective was to explore possibilities of transitioning

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human food and technology practices toward resilient, regenerative and justice-oriented (more-than-human) futures; to co-create new social imaginaries for the food system, both fantastical and plausible. In short, to embody step 1 of the above-described transition process. This work hinges on the understanding that social imaginaries – collective beliefs about how society functions – 'can enable or disable societal transformation and are critical to its realisation' (Jassanof & Kim, 2015). We thus set about unfolding new worlds, to 'arouse an appetite for what might be possible' (Haraway, 2011); materially interrogating design methodology, through critical exchange among diverse scholars and creatives.

Our workshop is designed to trouble the role of speculation within the afore-mentioned 4-step transformation process, so we might better understand how to move from future visions to 'desirable implementable nows' (Wilde, 2020) – to move from ideas to action. In the second part of the paper, we thus raise the question of how designers in diverse contexts of action, with different cultural, political, socio-economic and environmental pressures and concerns, might prototype their way towards desirable new imaginaries; scale out their practices; and lay the groundwork for realistic alternatives. Specifically, we ask: *How might designers leverage the results of their world-making efforts, use them to leapfrog the adjacent possible, and reorient current practices towards envisioned – socio-ecologically just – futures?*

As design researchers, we are not the first to grapple with these questions. Transition Design and Strategic Design, for instance, engage with these processes for shepherding transformation, shifting scales from the personal and local to the planetary (Boyer et al. 2011; Irwin, 2015). We amplify this process by holding focus at the scale of the body and embodied imagining. We access phenomenologically grounded ideation, to broaden and personalise understandings of issues at stake, gain access to new perspectives and enhance meaning-making (Höok, 2018; Wilde et al. 2017). Further, we focus the inquiry in the intimate realm of food and eating. This bracketing enables us to consider processes that are global in scope (e.g., climate change, industrial food production), yet intensely personal in their unfolding (e.g., reduced availability of seasonal produce). It allows us to leverage collective action at a range of scales, using interpersonal, locally-situated and embodied experimental food design practices to bring planetary and societal issues to a scale at which they can be co-creatively reflected upon and interacted with by interested individuals.

Next, we introduce the practical and methodological background of the workshop, and provide critical reflection of the processes and outcomes. We do not pretend to have answers to the questions we raise. In the tradition of research, we raise questions that operate at a range of scales. Our intention is to unfold those scales, expose them to scrutiny, and invite the design research community to join us in our inquiry.

ENVISIONING SUSTAINABLE FOOD FUTURES

Experimental Food Design for Sustainable Futures was a two-day conference workshop that used food as research object and accessible starting point from which to explore values, concerns and imaginaries associated with food futures and climate resilience. Human-food practices are amongst the most significant contributors to urgent global challenges (Willet et al. 2019). Our workshop proposed co-creative, experimental reflection on food issues, to engender ideas around system transformation. It involved 33 participants of diverse social, geographical and professional backgrounds. It was held online, over two days, and consisted of two distinct, yet thematically intertwined sessions.

Day 1 – *Fantastic(e)ating Food Futures: Reimagining Human Food Interactions* examined interdependencies between food, technology and social practices. The intention was to critically engage with ways that food-technology innovation might afford or hinder future flourishing. Technology is often hailed as a change-maker. Yet, it may have ambivalent impacts on food cultures (Davis et al. 2020). Food-tech propositions – such as cooking with smart kitchenware or high-tech farming – are contested areas navigated by multiple human and non-human stakeholders (Dolejšová, Wilde et al. 2020). The day-1 activities sought to examine: *What changes do food technologies bring into everyday life? How might we incorporate more-than-human values into food-tech futures? How might we leverage imaginative design approaches to scaffold development of fantastical and sustainable food-tech cultures?*

Day 2 – *Designing with More-than-Human Food Practices for Climate Resilience* sought to further unfold the potential of more-than-human food practices for supporting regenerative, climate-resilient food futures. The activities drew on a rich variety of existing projects tackling food sustainability, observing how many of these projects fail to acknowledge multi-species plurality (Dolejšová et al. 2020). We invited participants to reflect on these examples and imagine ways of including more-than-human perspectives in sustainable food transformations. The aim was to shift the focus of co-creative thinking from *fantastical* to *plausible* food futures, and contribute creative visions that might be fed forward towards positive transformational change.

EXPERIMENTAL FOOD DESIGN

As authors, we share a commitment to experimental research through food design. Food has useful qualities for transformative design research. Human-food practices – how we eat, provision and dispose of food – are connected to local culture and identity, yet are

global in their impact. The multi-species food web on the planet is dense, thick and multi-faceted. Food practices bring focus to our position in this food web (who eats whom; why) and confront the eater with transformation-related questions, embedded in the minutiae of everyday life. Food practices are commonly relatable, situated and personal. They unfold at the scale of the body – the scale at which people readily operate, think and imagine. And while technologies expand our scope for where we imagine our bodies begin and end (Wilde et al. 2017), it remains challenging for most people to think beyond the timescales of a human life. Indeed, perhaps the greatest challenge with climate change is that it unfolds over geographical and temporal scales that sit outside this 'human' scale. Food is social glue; foodstuffs are materially fantastic. Unlike other design materials, food is edible, perishable and compostable, and as such supports research through ecologically accountable design. And, while this workshop was delivered online, food materials still served as prototyping ingredients. Foods were physically present in participants' remote locations, digitally present in our shared Miro workshop setting, and vibrant in our sensory imaginations.

THE WORKSHOP

The two days in the workshop enabled us to consider the move from fantastic(e)ating to plausible envisioning. Both days focused on hands-on experimental design methodologies, and leveraged the collaborative possibilities of Zoom and Miro. Working remotely, participants shared food-related boundary objects and ingredients from their home pantries; engaged in foraging walks in their kitchens; used bespoke food design props; and co-designed food futures proposals in Zoom breakout rooms. Throughout, the shared Miro workplace enabled participants to bring together notes, observations and (representations of) food materials to create visually-rich proposals that we frame as experimental recipes (Figures 1,2).

DAY 1: FANTASTIC(E)TING FOOD FUTURES

The day-1 task was to reflect on existing food-tech issues and create recipes for fantastic picnic meals. The resulting 'meals' represent propositional food-tech futures: technological innovations designed to support new forms of eating together among diverse (more-than-human) eaters. The recipe prototyping process was supported by a deck of Food Tarot cards,[2] which presents 22 imagined food tribes – e.g., *Datavores* and *Turing Foodies* whose diets are radically shaped by technological advancement. The Tarot deck was distributed before the workshop. Participants were asked to select a card, choose an item from their home that represents the food-tech practice shown on the card, and film a short video that presents themselves, their object and the card as a boundary proposition. We began the workshop by viewing the videos as a single showreel. They thus served as a means of participant introductions. Visual representations of the selected personal food items – home-made foodstuffs, utensils, edible plants, and more – were then uploaded into a Food Swap Pantry located in Miro (Figure 1). The Pantry served as the mainstay of ingredients for the workshop activity – the task of prototyping recipes for fantastic picnic meals. We formed groups based on participants' shared interests, food-related background and diversity of geographical location. Working in breakout rooms, each group collectively envisioned a food-tech future and co-created a picnic recipe inspired by a simple instruction set, and the ingredients in the Pantry. We describe two outcomes:

Inspired by the *Ethical Cannibals* and *Gut Gardeners* Tarot cards, *Cannibalistic Pickn'ick' for Homo Sapiens* proposes the human body as a farm (Figure 3). The recipe envisions a local peer-to-peer system for sharing of edible resources cultivated in and on human bodies (e.g., urine, milk). It foregrounds broken global food supply chains and unevenly distributed food resources, which result in food shortages as well as brimming supermarkets the world over. Acknowledging the need for radical change, the recipe proposes self-replenishing human bio-materials as a nutritious resource for human and non-human eaters. Through its fabulations, the recipe asks: *What if breast-feeding reaches beyond the mother-child relationship? Why not use human cells in lab-grown meat? Why is using human-based bacteria to fertilise soil not globally normalised?* In some cultures, human fæces are composted, others propose composting the entire body.[3] The *Cannibalistic Pickni'ick'* recipe proposals thus sit within the realm of the adjacent possible. However, their implementation may require a shift in values. The recipe raises for debate the taboos that prevent people from 'eating themselves' in ethical and consensual exchange. It invites reimagining of the role of (more-than-) human bodies in supporting regenerative food futures.

The Nutritious Dating – Flourishing recipe (Figure 4) introduces a more-than-human dating sequence bringing together gut bacteria, trees, technology and potential lovers to connect love relationships to multi-species flourishing. Inspired by the *Nutri Amorists* and the *Turing Foodies* cards, the sequence is designed to track physiological signs of arousal in a person ('the lover'), to find them a perfect match ('a(nother) lover'). A swallowable 'butterfly pill' gut sensor tracks the butterflies in the 'lover''s stomach and an 'AI bucket' with fermented cabbage collects their spit for evaluation and matching. The matched couple then proceed on a

[2] https://foodtarot.tech/

[3] https://recompose.life

Figure 1: Left: Snapshot of the Food Swap Pantry and empty Miro workspace for Day 1 (Full board details available at: http://bit.ly/day1-pre). Right: Post-workshop workspace with co-created recipes for picnic meal prototypes (http://bit.ly/day1-full).

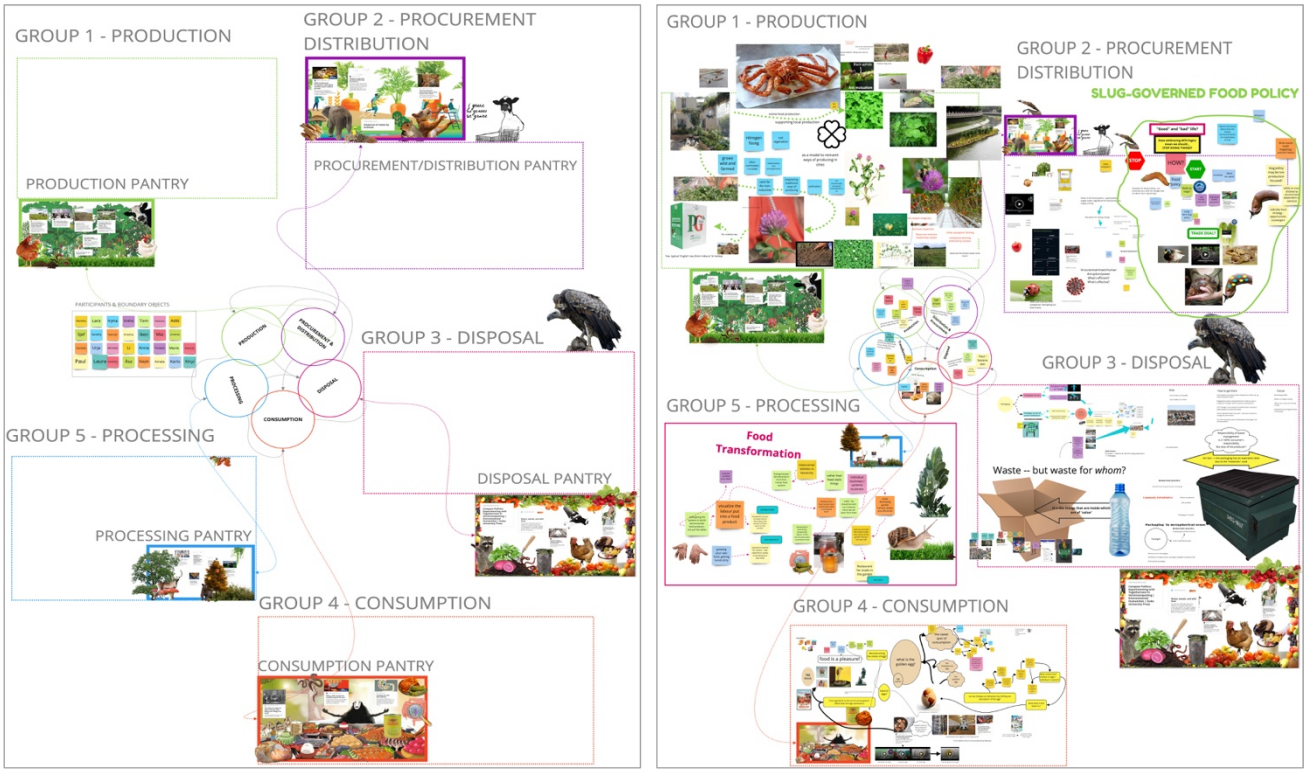

Figure 2: Left: Pre-stocked pantries and food-system area workspaces for Day 2 (http://bit.ly/day2-pre). Right: Co-created recipes for more-than-human food practices (http://bit.ly/day2-full).

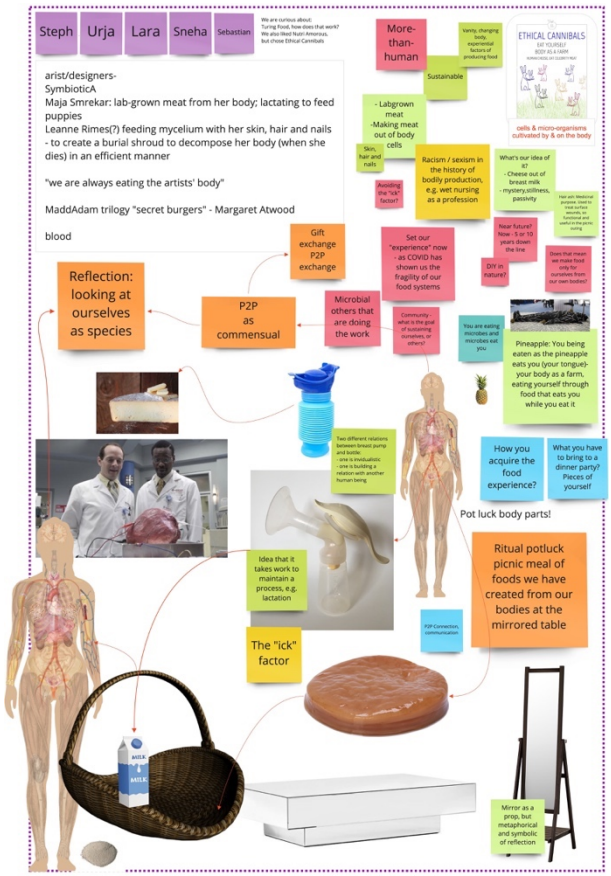

Figure 3: The Cannibalistic Pickni'ick' recipe.

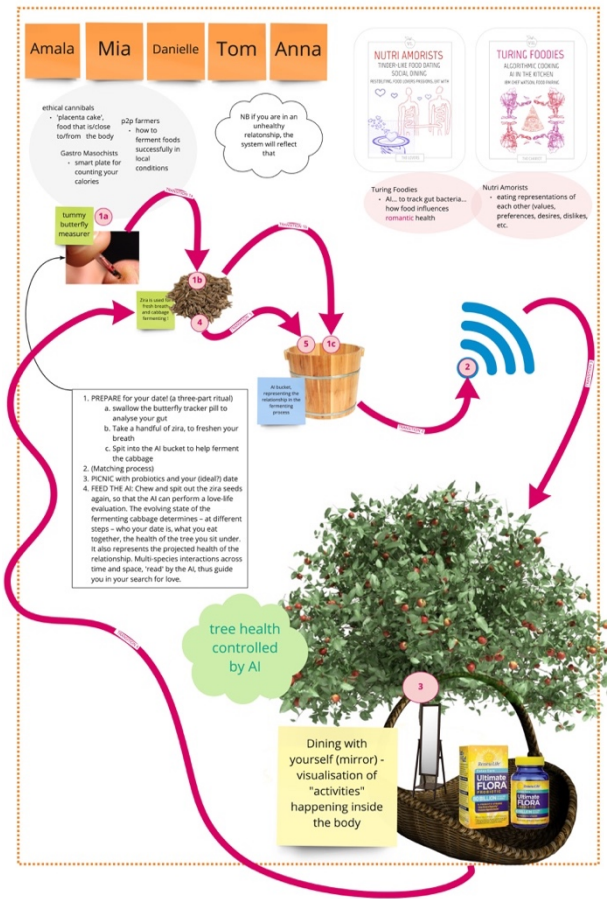

Figure 4: The Nutritious Dating - Flourishing recipe.

picnic date under a tree, mixing their body microbes with each other and the microbial surface of the tree. Post-date, the lovers spit into the cabbage bucket to measure changes in their microbiomes and check if their 'stomach butterflies' are thriving. This literal "Love goes through the stomach" interpretation engages with the non-linear, multi-species nature of relationships, and challenges quick-fix technological solutions for matters of the heart (and stomach). It acknowledges the complexity and relationality of more-than-human food webs. The resulting recipe brings together food, ritual, nature, technology, data and chance to remind us that food futures may be equally uncertain and exciting but always pluralistic, relying on multitudes of diverse, interdependent actors rather than a single response or 'solution' (technological or other).

DAY 2: MORE-THAN-HUMAN FOOD PRACTICES FOR CLIMATE RESILIENCE

To kick-start the creative process on Day 2, we prepared five virtual pantries in Miro, pre-stocked with examples of more-than-human food practices across five food system areas: production, procurement & distribution, consumption, processing and disposal (Figures 2,6,8). Participants added food boundary objects such as a lupin bean, a honey jar, a teabag, and a placenta cake, representing sustainability issues and values. The resulting pantries served the ingredients for recipe prototyping. The recipes – one for each food system area – intend to propose plausible more-than-human food futures. Two examples follow.

The Good, The Bad and The Invasive (Figure 5) looks into the complex entanglements of multi-species food systems and the ethical conditions underlying questions such as: *Who should eat whom; what should be grown where, and for whose benefit?* Situated in the 'food production' workshop area, the recipe considers the intricate position of invasive species: while commonly seen as unwanted pests, they can have positive effects on their surrounding habitats. For instance, a lupin bean plant may be regarded as an unpopular garden invader that should be terminated. Yet, it is a good source of protein for cows, and can be admired for its aesthetic beauty. The propositional recipe is for a floating urban platform of clover to help promote values of biodiversity. While clover is considered a pest in urban lawns, it is an incredibly potent plant for fixing soil nitrogen. It provides essential nourishment for other plants and reduces the need for expensive nitrogen fertilisers. The imagined platform becomes as a visually attractive element in public urban settings, repositioning clover as a sustainability agent, rather than an interloper. The recipe raises for debate the idea that all invasive species are bad – it questions who should decide about that, based on what criteria. It proposes that to enable sustainable and regenerative food systems, we need to

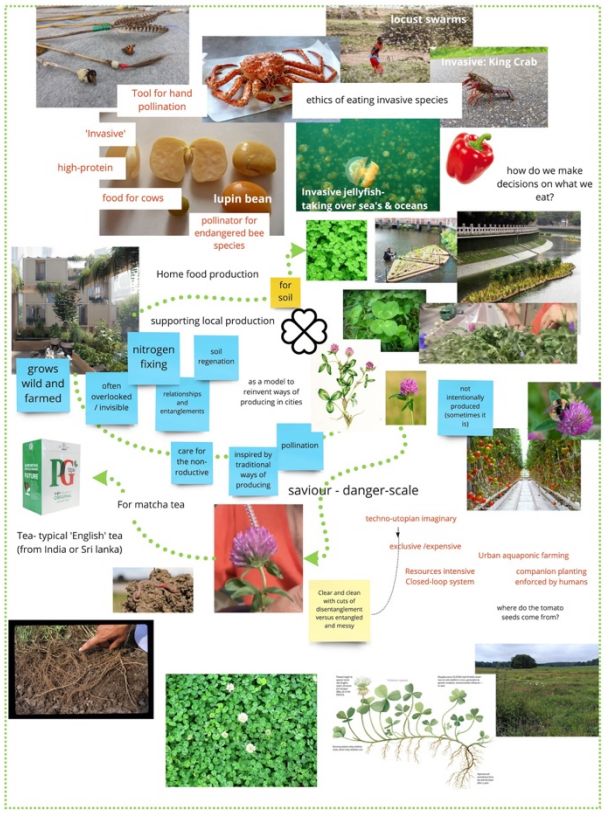

Figure 5: The Good, The Bad and The Invasive recipe.

Figure 6: 'Food production' pantry with examples (links to articles) of more-than-human food production practices.

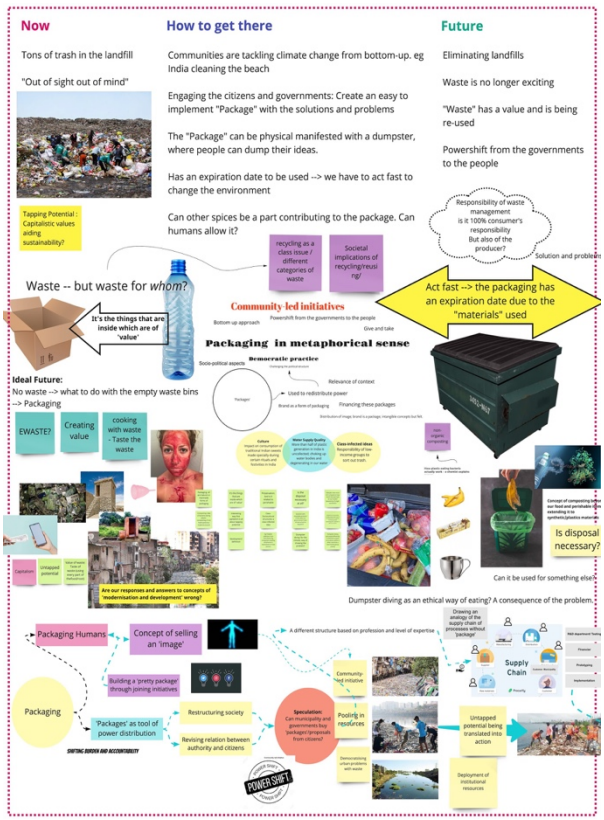

Figure 7: Less than Human? recipe packages.

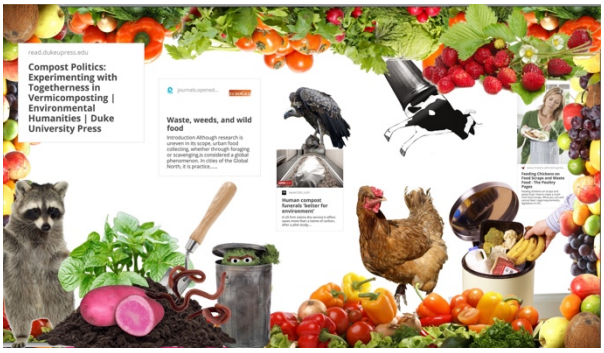

Figure 8: 'Food disposal' pantry with inspirations for recipe prototyping.

move beyond human-centric appraisal of the immediate benefits and costs of food production processes. Caring for seemingly 'unproductive' species can be a means for us to care for better futures.

The second example, *Less than Human?* (Figure 7), reflects on the 'food disposal' area. The recipe began from a realisation that every group member's boundary object – from menstrual cups to chocolate wrappers and banana skins – was a form of packaging. People tend to package things that they value, and dispose of the packaging once the goods are accessed or used. The relationship between the packaging and the packed troubles the notion of value. If we consider human fæces and menstrual blood, bodily waste products are surrounded by taboo, yet both can serve as a fertiliser; menstrual blood is also a nourishing face mask. Values around waste may differ across cultures and social classes. In wealthier communities, dumpster diving may be considered a hip, activist gesture that brings attention to climate issues, and affords a kind of glamour – itself a metaphorical form of 'packaging'. However, this glamour does not extend to ragpickers, or other communities on the periphery, for whom living on others' waste is not a choice but a necessity. To bring focus to differing values concerning waste, the *Less than Human?* recipe presents metaphorical 'packages' – plans of action for democratic forms of governance. The packages originate within concerned communities and are manifested as dumpsters, open for anyone to 'dump' their ideas. Their purpose is to assist governments in accessing and acknowledging diverse values, and finding inspiration in sustainable food practices taking place on the peripheries. They invite respect for the

needs of stakeholders from often marginalised areas of the socio-economic 'food chain'. The recipe serves as a reminder that, just as packaged goods may expire, our time is running out. Bottom-up climate proposals coming from the peripheries – from stakeholders who have intimate knowledge of situated challenges – must be considered and acted upon. This recipe-for-action points to implicit value judgements when considering what it means to be human. In many societies, there are people designated by some as 'less than-human'. The values of more-than-human food practices can only come into play when all human and non-human stakeholders in the food system are acknowledged and respected – when they are valued.

DIGESTING THE WORKSHOP

The recipes resulting from the workshop do not provide exact ingredient lists or precise measures. Rather than being step-by-step guides for cooking up better futures, they reflect on existing food issues and present proposals for alternative approaches that embrace values of inclusivity, multi-species pluralism and socio-ecological restoration. They echo emergent concepts in transformative design, such as Escobar's (2018) notion of *radical interdependence,* and Puig de la Bellacasa's (2017) *more than human care.* These concepts are increasingly present in discourses around decolonising design (e.g. Calderón Salazar & Huybrechts, 2020; Liu et al. 2019; Nold, 2018; Pennington, 2018). They foreground the need for relational co-existence and respectful ways of living and being together in order to support the repair of our worlds. They highlight that all actors – living and non-living – are deeply interconnected, and stress the importance of empowering local (multi-species) communities to meet their situated needs. The discussed recipes by no means fully encompass these transformative design concepts in their complexity – and do not aspire to do so – but they share intentions. By situating these radical concepts within the context of food practices, the recipes serve as a provocation to rethink socio-economic and human-centric hierarchies in food systems towards future flourishing.

To thicken our understanding of the impact of collective food design experimentation, we ran a qualitative survey with our workshop participants. We asked in what ways their experience informed their thinking about food futures and what they found enjoyable or challenging. The workshop involved participants from a variety of professions and practices including designers, researchers, artists, growers. Among the 9 respondents (R), many noted the value in working with such a diverse group: "everyone gave their input from very different perspectives so we ended up with very creative solutions" (R4). This diversity helped to surface food system hierarchies and tensions: "I will be thinking about the notion of 'less than human' design and Western attitudes to design and food futures" (R1). Some were inspired to pursue further explorations: "The idea of self-cannibalism is something I would be exploring in the future" (R2); and engage in newly-discovered practice: "It reminded me of the waste disposal problems around us and got me deeply involved in reuse of menstrual blood" (R2). In general, participants perceived the workshop activities as actionable: "I was offered a grand perspective on action." (R8); "there is an urgent need for more of this type of thinking to be centred within innovation, and by research funders" (R1).

These reflections confirm our first-hand impressions that the workshop was stimulating, supported mutual learning, and planted seeds for further action. As authors, this is encouraging. However, we have long-term goals to maintain a continuity of conversations provoked through such activities. The workshop described here is part of an ongoing series of activities that interdependently interrogate the methodological value of experimental design research towards societal – particularly food system – transformation. These activities take place in diverse venues. They serve as collective inquiries and outreach efforts to nurture a community of contributors interested in food system transformations. To understand how successful these efforts may (not) be, we need to critically reflect on what our design research practices do in the world, and engage with the diverse scales at which we are, and aspire to be, operating. Following, we reflect on the workshop outcomes against the background of our longer-term design research practice, and unpack some opportunities and challenges we encounter.

ANTICIPATING IMPLEMENTABLE NOWS

At the beginning of this article we proposed that robust transition requires a 4-step process, in which stakeholders: 1) imagine desirable futures that are resilient, restorative, regenerative and transcendent of current socio-technical constraints; 2) prototype towards these new imaginaries, while engaging with contemporary practices and situated concerns; 3) negotiate infrastructuring challenges, to ensure the work is oriented towards realistic alternatives; and 4) identify impediments to scaling out, to understand if and how promising experiments might be adopted and adapted to other contexts of action (Wilde, 2020). The workshop activities described here activate step one. Our ongoing work reflects on steps two to four, on how stakeholders (including design researchers) might leverage new social imaginaries to *prototype, negotiate* and *identify* desirable alternatives, leapfrog the adjacent possible, and reorient current practices towards envisioned, better futures (c.f.: Wilde et al., 2021). The intention of this work is that these futures might become not only preferable or plausible, but increasingly probable, when considered through varying cones of futures (e.g. Voros, 2003) and non-linear notions of transitional (design) histories (Göransdotter, 2020).

Our two-part workshop gave rise to a variety of recipes that unearth dilemmas related to sustainable food

system transitions. Some are playful, others more pragmatic. They all provoke creative thinking and inspire interest towards longer-term reflective action. The 2-day workshop program facilitated a shift from fantastic to plausible imaginaries (day 1 / day 2). Yet, it did not require participants to infrastructure their proposals or think seriously about implementability in real-life contexts. The workshop recognises the importance of social imaginaries in societal transformation (Jassanof & Kim, 2015) and align with design futuring methods (e.g. Blythe et al., 2016; Dolejšová, Wilde et al., 2020).

Imagining futures is hardly sufficient to bring them into being. We now seek to understand how to kick-start the infrastructuring process, while staying true to the radical imaginaries brought forth in our world-making. We are interested in efforts made, for example by Auger et al. (2017), Boyer et al. (2011), Björgvinsson et al. (2012) Irwin (2015) and LeDantec and DiSalvo (2013), to infrastructure new imaginaries and implement change. We recognise, as they do, that infrastructuring invigorates democracy and sustains participation at community and societal scales. We also look beyond design research practice to see if we might further expåand our thinking, and at the same time scaffold new audiences for the possibilities afforded through experimental design.

In 2018, UNESCO outlined eight key competencies crucial for people to think *and act* in favour of sustainable development (Leicht et al. 2018). One of them, Anticipation (Poli, 2017), involves commoning issues to arrive at new perspectives; from this new position developing new imaginaries, backcasting and then negotiating the infrastructure needed to transform the imaginaries into what Wilde (2020) calls 'implementable nows' – transformative innovations that can be enacted today. In contrast to forecasting, a backcasting approach begins by working backwards from (radically) different images of the future towards the present in order to gain a deeper understanding of the feasibility of these futures and what measures would be required to achieve them (Dreborg, 1996). It enables people to forge new relationships and cross-sectional collaborations, and reorient themselves towards more desirable futures. Anticipation thus leverages design's world-making capacities to generate new practices, policies, technologies and relationships; ensuring these are personally meaningful, contextually relevant and ecologically impactful. When anticipation is enacted through experimental design practices, it draws on, and can maintain centrality of radical creativity in the transition process (Light et al. 2019). Inspired by these possibilities, we are working towards a deepened understanding of how to enact the full 4-step transformation process in ways that honour the wildness of design future imaginaries. In this direction, we offer an anticipatory backcasting workshop at Nordes 2021, with future food transitions as the thematic context (Wilde et al., 2021). This move at once brings issues to the scale of inter-personal experience and allows us to scale out and around our intentions to – imaginatively and concretely – infrastructure societal transition.

SCALING OUR PRACTICE

As a loose collective of researchers,[4] our efforts constantly shift scales. We conduct situated design research events, workshops, future food enactments, salons and more; across academia, industry, government and civil society. These efforts deepen and enrich our inquiries. They foster productive exchange across the food and transition landscape and constitute network building. To nurture this network of sustainable food transition, we constantly seek new contributors from diverse areas of expertise. All entities on the planet are implicated in the futures to come, and we thus consider collaborating with diverse stakeholders as both necessary and ethical.

These collective, albeit interdependent efforts reach from situated first-person perspectives to co-creative group engagements to planetary impact. This *scaling out* of our practice is non-trivial. Scaling out, as understood in transitions theories, involves the replication of a successful and/or desirable intervention through its iterative, situated duplication in different sites (Moore et al., 2015). It stands in inherent opposition to the strategy of *scaling up*, which follows a commercial-economic expansionist dogma of 'growth at any cost', celebrates centralisation, and is thus deeply embedded in many of the least sustainable industrial practices (e.g. meat and dairy farming). In contrast, scaling out as a strategy for community growth, aims at building capacities that can proliferate across contexts and over time, rather than products or solutions (Lampinen et al. 2019). Our efforts at building a distributed network for food futures transitions embraces such scaling-out to foster rich, multi-faceted and sustainable ground from which buds of better futures – not only in food systems – might sprout.

We use a variety of tools and formats to put this process in motion. From the workshop we report here, we collectively developed a co-authored, open-access book to ferment our ongoing thinking. The *More-than-Human Food Futures Cookbook*[5] includes all 11 recipes co-developed in the workshop, and is co-authored by the attendees. As a compilation, it serves as a tool for scaling the workshop into a longer collective reflection. It prioritizes diversity and collects ideas which bring forth idiosyncratic concerns. By shaping these ideas

[4] http://foodfutures.group

[5] https://cookbook.foodfutures.group/

together into an aesthetically cohesive format, the Cookbook juxtaposes differences and becomes a stepping stone towards a more open, distributed 'sprouting' of our food transitions network.

The Experimental Food Design workshop was held online, on a free-entry basis. We were thus able to include food practitioners from outside of the usual conference realm. As noted by one survey participant: "I would like to acknowledge that this transition [to online] allowed me to access a conference and workshop that I wouldn't usually have access to, as I am both outside academia and on a low income. I really enjoyed being able to collaborate with like-minded people in different countries and hope this is something I can continue to do." (R1). We take comments like this seriously and recognise through all of our work a need to bring forth alternate mechanisms for sprouting growth and aliveness in our network. We consider collective projects like the Cookbook to be important (if small) steps in this direction, and recognise that these efforts are appreciated. As R5 explains: "The challenge is less working together during the workshop, but more what happens afterwards. So often ideas get lost – so I really appreciate your efforts with the cookbook" (R5).

We remain committed to fostering an understanding of how to care for 'what happens next'. To keep enhancing public accessibility of our events, and support pluralistic, disseminated sustaining of our network, we propose a variety of upcoming activities: an online reading group; a series of informal seminars; a collaboratively organised workshop at a public festival; and more. These activities focus on scaffolding the internal workings in the network and fostering new – perhaps unexpected, unthought-of, surprising – forms of knowledge production among those who share interest in sustainable food transitions. We hope our efforts sprout fruitful connections and support a gradual proliferation of the network and its concerns.

CONCLUSION

There is no widely acknowledged recipe for what constitutes a successful, transformative design research practice. The transformative power of experimental design research and the question of what design can do in the world has been at the centre of scholarly (and other) debates for more than a decade. Experimental inquiries into the transformative potential of creative arts and design practices are emerging (e.g. Dolejšová et al., 2021). What we offer here is a humble contribution to these ongoing efforts in the form of first-hand reflections from our collective experimental food design research practice. In a world where nothing is certain, we consider design research experiments that engender alternative, desired ways of living – of eating, procuring, distributing and otherwise sharing food together – to be a potent approach towards future flourishing. The participant responses to our survey suggest that the workshop described here makes modest moves in this direction, by fostering individual and community resilience, across practices and scales. We hope that our experiences and reflections inspire other fellow travellers to intertwine their metaphorical growth with our own.

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NORDES 2021

THE DESIGN FICTION MATRIX— A SYNTHESIS TOOL FOR GROUNDING FICTION SCENARIOS IN REAL FACTS

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ABSTRACT

This explorative paper presents a didactic synthesis tool to support designers and design students in adopting design fiction as a method for speculative design. We present the theoretical underpinnings behind the development of the framework and the logic of the tool itself while situating the tool among the current discourse on design fiction. Finally, we present a series of reflections upon the recent year's application of the tool in a design educational setting, showing the different ways the tool can be applied and represented in practice.

INTRODUCTION

Up until the point of its actual implementation, any design can be seen as fiction—a functional story that speculates about a possible future state of the world, an abductive synthesis of "what if" (Kolko, 2009). In recent years, design fiction has become an intriguing new conceptual tool with which to examine the usability, utility, and desirability of such design concepts, especially in regard to possible consequences of advances in new emerging technologies. Design fiction is defined by Sterling (2012) as "...the deliberate use of diegetic prototypes to suspend disbelief about change". This deliberate element tells us that the narrative construction is different from that of traditional storytelling: It has a functional focus on actively doing something other than "just" telling a story or giving its audience an experience. This functional purpose is stated in the next section of the Sterling's definition using so-called "diegetic prototypes" to suspend disbelief about change for stakeholders. A prototype is "diegetic" when it is ontologically coherent and true inside the premises of a given narrative. In other words, rather than being "real", the prototype is "being told" as part of a story and thus becomes a "performative object" (Kirby, 2010). This performative nature of design fiction enables the designer to create a discursive space in which the proposed design concept can gain meaning, context, and explain the currently unknown to future consumers and users. It is by creating this discursive space that the design fiction aims to suspend our disbelief for a moment and invites us to speculate within the frame of how the fictional scenario applies its "what if" question to a future design concept. Thus, this shows a diegetic prototype in use, in a specific context, and with an imagined user experience for a proposed user.

As highlighted by Vistisen et al. (2015), a narrative opens for possibilities, and engages the reader, viewer, listener. And with engagement comes participation and empathy. A deeper understanding of the design and its purpose and possibilities within the world. This exploration is not based on some far-future utopia or dystopia, but on how we make the most responsible user experiences in the near-future. To achieve this, the design fiction discourse needs to not only acknowledge its roots in narrative theories and methods but also ground itself in the facts of the current reality of our here and now. This is further stressed by Dunne and Raby (2009): "Rather than thinking about architecture, products and the environment, we start with laws, ethics, political systems, social beliefs, values, fears, and hopes, and how these can be translated into material expressions." This is to say, that even though it can be intriguing and valuable to "just" speculate about the future possibilities of a technology or technological practice, if the design fiction scenarios are not grounded in either actual facts and data or at least indications or misconceptions existing here and now, the design fiction scenarios will be at risk of drifting into the domain of pure science fiction and thus not be able to guide or

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provoke design in practice. Achieving this balance between the here and now and the future scenarios of design fiction without becoming "too speculative" is difficult, especially for designers not used to apply narrative thinking and storytelling in their design practice. From our own academic context of educating designers from a multitude of fields, ranging from interaction design, experience design, and service design to design engineering, we have observed this challenge of speculation as one of the primary issues in applying design fiction as a feasible method in practice. We believe this is an important methodological problem with the aim of investigating how to support designers in grounding speculative future scenarios in facts and issues present or indicated in our here and now.

BALANCING BETWEEN DESIGNING AND STORYTELLING

The point of venture for most design fictions are some kind of materialized storytelling—either in the form of classical narratives or through speculative artefacts that promote or provoke discourse about form, function, and context of use.

Applied approaches have varied from traditional storytelling frameworks, such as the dramatic narrative curve (Genette 1983), the actantial model (Greimas, 1987), and the hero's journey (Vogler, 1998), to more user-centered, design-oriented attempts at narrative design, such as personas and use cases (Nielsen, 2012) as well as user scenarios (Carrol, 2000). Such frameworks work well in terms of how to plan and structure the design fiction scenario from a storytelling perspective and have shown to also be easily translated into the context of speculation regarding emerging technology, e.g., when using the "helper" actant in the actantial model as a placeholder for the proposed diegetic prototype rather than as the traditional helper archetype from storytelling fiction. However, even though these approaches make it easier and more manageable for the designer to structure the components of the design fiction as a narrative scenario, they do little in terms of ensuring that the design fiction is actually grounded in some kind of contextual setting or socio-economic situation that is based on facts about reality, misconceptions held by current stakeholders, or signals indicating future developments. To some extent, this is not a problem, if the aim of design fiction is to make us reflect critically and question our current design ethos through fictional "what if scenarios", such as Mark Blythe's (2006) emphasis on how "pastiche scenarios" do not necessarily need to be assessed in terms of their plausibility or, as Markussen and Knutz (2013) label it, their "accessibility" as a possible future world. On the other hand, this also presents the challenge of balancing between storytelling and design to ensure that the design fiction actually becomes a functional vehicle for creating discourse rather than "just" speculative science fiction. This issue has previously also been raised through Auger's (2013) notion of "perceptual bridges" to reality as a necessity for rooting speculation in the real world. This challenge adheres to the storytelling subject—the designer investigating the "what if" scenario through storytelling. However, most designers are not educated authors or critical philosophers well-versed in the literature tropes from the broad range of critical theories. Especially for design students, the "leap" towards using speculative design methods and storytelling can be daunting. In academic design schools, there have been instances of students' tendencies to adhere to normative and pragmatic design spaces rather than explore the full design space due to the "risk" of becoming too speculative. Thus, design fiction, while intriguing and valuable, is still in need of tools to more easily instill a speculative- and narrative-driven mindset in unfamiliar designers, while supporting them in retaining a perceptual bridge to reality.

THE DESIGN FICTION MATRIX—BUILDING FICTION THROUGH MAPPING FACTS

Bleecker (2009) saw the link between design and fiction originating as an integration of three different paths (technology, art, science fiction) to find opportunities for design "to re-imagine how the world may be in the future". The important issue here is deciding upon this mix of paths in contextualizing the diegetic prototypes of design fiction. Auger (2013) states that it is important for the designer to understand and decide upon in what contextual space the existence of a design fiction would be plausible. Examples of such environments could include the home or office as well as a cultural or political situation. This is what is referred to as "the ecological approach to speculative design." This supports the concept and provides a foundation of understanding in a familiar or logical reality. Furthermore, Auger argues that the concept of design fiction is, in a sense, loaded with associations, e.g., jetpacks and flying cars, because it has etymological baggage. One of the key factors of this approach is that a designer must not present a concept that is too futuristic, because this will be perceived as implausible. These important points are also what we have seen as a challenge among design students engaging in design fiction. If we asked to propose diegetic prototypes of future concepts, how do we then avoid being too futuristic or too conservative? Here, we might lean towards Gert Pasman (2016) and his notion of design fiction as: "storytelling through and with designed objects [...] Design fiction is mostly firmly rooted in the here and now but adds a layer of (near) future to that, thus blurring the boundaries between realism and

fiction". From here, we could argue that design fiction is not assuming the future but looking at different possible futures and must thus take an analytical approach to fact and fiction not just based on future speculation but also on the past and present upon which we build our reflections about the future.

Based on the latest decade of intriguing contributions within the field of design fiction, we have sought to experiment with different frameworks and approaches to ground speculative design in narrative scenarios in various design education programs. We have also sought to experiment with constructing a new framework aimed at newcomers in the domain of working with diegetic prototypes for design fiction by focusing on grounding speculative design fictions about the future in plausible ontologies based on the past, present, and informed projections about the future. This framework, called "the design fiction matrix", spans between a vertical "fact/fiction" axis and a horizontal "past/future" axis, creating four quadrants, each promoting different considerations that can be made in the exploration of a future scenario.

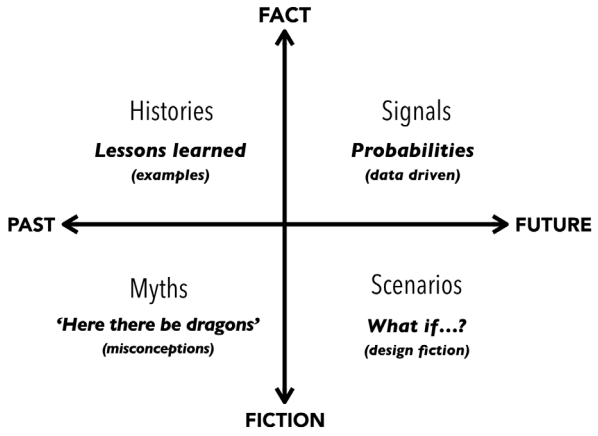

Figure 1: The design fiction matrix comprised of the fact/fiction and past/future axes with the four areas to map in order to qualify what if scenarios through both past and future knowledge.

This simplistic framing aims to ensure that, before speculating about of a future scenario (the fiction/future quadrant), its plausibility is to be rooted in both a reference to previous lessons learned or the current state of art in its field (the fact/past quadrant), current myths and misunderstandings that can be argued to affect how we might engage in the field in the future (the fiction/past quadrant), and which actual data-based projections exist within the field (the fact/future quadrant).

The hypothesis is that mapping these three quadrants makes the design fiction scenario more substantiated and rigorous while also supporting the accessibility of the future ontology of the scenario. The pedagogy here is that the matrix forces us to both explore the facts of the present and past through, e.g., state-of-the-art analysis of technologies, user cultures, and case studies, while also challenging us to question and reflect upon possible blind spots, misconceptions, and prejudices inherent in our present understanding of a given design field. This section, called "myths" in the framework, shows us that even our present and past are constituted by functional stories we tell each other in various social constellations, e.g., when opposing a given change based on an biased or ill-informed opinion (like much organizational change) or when being afraid of a technological change due to a bias based on how a technology has been portrayed in, for instance, popular culture (like recent years' debates on climate change, artificial intelligence, and fake news).

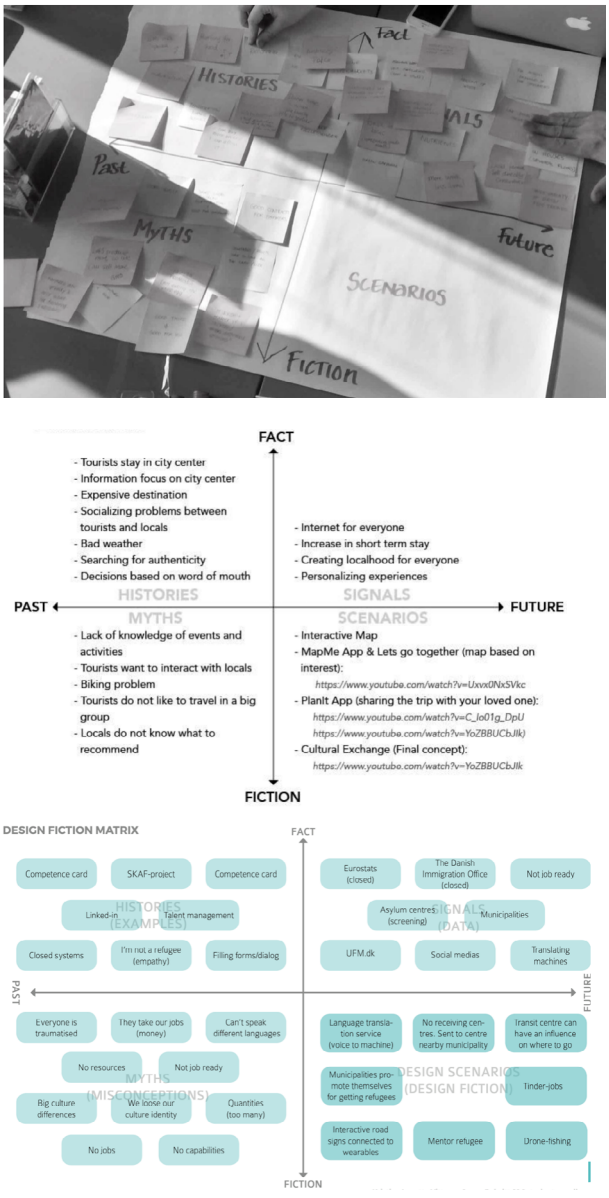

Figure 2: Three different visual styles of students' mapping of design spaces within the design fiction matrix. As seen in the top image, the common trait among all the mappings is to start by mapping the past/fact, past/fiction, and future/fact quadrants based on research before using it as an ontological frame for speculation in the future/fiction quadrant. A broader overview of the mappings can be found in Appendix 1.

EXAMPLES OF DESIGN STUDENTS APPLYING THE DESIGN FICTION MATRIX

In the period of 2013–2020, we have applied the framework in various design education settings concerning the exploration of possible futures within different service sectors. Here, we have applied, reflected upon, and gradually refined the framework and observed how the workshop participants applied the framework to ground their future speculation in plausible ontological structures based on both the past, present, and projections of the near future. The uses of the matrix framework varied considerably; some design students chose to use it as a canvas on which to experiment with different setups through, e.g., post-it notes of their prior desk research and empirical data, merging them into design fiction scenarios (Figure 2). Others chose a more reverse engineering analytical approach, brainstorming various design fiction scenarios and adjusting them via back-tracing towards either the lessons learned, myths, or signals quadrants. A third approach arose in 2020 during the Covid-19 pandemic, during which students worked remotely using online tools to collaboratively create digital design fiction matrixes by negotiating the formulation and placement of virtual post-its in a digital template of the framework (see examples in Figure 2).

The output from the proposed scenarios are often materialized through some kind of storytelling medium. Often, the methods of video- and animation-based sketching (Löwgren, 2004, Vistisen, 2016) have been applied to tell a story through a medium often associated with storytelling and thus with the easily applicable visual language of placing a diegetic prototype in a proposed future use case and context (Figure 3).

Figure 3: Stills from two video- and animation-based design fiction scenarios in which students took past empirical experiences, preconceptions, and myths as well as data-based future predictions into account about two different design spaces: future migration and integration (top) and air polution in citites (bottom).

However, an increasing number of design fiction scenarios are also moving beyond the medium of film, video, and photography towards the materialization of, for example, physical props, models, and prototypes used in different performative ways than the traditional usability and contextual inquiry methods of prototypes. Here, the props and prototypes are seen more as a creative provocation, telling a story through the friction and articulations of surprising user reactions, which is similar to what is also achieved when watching a design fiction scenario play out through film or animation.

DISCUSSION & FURTHER PERSPECTIVES

Our accumulated findings from this application show that frameworks like the design fiction matrix can be a simple way to ensure that design fiction scenarios are not just speculation about the future but also explore plausible futures for us to assess the design fiction scenario's viability, feasibility, and desirability by extrapolating from the past and present. As such, we argue this positions the results in established future studies (e.g., van Duin, 2016; Buehring & Bishop, 2020), and interweaves design fiction with traditional design thinking, which is also concerned with going from "what is" to "what might be".

In this sense, all design can essentially be considered fictitious until the moment of realization, with the difference being design fictions have the liberty to speculate a bit further, and we can deliberately use their diegetic prototypes to open discussions about change rather than necessarily prototyping a specific testable function in the here and now. Thus, the design fiction matrix also emphasizes the future scope of design fiction: it tells stories through performative objects and aims not to be as specific and realizable as design thinking but rather to create a direction for the design process to take. This is where the design fiction matrix diverges from frameworks like Auger's (2013) in asking explicitly to address the plausibility of the fiction scenario by tracing both the conceptual "what if" as well as contextual grounding in either the lessons learned or misconceptions of the past or data-based signals for the future. Mapping out a design space in the matrix thus supports assessing and evolving the plausibility of future scenarios in design by grounding the design fiction in established ontologies of reality. A critical issue that is yet to be resolved is how to ensure that the unfamiliar designer or design student finds the right balance when choosing or merging different scenarios ideas from the future/fiction quadrant of the matrix. Often, a balance has to be struck between the very speculative and scenarios bordering on the normative. Here, we propose that future revisions of the design fiction matrix take into account poetic guidelines, such as those proposed by Markussen and Knutz (2013), and focus on making the storyworld a true speculative vapourworld, as proposed by Coulton and Lindley (2017).

In the end, design fiction, which is not much more than 15 years old (Lindley & Coulton, 2015), is still a discipline in its infancy, with many more nuances still to be explored. Our framework represents an attempt to "get started" and overcome the barrier of "speculation" often seen among novice designers across the fields. By grounding design fiction in both facts and fiction from the past and present along with data-backed indications of the near future, we argue the design fiction matrix is on the path to enable more designers, especially design students, to take the "jump" and scale up their design skills from the normative and pragmatic to the speculative and evocative practices of design.

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APPENDIX

Appendix 1: Examples of student uses of the Design Fiction Matrix usages (accessed 27.1.2021) https://docs.google.com/presentation/d/1vrjx2K9G7WlCxzRFA41-dP-8G9zed6x0xJ_yd3aFVh8/edit?usp=sharingColumns on the final pAge should be of equal length

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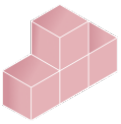

TEMPORAL SCALES OF PARTICIPATION: A RIFT BETWEEN ACTORS AND SPECTATORS

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ABSTRACT

Participatory design is a future-oriented discipline, but there is an imbalance in agency between those who produce future imaginations, and those who consume them. This paper argues that we, as designers and producers of future-oriented design interventions, hold responsibilities towards third party "spectators". The paper departs from an incident that took place two years *after* a Future Workshop had taken place between public sector workers and citizens in Malmö, Sweden, when a concerned third party mistook the workshop's potential and preferred imaginations of the future for truths. In the light of Hannah Arendt's writings on imagination the paper separates actors from spectators, marking a difference in agency but also a difference in temporality. For the *actors'* imagination is directed towards the *future*, while it for the *spectators* is directed towards the *past*, or present at best.

INTRODUCTION

The discipline of Participatory Design holds a commitment to furthering representation and to navigating the slippery slopes of democratic negotiations (e.g. Binder et al 2015; Björgvinsson et al 2010). When participatory design takes place within the public sector (as in this case) which by its very nature is intrinsically tied to the public sphere/realm (Arendt,1958), we must be conscious of the politics we partake in as we enter into or create new *agoras (*Huybrecht et al, 2018). We must care for our imaginations, as they entangle participants both today and tomorrow.

This paper seeks to unfold an anecdote from a participatory planning project, in order to discuss the contrasting tensions that presented themselves in the aftermath of a *Future Workshop* (Jungk and Müller, 1987). The paper argues, in the light of Hannah Arendt (1958; 2005), that imagination(s) is a quintessential part of political action. To make something new, and perhaps even something better, we have to be able to step outside the known present. While this paper departs from Participatory Design the need to predict, forecast, and imagine the future for better or for worse is something most contemporary design scholars are well versed with. In fact, many would argue, as Herbert Simon (1988) famously wrote, that *to design is to device courses of action aimed at changing existing situations into preferred ones*. What designers in general, and participatory designers in particular, can learn from Hannah Arendt's thoughts about imagination is twofold: Firstly, Imagination is always bounded to reality; Secondly, imagination is tied to both judgement and action and hence performed differently for different actors. In Arendt's terms imagination separates actors from spectators, marking a difference in agency but also a difference in temporality. For the *actors'* imagination is directed towards the *future*, while it for the spectators is directed towards the past, or present at best (Arendt, 2005; Tyner, 2017). It is therefor imperative that we, the dreamers, do not forget to bind our imaginations.

A GREY MORNING IN EARLY SPRING

It is a grey morning in early spring, and I am queuing for a coffee when the phone rings. On the other end of the connection is a colleague, a casual acquaintance. Audibly stressed, she is asking what I know about the plans for the new development plans for her residential area. 'Nothing' I say but as the conversation went on it became clear that I did, in fact, know these plans. As it

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turns out, I was one the original creators of these plans. Now my colleague on the phone is asking me when the proposed construction work is set to start, and if it is too late to register a complaint. She can't live like this, she says, the new houses will be much too close to her home. She will have to move.

Unknowingly to me, this story began two years earlier, at a workshop. As part of a broader innovation project initiated by the municipality we were encouraging local residents to imagine new futures, to leave behind the known present and imagine the area as they wished for it to be in 30 years' time. The result of the workshop enumerated to several interesting conversations about the current state of things; strengthened relationships between the public sector workers and the local residents; a few visualisations and some concrete suggestions on how the area might be improved. As a Ph.D. researcher attached to the project, I wrote a quick summary and a reflection of the events and handed them over to the project's communication manager who added them to the project's website on the municipality website. And there they remained until a year later when the project finished: reports were written and presentations were delivered to the municipality where we accounted for the strengths and weaknesses of our work.

Another year later and I'm standing with my phone in one hand and a coffee in the other, as my colleague explains to me how she has found these plans, and how she has searched for days, without luck, for someone within the municipality to speak to. Seeing as we worked at the same university, she managed to get hold of my contact details, and was now on the phone asking how long before she had to leave her home. Of course, none of the imaginations that the workshop produced two years back were designed to be built. At least not without proper consultation, without meeting the regulations in the municipality's detailed development plan, or without the approval of concerned authorities. But without the context of the project the intentions of the drawings were unclear. Left as they were in the municipality's cluttered digital archives the imaginations that we had produced were open to interpretation by anyone who happened upon them. While I managed to convince my colleague that she would not have to move, I couldn't help but wonder how many people, like her, had found the plans - and been terrified? People who did not work at the university, and no internal phonebook to consultwho did not have anyone to ask. People who may even have made plans based on our imaginations, perhaps some of them had already moved?

ACTORS, IMAGINATION AND THE FUTURE

A key issue in this anecdote is that imaginations behave differently depending on how you relate to them. That is, their performance and significance is dependent on whether you are a producer of imaginations, or if you are a consumer of them. In Hannah Arendt's terms imagination separates actors from spectators, marking a difference in agency but also a matter of temporal scales. For the *actors'* imagination is directed towards the *future*, while it for the spectators is directed towards the past, or present at best (Arendt, 2005; Tyner, 2017). This will almost inevitably cause a rift, such as the one seen above, where we had asked the actors engaged in the Future Workshop to leave the past behind. Unconstrained by the known issues of their present they would imagine a, in their minds, preferable future world. By doing so we - the designers and city planners who were also active participants in the imagination process - were told much about what was lacking in the area today. We were told, for example that the area had insufficient childcare, and that the day-care centres would benefit from better outdoor playgrounds. In the workshop we discussed potential solutions such as if a public park could be a common solution that would benefit both new and old day-care centres. We were also told that the public transport in the area was poor, and that flying cars would certainly be an improvement - but if flying cars was not an option, perhaps we could work with cable cars? The sky was the limit.

Including the city planners and other public sector workers was an important part of the workshop. By doing so we facilitated a dialogue with local citizens that they themselves had expressed a wish for. By working alongside the city planners the local citizens were afforded a window of insight into the city planning process. It was a space for mutual learning. But it was a limited opportunity, and a temporal connection when the majority of the group only meeting for a day and a small number of core participants working together for a few months. Hannah Arendt, in her essay *Truth and Politics* (Arendt, 2006) stresses that imaginations must be bound. This means that to produce a vision for the future we must anchor it in the constrictions that are shared truths to us all "Conceptually, we may call truth what we cannot change; metaphorically, it is the ground on which we stand and the sky that stretches above us" (Arendt, 2006., p.259). The meeting between citizens and public sector workers served to do this: it helped create a common ground, and identify common issues between the two groups. It was used as a way of *grounding imagination* (Büscher et al, 2004), and may also be viewed as a situating action.

The future-oriented approach to Participatory Design that was used in the case above is far from novel. And while there are surprisingly few articles written on the traditional format of the Future Workshop (see, for

example, Jungk and Müller, 1987), there has been no shortage of critical discussions around neither the benefits or challenges of future-oriented Participatory Design (Neumann and Star, 1996; Halse et al., 2010; Ehn et al., 2014; Suchman et al, 2009; Storni, 2013; and Hyysalo et al, 2014 to mention a few). The issue of temporal scales is integral also in the practices of infrastructuring: "an ongoing, long-term and emergent designerly effort aimed at aligning humans and non-humans (technologies, resources, spaces) for the emergence of new practices" (Seravalli, 2018., p.3). In fact, it is often described as one of the cornerstones of participatory practices: "Local knowledge production and collaborative prototyping are still fundamental to participatory design, but now, typically, this mundane future making […] takes place as design in use, not before use, and is often staged to deal constructively with controversies" (Ehn et al., 2014, p.7).

SHARED PUBLIC TIME AND SPACE

The notion of the public space as an agnostic space has a temporal element has been discussed by Hernberg and Mazé (2018). Agonism in Participatory Design is often discussed as a way of allowing controversial issues or matters of concern to co-exist, rather than aiming for consensus. Hernberg and Mazé suggest that paying attention to temporality - or temporal use (TU) - can be a way of uncovering agonism over time. They elaborate that "The problem is also identified by critics of formal participatory planning, who argue that official, legally required forms of participation are often "tokenistic" and aim for consensus and legitimization of already made decisions. Thus, if participation is disguised as democratic, it is used in fact as a means of control and a way to depoliticize planning" (Hernberg and Mazé, 2018.,p.3). The future workshop, in the anecdote that this paper rests upon, did take place as part of a formal participatory planning project, and it did indeed strive towards democratising a process that conventionally is gatewayed by formal institutions of power (such as, in this case, the municipality or the university). To do this the Future Workshop was forced to challenge the bureaucratic structures that would otherwise govern the planning process. Bureaucracy has a dual nature: it is both a means to fair treatment, a standardisation, *and* a restrictive measure that prevents actions outside the framework, limiting agency (Mukhtar-Landgren, Nyberg and Paulsson, 2019). It falls outside the scope of this paper to provide a satisfactory discussion of how the bureaucratic duality was visible in the municipal archival practices. It is nonetheless worth mentioning that the standardisation of all municipal documents demonstrated both a "democratic" open-to-all ideology, while simultaneously being stripped of its situated history and personal accountability. The archival traces that the workshop left behind - read by actors as "visions" and read by at least one spectator as a policy document – came to be the infrastructural breakdown that illuminated the rift between those with agency to act and those without.

The group that participated in the Future Workshop was granted more agency to move and act in the planning process, but it also meant letting go of those procedures of equality that bureaucracy strives to uphold. The ethical strategy that many Participatory Designers apply in such situations is a raw, tentative Ethics of Care (Toronto, 1994; Bellacasa, 2017) which would suggest that we hold obligations to those in our immediate surroundings, as they are the ones that will be most acutely affected by our actions. This begs the question: What about those outside our immediate surroundings? What responsibility do we - as Participatory Designers - hold towards them when we attempt democratisation?

THE SPECTATORS AND THE WORLD AS IT IS

Indeed, I argue that in Arendt's understanding of imaginations the Future Workshop could be seen as a democratisation. Arendt, in a text entitled *Imaginations* (1970) draws upon Emmanuel Kant's distinction between intuition and concepts as the two twin pillars of knowledge "Intuition gives us something particular; the concept makes this particular known to us" (Arendt, 2020., p. 157). Coming to the table of the Future Workshop, the participants shared their intuitions through the means of imaginations, and left the table with common concepts. Through the political act of sharing ideas they set something in motion. After all, we must talk to others to be able to include their perspectives in our imaginations (Benhabib 1988). The participants become, as mentioned above, actors who change the world. But while we - as participatory designers - can seek to include many in our workshops, and can pay particular mind to those marginalised voices who are often otherwise excluded, we can never include *everyone*. Those who view and judge the actions and imaginations of the actors are referred to as *Spectators* within Arendt's reasoning around judgment (2006). Spectators view and judge the actions and imaginations of the actors - who attempt to change the world - based on *the world as it is*.

The woman who called me two years after the workshop had taken place did not view the actors' imaginations in the light of their envisioned future, but viewed it in the light of her lived present. While it was a bounded imagination of the world that the Future Workshop had produced, it failed to generate meaning to her. The visions in themselves could not, in this case, make up for the division between participants and non-participants. Between actors and spectators. It is perhaps a good time to remember one of Arendt's most cites phrases:

"The world and the people who inhabit it are not the same. The world lies between people, and this in-between […] is today the object of the greatest concern and the most obvious upheaval in almost all the countries of the globe." (Arendt, 1995., p.4)

SUMMARY

This paper has sought to discuss the imbalance of agency between actors and spectators within future-oriented participatory design interventions. The paper has suggested that this imbalance can be understood as a temporal rift, and that this, in turn effects the longevity of our visions. Misunderstandings could be said to be inevitable when working with large and/or disparate groups, and this is an issue that transcends both time and space.

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NORDES 2021

Paper Session 2

Non-human and Other Scales

Session Chair | Thomas Binder

'Design for Noticing' with Biodiversity Logbooks
Liz Edwards, Serena Pollastri, Linda Pye and Robert Barratt (E)

A Tale of a Wise City: A Speculation on Entanglements of Non-Humans and Humans in an Urban Space
Inna Zrajaeva (E)

Cocoon – Conceptualisation of a Virtual Membrane in the Current Transition Towards More-Than-Human Design
Cornelia Hulling, Jan von Loeper and Swathi Shivaraj, Yanyi Lu (E)

NORDES 2021

‘DESIGN FOR NOTICING’ WITH BIODIVERSITY LOGBOOKS

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ABSTRACT

This paper introduces the use of design to improve noticing skills in order to address environmental issues at a variety of physical and temporal scales. We illustrate the application of ‘design for noticing’ through Biodiversity Logbooks – a pilot project intended to reduce ‘plant blindness’ amongst primary school children. Plant blindness is the inability to recognise, appreciate and value plants and it has far reaching social, environmental and economic implications. In this project, we designed pedagogical tools and processes to foster the skills of noticing plants in their environments, and connecting the small-scale of their individual features to large-scale systems.

Biodiversity Logbooks was designed in collaboration with primary school staff. We present initial lessons learnt from our work to support the delivery of specialist content and to create activities that can be embedded in the curriculum for the long term.

INTRODUCTION

Many current ecological threats have been accelerated anthropogenically. Any attempt to overcome or counter these threats requires a transformation in human behaviour and increased appreciation of the interconnectedness between human lives and more than human worlds.

Design activities can play an important role in reframing these relationships. For this project, we developed an approach that we call ‘design for noticing’ for education to support environmental care and pro-environmental action. Biodiversity Logbooks is an exemplar of an ongoing collaboration which uses this ‘design for noticing’ approach to challenge ‘plant blindness’ amongst primary school children, as a step towards greater environmental care. Through this approach, we design tools and processes to notice elements and interconnections within systems (Meadows, 2008, p.16).

This project does so through a set of interdisciplinary educational activities that focus on learning to see and noticing at the small scale of plants and, by looking at differences and similarities in plants and habitats, connecting these observations to the large-scale complexity of the botanical world and its relations to the environment.

Design for noticing is a response to theories about development of attention, interest, nature connection and ethic of care applied in an environmental context. Noticing is a point of intersection in these theories and our ongoing work explores how design can be used to encourage noticing at different scales, to support cross-curricular education about biodiversity.Through the

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design of the Biodiversity Logbooks, we sought to explored how 'design for noticing' can contribute to countering plant blindness.

WHAT IS PLANT BLINDNESS?

Plant blindness describes the tendency to overlook plants in everyday life (Balick & Cox, 1996), perceiving them as of lower value than animals (Wandersee and Schussler, 1999) and hence "unworthy of consideration" (1999). It manifests in people's inability to appreciate plant needs or recognise unique plant features, a consequence of which is people's blindness to the importance of plants to human life and the biosphere.

Different causes for plant blindness have been proposed, from a combination of perceptual, cognitive and evolutionary factors that mean plants do not capture human attention as readily as animals (Wandersee and Schussler, 1999; Balas & Momsen, 2014), to a variety of social and cultural reasons. This includes a tendency within research, teacher training, education, publishing and media to give pre-eminence to content about animals over plants (Hershey, 2002).

Plant blindness has far reaching implications across different sectors including environmental sustainability, health and the economy (Krosnick, 2018). This is because the inability to notice, appreciate and value individual plant species has an impact on priorities, decision-making and future planning. Where the importance of varied plant functions is not recognised, biodiversity is undervalued and environmental resilience is lost (Fančovičová and Prokop, 2011; Balding and Williams, 2016; Comeau et al. 2019).

ADDRESSING PLANT BLINDNESS

Education has been recognised as an important means of addressing plant blindness. Various approaches have been proposed, including developing specific courses and materials about plants (Hemmingway et al. 2011) and involving plant mentors (Hemmingway et al. 2011) and experts from botanical gardens (Amprazis & Papadopoulou, 2020).

Many researchers point to the benefits of outdoor education and experiences in combating plant blindness (Fančovičová & Prokop, 2011; Lindemann-Matthies, 2002; Nyberg and Sanders 2014). There are manifold reasons given for endorsing direct engagement with plants including nurturing empathy, emotional connection and skill acquisition (Amprazis & Papadopoulou, 2020; Balding & Williams, 2016; Hershey, 2002)

Place making, and community connection can be key because they give prominence to people's home area which can make the learning more meaningful (Amprazis & Papadopoulou, 2020) and anchor ecological awareness (Frisch at al., 2019).

Several active learning approaches have been advanced for addressing plant blindness such as drawing natural objects, keeping observation diaries, plant-focussed supermarket trips, gardening and nurturing plants (Lindemann-Matthies, 2002; Smith and Avery, 1999).

A multidisciplinary approach incorporating creative dimensions is often favoured because this can reinforce learning and grow empathy for plants. For example, Hecht's work with naturalists shows how their long-term interest in nature grew in tandem with other interests such as photography and drawing (Hecht et al. 2019). The strength and persistence of an interest is often attributed to such "interwoven experiences" (Hecht et al. 2019).

Care, attentiveness and skill nourish one another. Increasing care is associated with increasing perceptual competence and attunement to materials and place (Krzywoszynska, 2016), in other words the skills to care. Skills are a catalyst for interest, and this in turn ignites both attentiveness and skill acquisition.

Accordingly, educational approaches that enable acquisition of skills needed for plant care will help promote attention to plants and potentially interest in plants, especially if tied experientially to other pre-existing interests.

Direct experiences of nature can feed interest and seed connection to nature (Chalwa, 1999; Hecht et al. 2019), especially habitual experiences in local environments. Knowledge that situational interest and nature connection linked to positive environmental behaviour are generally established before twelve years of age has informed the design of the Biodiversity Logbooks project, described below.

DESIGNING PEDAGOGICAL TOOLS FOR NOTICING

The Biodiversity Logbooks project sought to investigate how to design pedagogical tools and processes that could help children notice features in the environment that would otherwise go unseen.

Most of the studies on plant blindness that we reviewed as part of this project identified the lack of meaningful engagement with the environment and of time spent in and with nature as some of the key issues. For this reason, rather than designing a tool for quick and efficient plant identification, we chose to design a toolkit that encouraged slowness and intentionality instead, the centrepiece of which was a kit for making cyanotype impressions from plant samples collected during fieldwork.

One of the oldest photographic techniques adopted by artists and naturalists alike, making a cyanotype involves exposing paper that is treated with a photosensitive chemical solution to the sun. Areas of the paper that are hit by sunlight turn blue, while those that are in the shade remain white. Plant samples placed on photosensitive paper appear as white silhouette on the cyanotype. Exposure times vary greatly, and on cloudy winter days in the North of England (where the team is based) may require up to an hour or so. In addition, in order to clearly display the key features of the plant in the impression it is necessary to observe it closely, understand its structure and arrange it accordingly.

The Biodiversity Logbooks toolkit (Figure 1) includes photosensitive paper to produce cyanotype impressions, a logbook with plant and leaf study sheets to collect and describe the cyanotypes, as well as transparent acrylic to keep the plant samples in place when exposing them to sunlight. As a tool for slow visualisation, it requires time and care spent with samples to produce the cyanotypes, and it supports the development of knowledge of plant features by asking key questions through the plant and leaf study sheets. We expanded the initial logbook design into a set of multidisciplinary activities aimed at yielding perspectives on the scale of an individual plant and wider environment. The activities, which included drawing, mapping, physical computing and picture matching as well as making cyanotypes, were designed to introduce the basic knowledge of plant structures and key vocabulary needed for observing and describing plants, ahead of venturing out in the field. In this paper we reflect on a subset of the activities and their relevance to design for noticing.

Figure 1 The Biodiversity Logbook toolkit

In the autumn of 2020, design researchers working on the Biodiversity Logbooks project were joined by the Headteacher at Ryelands primary school in Lancaster (UK) to discuss and refine the programme, with particular attention to progression of activities. Together, and in collaboration with the team of teachers at the school, we delivered activities to two Year 3 classes involving 44 children aged 7 and 8 years-old.

Because of the restrictions on indoor contact and access to school that were imposed during the covid-19 pandemic, all of the activities except for the fieldtrip were designed for remote delivery to students in their classrooms.

Figure 2 The two locations of the fieldtrip: the park (A) and the roadside area (B)

Preliminary activities included learning to look for key plant features and learning the scientific vocabulary to describe common leaf arrangement patterns and leaf structures. We did this through an activity in which students were asked to match botanical illustrations of various plants to the corresponding categories of leaf arrangement and structure. The teachers devised hand gestures to reinforce leaf arrangement patterns. Picture matching was repeated to identify plant family characteristics.

We explained the importance of being able to notice these features (as well as fruits and flowers when present) in order to connect individual plants to the families to which they belong. This allowed us to discuss how individual organisms are part of systems that are characterised by interactions at different scales, and how plants that look very different from each other might share key characteristics and benefit from similar habitats.

The knowledge built through the remote workshops proved valuable when out in the field. During the fieldtrip we visited two areas: a section of a large park and an unmanaged plot wedged between a busy road and railway tracks (Figure 2). The two areas represented two very different environments for plant life. The open ground of the park allowed for plenty of sunlight, but also strong winds and the regular presence of humans and dogs. Tall, woody plants and grasses thriving in exposed areas were prevalent here. By contrast, the roadside area was much more protected from winds and shaded by large trees as well as the nearby railway bridge. Smaller, more fragile plants thrived in this area, alongside shrubs, brambles, nettles, and saplings. Students used the notepads in their kit and the digital

compasses that we programmed in one of the introductory lessons to map and describe the two habitats.

During the field exploration students were encouraged to collect plant samples, which were brought back to the school. Here, we sat outside and positioned the samples on photosensitive paper to create the cyanotypes and then waited patiently for the sun to create an impression (Figure 3). With the samples kept securely in place by two acrylic boards clipped together, students used the

Figure 3 Exposing the cyanotypes and studying the plants

plant and leaf study boards in their logbook kits to describe their plants and habitats, using the vocabulary and methods learnt during the remote workshops. At the end of the process the research team collected and washed the cyanotypes, while students returned to their classrooms where they were asked to produce a drawing of the plant they have been studying, in as much detail as possible.

As part of the coding and evaluation part of the research process, we collected these drawings and compared them to the base-line drawings made by students at the outset, to see if we could identify any evidence of improved plant noticing skills (Figure 4).

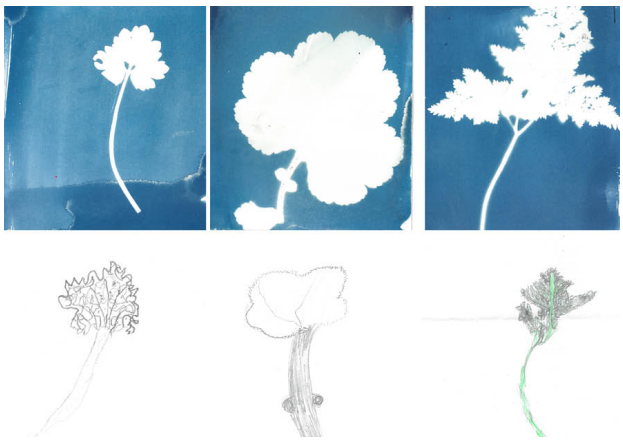

Figure 4 Some of the cyanotypes made by the students and the corresponding drawings

DISCUSSION/REFLECTIONS

These reflections are co-authored by researchers and a headteacher who participated in development and evaluation of this project. It also draws on interview data from four educators involved in delivery of the activities. Although the project comprised multiple activities the reflections will predominantly address cyanotypes, leaf arrangements, drawing and fieldwork in respect of design for noticing and additional insights regarding project delivery and embedding the project into a local, place-based curriculum.

The skill of noticing was recognised by staff to be one of the most important aspects of the project because it is essential for studying nature as well as active, independent learning. Teachers noted that children were using the word ‘notice’ more and were applying it in other parts of the curriculum.

Making cyanotypes proved one of the most popular activities because of the combination of science, beauty, magical sensation and detail. The cyanotypes work with scale in different ways; harnessing different temporalities to encourage careful observation, and directing visual attention toward the precise size of a plant and it outline features, portrayed in silhouette.

Anna Atkins' botanical records collected in the 19th Century illustrate the noticing skills and value inherent in well made cyanotypes. Positioning the sample on the photosensitive paper requires speed and care but observation over an extended period is needed to judge the best moment to fix the exposure. The children loved being able to see detail and used it to reinforce learning about leaf arrangement and structure.

We compared base-line drawings made by children before the activities with those produced after the workshop (see Figure 4). We noticed that some drawings done after the cyanotype activity were less ‘pretty’ but were also less idealised and displayed more detailed representations of plants. The different dimensions of scale involved differentiate this approach from ‘slow design’ (Strauss & Fuad-Luke, 2008).

The illustrations used to teach plant features and families were presented as black and white line drawings at an enlarged scale. Every time they were shown, teachers reinforced the names of plant features using hand shapes to show how a leaf joined a stem. The simplicity helped children to see plant features and details that were hard to see with the naked eye but the fieldwork introduced the nuances and uncertainty of ‘real’ three dimensional plants that don’t necessarily conform to a simplified archetype. The activities were staged to progress from images that isolate the plant from context to ones that situate it in its locale and introduce new learning about aspect, landuse and microclimate. A similar approach was used to start to

introduce the concept of plant families and this has the potential to introduce global connections.

The importance of looking at actual plants was noted by the headteacher who commented that traditional teaching about plants, that relies solely on worksheets, dismisses ambiguity and complexity, and glosses over inconsistencies between the stereotype and the actual plant. It isn't easy to identify plants in the field. It is a skill learnt over time and it is challenging for children to persevere with this unfamiliar and uncelebrated skill. However, research shows that skill, interest and care are interlinked and we saw children's palpable excitement and attention as they began to recognise and name plant features on their fieldtrip. The children were proud of their ability to use technical language that went beyond the requirements of the National Curriculum and teachers reported children teaching their parents.

It is also challenging for teachers to teach in the field if they lack confidence or specialist knowledge. Hence the value of collaborations which introduce these experiences practically, so that teachers learn the detail of the project and gain the confidence to make them their own. Once specialist content feels more familiar staff can bring their own expertise to change the pace of delivery and find ways to embed the activities more comprehensively into the curriculum.

This is an ongoing endeavour. The next steps involve reinforcing current learning and introducing activities that contextualise plant ecology in relation to seasons, climate and human activity. The work to date has shown that design approaches that harness different temporal and physical scales can tune humans into scales at which they can more readily notice more than animal worlds, sewing the seeds for plant care and appreciation. We are now working with Eden Project North which is developing the Morecambe Bay Curriculum, aimed at enriching the UK National Curriculum with a place-based programme of interdisciplinary activities aimed at fostering a stronger connection with the local environment through experiential learning. Our objective is now to work more closely with schools and Eden Project North to design an open, adaptable, long-lasting set of resources based on the original toolkit.

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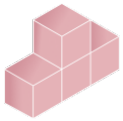
A TALE OF A WISE CITY



A SPECULATION ON ENTANGLEMENTS OF NON-HUMANS AND HUMANS IN AN URBAN SPACE.

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ABSTRACT

This paper proposes methods for imagining a future which includes non-human stakeholders. The particular scenario is built on the concept currently known as Smart City. This exploration proposes a speculative fiction of a future where technologies in a Smart City are serving human and non-human citizens. The final outcome is a fictional documentary that illustrates life in the city from the viewpoint of its human citizens. To develop the concept of the city one of the primary challenges was to coordinate the many different scales, from the entire city structure to the interactions between the individual citizens. To address this, I used rhythm as a method. For the resulting prototype, storytelling was chosen as a medium to allow the concept to be articulated on multiple scales. Both, the rhythm, as a method, as well as storing, as a prototype, are methodologies I will present in this paper. I suggest that these methodologies can be seen as tools for helping to reimagine the future of relationships between humans and non-humans. By using this speculative design approach I suggest that we can better reflect on the relationship with non humans in the future.

INTRODUCTION

Fluid Assemblages as described by (Wiltse and Redström, 2019, p.17-18) are a new form of things that define our world and our everyday life. Under this term, Wiltse and Redström identify connected devices, apps, digital platforms, etc. These 'things', unlike their predecessors, are never singular. They are an accumulation of different components. Hence assembly. This assembly changes depending on who is using it, when, where, how etc. Hence fluidity. Fluid Assemblages hold the potential for solutions, as well as the potential for problems, equally.

One thing that is clear is that Fluid Assemblages, via platforms, via devices, and via large scale IoT systems are already rendering the reality of the future to come. This becomes problematic when we think about whom or what this world of Fluid Assemblages does not include. And what it does not include is almost everything which is not human or directly connected to the human experience. They are—as so many 'things'—a fruit of human exceptionalism and the tale of never ending progress. They are an abstraction of an already abstract human world that managed to ignore its permanent dependency on the interconnected mesh surrounding it. Fluid Assemblages therefore reflect the ignorance of their makers. Making plain the fact that their existence is dependent upon an environment which is unaccounted for in their systems, and that they have become active participants in that environment's ruin.

As the last two decades have taught us, Fluid Assemblages have an extreme influence on the human experience. Social media platforms significantly changed the ways in which we interact with each other, from the personal to the political, it has even influenced how we interact with the world around us. That is why it is crucial to start including non-human actors as a variable and a stakeholder in those systems and offer alternatives to the self-destructive, one-way-track of the modern human experience. The aim of this paper is to offer a perspective of how Fluid Assemblages could serve the interests of non-humans or as Ursula K. Le Guin puts it: "...how to put a pig on the tracks."(Guin, 1989).

BACKGROUND

To understand some alternatives that break away from this rigid, human perspective, we might consider the

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concept of Polyphonic Assemblages as it has been proposed by anthropologist Anna Lowenhaupt Tsing (Tsing, 2015 p. 22). Tsing understands assemblages as "open ended gatherings" of ways of being; human and nonhuman, living and nonliving. For Tsing, assemblages "...don't just gather lifeways; they make them." Meaning that the whole combination of different lifeways of the human and the non-human, in an assembly, has an effect on the lifeways of its many parts. In describing these assemblages as polyphonic, she clarifies this idea. In polyphonic music, independent melodies are played parallel to each other. The various melodies sometimes come together in synchronization only to separate into different rhythms again. Tsing uses this melodic phenomenon to propose a way of existing between humans and nonhumans.

Similarly, environmental and feminist scholar Donna Harway (2016, p.13-14) speaks about the need for entanglement between humans and non-humans in her book Staying with the Trouble. Haraway offers a metaphor that describes the play of string figures. In the game of sting figures, strings are formed in different constellations and are exchanged between the players. "Companion species play string figure games where who is/are to be in/of the world is constituted in intra- and interaction. The partners do not precede the knotting; species of all kinds are consequent upon worldly subject- and object-shaping entanglements." Haraway sees in the game the opportunity for humans and non-humans to render each other capable of doing or becoming that which they could not do or be without each other. She refers to this as the relationship of "response-ability". For Haraway, multispecies world-making is built upon these relationships and the game of string figures.

Both of those concepts share the idea of entanglement, flexibility, independence and intersection between different parties: human and non-human. This paper will hold on to those ideas presented by Tsing and Haraway, in order to start thinking about how technology could exist within those concepts. How it could become an active part in the coming together—or parallel coexistence—between humans and non-humans. Exemplifying how Fluid Assemblages can become a participant, and an enabler, of Polyphonic Assemblages.

A WISE CITY

This project focuses on the case of Fluid Assemblages in a city. The city is an environment where humans and non-humans already co-exist. (Haraway, 2016) describes this when she talks about relations of response-ability between pigeons and humans in an urban context.

Even though urban spaces are not particularly welcoming for non-humans, they often become sanctuaries for many species as the surrounding countryside presents a greater ecological threat than the city area, due to sprawling industrial agriculture and destructive land development practices. For example, in Germany, solitary bees can best survive in cities as almost all the rest of Germany is agricultural land and heavily rendered by pesticides use (iDiv, 2016).

Fluid Assemblages can be found in the IoT systems that rather already exist in some cities or are about to be introduced in many others . The concept of connecting a city through smart systems is widely described as the "Smart City". The project identified this concept for its use of Fluid Assemblages in the life of humans as well as non-humans. If you are a pigeon or a human, you will be affected by the Smart City. In both cases the participants are similarly involuntary. Surrounded by a Fluid Assemblage that is now the place they inhabit. The concept of a Smart City itself, thus remains highly problematic. Adam Greenfield (2017) warns us about the false promise of smart cities in his book Radical Technologies: The Design of Everyday Life. He argues that Smart Cities are simply another example of a short-sighted, technofix. The idea of a Smart City is built on the misconception that data can be used to offer universal solutions and that the data is immune to being submerged in politics. Furthermore, he explains that cities inhabit a diversity of communities with different interests and opinions. What is a gain for one community is often a loss for another (Greenfield, 2017). This becomes even more problematic when non-human communities are involved. And while the aim of the project is to present an alternative narration of what Smart Cities can be, it became important to distance it from the current concept. Therefore, the name "Wise City"—a suggestion by my tutor Heather Wiltse—was chosen to position this project away from a Smart City. A Wise City uses the possibilities of Fluid Assemblages to serve the needs of humans and non-humans and offers a platform for entanglements. The Wise City does not propose to be a solution to the socio-political concerns of different interests, or the problems of misuse of data, etc. The Wise City is doomed to be a mess. But according to Haraway and Tsing, it is a mess that we need in order to survive.

METHOD

So how does one conceptualize a Wise City? Tsing´s (2015, p.23-24) concept of Polyphonic Assemblages gave a basis for answering this question. It set the tonality of the piece to be written. Next, the rhythm has to be considered. Tsing (2015, p.24) describes the activities of humans and non-human as rhythms. As an example, she offers the farming techniques she observed in Borneo. Different plants "Rice, banana, taro…" were farmed together in the same field even though they had different rhythms of maturation and intersected differently with the human rhythm of harvesting. "The polyphonic assemblage is the gathering of these

rhythms, as they result from world making projects, human and not human." (Tsing, 2015).

Based on Tsing's experience, I started to think about the different rhythms of humans and non-humans around me. About how trees lost their leaves and about how flocks of wild geese were flying in formation to a warmer place, about mushrooms popping up for a couple of weeks and then disappearing again, and so on. Undoubtedly, the rhythms of humans are very different, and as described by Tsing: polyphonic. In polyphonic music—where Tsing borrows the term from—while melodies have different rhythms, they all are defined by the time signature of the piece. Most songs, especially contemporary western music, are written in 4/4 time. Similarly, one can say that if we pick out a fixed location—in my case a particular city—that the different rhythms of humans and non-humans are underlaid by the signature time of the day and night, as well as the timing of the seasons of the year. The signature time is universal no matter if for a bird or for a human. Based on this thinking I developed the Rhythm Board.

The Rhythm board is simply a circle of white acrylic and two rings of laser cut MDF. One ring represents the 12 months of the year, the other represents the 24 hours of the day. The rings can be turned, and different times of the day or month of the year can be selected. This selection offers a frame and provides an opportunity to find convergences or divergences, resonance or dissonances. Using the Rhythm Board, I hosted a co-creation workshop to write the melodies i.e. the different stories, needs and possibilities of the different non-human and human actors. The rhythm board can be used for different scales, in this project I used it at the scale of the city but it can be used at smaller scales as well. For example, at the scale of a park, a house, a pond, a room, a pasture, a stone, etc.

During the workshop participants got to represent different human or non-human actors and try to find ways to build the city together based on the different needs they had during the course of a "year". This idea of representation for non-humans in political discussion, is informed by Bruno Latour's concept "The Parliament of Things" (Latour, 1993). Equally important was the work of (Weisser and Hauck, 2017) on the method of Animal Aided Design. This method looks into the needs of a species (e.g. a sparrow) over the course of the year. I also used some of the "species profiles" developed by Weisser and Hauck as a source for developing the information cards I shared with the participants.

Figure 1: The Rhythm board

THE RHYTHM BOARD WORKSHOP

I hosted the The Rhythm board Workshop with five players (participants). Each one got a human or a non-human character to play. In this workshop the characters were: the Bohemian Waxwing (Bombycilla garrulus), two human citizens, a Red Admiral Butterfly (Vanessa atalanta) and the larger family of lichen. Each player got an information card for their character detailing their character and their needs during the different months of the year, and times of the day. The workshop was held in four parts (Fall, Winter, Summer and Spring) with a discussion and ideation session between each season away from the board. In each part, participants first were asked to come up with ideas for what their character would like to see in the prospective city. Afterwards a discussion/making session took place where participants would draw or build their proposals on the whiteboard. Following that, the participant would move away from the Rhythm board and reflect on the making session outside of their character.

As a result of the workshop, a lot of different ideas were generated of what the Wise City could look like. For example, sensors that track the coming and going of species were proposed. Other ideas were to have structures that appear for nesting when needed and are hidden for the rest of the year, special traffic lights secure species movement of certain species as well as sensors to monitor population size (for example if a decline in lichen population is registered the city would introduce air safety measures) It was also extremely helpful to discuss the lifeways (melodies) of the chosen characters with others. However a lot of the ideas introduced the implied parallel existence rather than entanglement. The human characters also expressed frustration with the changes of the city we built on the white board. In general, there was more collaboration between the non-human players. For example the lichen, the waxwing and the admiral teamed up to build a park where they all could profit from, taking away valuable space for human housing. While the human

players merely tolerated the decisions but could not see how those could profit them. A connection between humans and nonhumans was missing. As a result of the workshop, it was clear that something had to be the glue between the rhythms of non-humans and humans. Something that would lead to more acceptance in the human population.

LEGEND AS INTERFACE

Here I will argue that legends can be understood as an interface between humans and non-humans. However I want to distance myself from the term "interface", as it might be limited by what one's cultural understanding of what an interface can be. Alternatively, to stay true to the metaphor of music, I will use the word "instrument" in place of "interface". A musical instrument is what allows melodies and rhythms to play together and to hear each other. It amplifies the rhythms of non-humans which have become hard for us to hear.

During the workshop, ideas of how the city itself could be an instrument emerged. For example, the city could change the color of the streetlights to communicate that Waxwings have come back. Or surfaces could appear and disappear making it easier for the admiral butterfly to mate, while at the same time communicating to the humans the timing of the other species. However, this still left the humans passive and did not entangle these species rhythm with human life.

How could rhythms of non-humans become entangled with the human experience instead of remaining marginalized? (Frankjaer, 2019) describes how her life became aware and adjusted to the rhythm of a plant (Calathea). She realised that the Calathea she was working with for an art installation would not be active before 11am. Thus, Kranjaer had to adjust her working hours to the active hours of her plant participant. Of course, not everyone has the motivation of a PhD thesis to go into such a relationship with the rhythm of the plant. However, I found other examples of approximation of rhythms on a much larger scale.

A classmate who is originally from Deli, India told me about Shravan, a month in the Hindu calendar during which fishing is prohibited. The reason for this is that fish are reproducing during this month. The prohibition gives the fish a window to reproduce, without the interference of humans. This tradition offers a way for humans to "listen" to the rhythm of the fish and adjust their rhythm to it. I therefore see it as an instrument which enables this synchronization of rhythms to happen.

Another example was introduced to me during a lecture on the subject of birds in Sami Mythology, given by Elina Nygard. Nygard is a Sami artist who collected bird mythologies and illustrated them. Here is one of them:

"When the stormy weather with snow and wind is arriving the grouse will warn you. Then it laughs when the sun goes down. If it only makes a quiet sound there will be only snow and no wind." (Nygard, n.d.)

This myth about the Willow Ptarmigan (Lagopus lagopus) is a great example of the legend becoming an instrument. In this case, it enables humans to literally listen to the rhythm (activity) of the Willow Ptarmigan and draw consequences to the rhythm of their life. In this case a weather forecast.

Furthermore, I want to argue that the instrumentation of Fluid Assemblages today already resembles myths. As a user of Amazon's Alexa we know as little about the actual system the device works with as we know about the complex ecosystem of the Willow Ptarmigan. Here is my take on how a myth of Alexa might be written:

"When the blue eye is open, Alexa will listen to you. If you say her name, she will answer. If you ask her to turn the light on, the light in your house will be turned on".

As interaction designers we have been designing legends all along. My argument is not that it is necessarily a good thing. The fact that only a tiny percentage of humanity knows how Alexa actually works is deeply problematic. What is even more problematic is that an equally tiny percentage of humanity has an understanding of how the ecosystems of their immediate environment work. And no multi-billion-dollar corporation is designing legends for the latter.

THE CONCEPT OF THE WISE CITY

The "Wise City" is an assembly of instruments which enables human citizens to "hear" the rhythms of the non-human citizens and to play together with them. While there are different instruments involved, they function as an assembly where the parts are interconnected. The assembly has two main parts: The city's infrastructure and the Legends.

THE CITY INFRASTRUCTURE

The Wise City communicates the rhythms of non-human communities in different ways. It will, for example, change traffic patterns to serve the rhythm of a migrating community which moves on the ground. In the times when reindeer herds have to cross the city, the architecture will shift accordingly. Structures appear and disappear to serve the needs of a community. For example, nesting opportunities that are needed at certain times during the year, will appear, making the rhythm of non-humans apparent to human citizens. Some are not connected to any specific function but instead are an expression of information during a particular interval of the non-human community's rhythm. For example, city lights will take a certain color for an evening, a

sculpture that was not there before will appear, a sound will be played etc.

LEGENDS

The Legends can be seen as a leading instrument of the Wise City. They are powerful in creating harmonies between the rhythms of the human citizens and the non-human citizens. Legends, here, is used as an umbrella term for all kinds of traditions, festivals, superstitions and rituals that have a connection to the rhythm of the non-human. For example, “Divaki, a festival connected to the arrival of Waxwing in the city. The city light will turn red, Waxwing songs are sung and humans are supposed to put a branch of rowanberries in front of the house of the person they love.

These two main instruments find themselves in a relationship of constant exchange. A Legend's mind evolves as the city’s infrastructure changes, but the city structure can also be influenced by one of the legends. Both the city infrastructure and the legends are sensitive to the rhythms of non-human communities.

STORY AS A PROTOTYPE

The final outcome of the project is a fictional documentary about life in the Wise City. The documentary is largely narrated through interviews with human citizens of the city in the year 2043. The documentary format allowed me to prototype the Wise City, giving the viewer some details to render an idea of the city, but still leaving enough room for discussing ideas and opinions. I see the documentary not as a final result, rather like the Rhythm Board, a tool to engage with others. For example I could imagine showing the documentary at the start of another co-creation workshop (find an other example). The documentary can be found here: https://vimeo.com/487009739

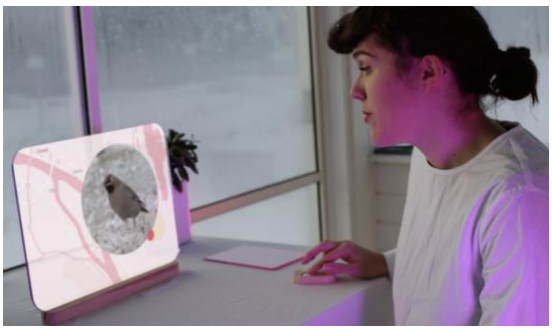

Figure 2: The documentary paints the Wise City from the narrative of the human citizens.

CONCLUSION

In this paper, I have presented the Wise City: project that aims to offer an alternative view on how technology could become an agent of entanglement between non-humans and humans. I explained my process which was heavily influenced by the ideas of Anna Lowenhaupt Tsing and Donna Haraway. Furthermore, I presented the method of the Rhythm Board workshop, a co-creation activity based on the idea of representation of non-humans in a discussion. Generally, I suggest that the idea of rhythms is an important tool for finding entanglements between non human and humans. I am also proposing the idea to acknowledge legends as an interface, and an interface as a legend in order to enable humans to listen to the rhythms of non-humans. Lastly, I presented the design process through “storying”. The final outcome is a fictional documentary, which I see as a tool rather than a final proposal. The documentary can be used to engage others in exchange of ideas and discussion. I hope to use the documentary as a tool to situate collaborations and workshops.

Although I had the best intentions to make this project as non-human-centred as possible, it remains the work of a human, raised on the ideology of human exceptionalism. I acknowledge that my logic and argumentation throughout this paper is therefore still, unavoidably, highly anthropocentric. While I think that the generation of designers that I am a part of will probably never master the art of designing outside of our rigidly-human perspective, I do hope that the tools we are proposing today will serve as a stepping stone for the next generation of designers.

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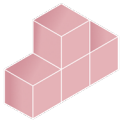

COCOON – CONCEPTUALISATION OF A VIRTUAL MEMBRANE IN THE CURRENT TRANSITION TOWARDS MORE-THAN-HUMAN DESIGN

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ABSTRACT

Through the COVID-19 pandemic, existing socio-technical work phenomena are revealed and magnified. With the help of a design case, this paper discusses where the Human-Centred Design (HCD) paradigm meets boundaries, asking to expand and shift towards More-Than-Human Design. The case at hand presents the metaphor 'Cocoon', furthermore allowing to speculate on the broader concept of 'virtual membrane'. Recontextualising the case from the scales of work-spheres and from user–tool towards human–nonhuman relations, we critique and discuss the socio-technical implications of HCD.

INTRODUCTION

With the development of technology and changing of social attitudes, people's choices towards working modes are becoming more and more diverse. During the pandemic, some people appreciate the flexible working schedules they have in their home offices while some others show signs of depression due to problems such as creativity stiffness, poor collaboration, feeling disconnected from colleagues, and information overload when working at home without face-to-face interaction (Clickshare, 2020). In fact, some of these problems already exist in our on-site workplaces but have often been ignored. Working from home now reveals and magnifies their impact on individual workers.

As an example, within open office spaces, putting on earphones could be seen as an unwritten consensus to create a shell, a sphere to focus and avoid distractions. Moving from the on-site office into a remote work environment, increasingly connected, new solutions need to be found. Therefore, it becomes more and more important to create a remote workplace culture which can empower employees to work agilely to bring the best of themselves into work practices depending on different circumstances.

Compared with the primary working tools of pen and paper in the last century, most of today's work almost cannot leave the screen, keyboard and mouse − these rigid interfaces. This implies that we are in a transitional process towards posthuman work practices. We have already entered the early stage of hybrid human-nonhuman in the context of work.

With remote work increasing our intimacy with technology, the risk of it infiltrating our private life gradually emerges. This paper aims to explore how a 'virtual membrane' can help workers dynamically manage boundaries for personal life and work, when remote or hybrid working modes become more common in the near future. It presents the scaling of the design approach to cater for the current technological growth through the perspective of tangible objects, their

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associated interactions and impact at a systemic scale. In the following sections, this paper will present the emerging issues of remote work and the explorative interaction design concept ‘Cocoon’. At the end, human-centred design (HCD) will be reassessed.

BACKGROUND

HCD APPROACH IN WORKPLACE DESIGN

Suchman (1995) mentions that people’s work is not always visible at a distance, and that the creation and use of shared artifacts and the structuring of communicative practices can be a possible design orientation for making work visible. However, with the increasing involvement of technology, like web cameras in the home office, Hodder (2020) expresses concerns about the surveillance of private spaces and the blurring of the line between personal life and work.

As for the consideration of wellbeing, Sachs (1995) argues for the importance of reconstructing the work environment by an *activity-based* view which emphasises using a HCD approach to redesigning for work and seeing work as learning activities to support individual development.

DESIGN METAPHORS AND TANGIBLE INTERFACES

Considering this emerging need to design for better remote work practices and enabling the capabilities of individual workers, the following works within interaction design offer perspectives on the creation of meaningful actions in complex socio-technical relations.

Dealing with questions of how to design for this increased complexity, Strömberg, Pettersson and Ju (2020) explore the use of enactments of metaphors as a tool to create interactive concepts. They state working with metaphors allows for abstract concepts, such as the relation between humans and technological systems, to take on concrete properties. Djajadiningrat et. al. (2004) and Redström (2008) argue for the design of tangible interfaces to establish more meaningful ways of interacting with technology.

As for metaphors describing boundaries between humans and things in the age of technology, ‘tele-cocooning’ is one of the representative terms raised by Kobayashi (2014). It means that the positive association of general trust, including social tolerance and social caution, disappears through the use of telecommunication.

DESIGN CASE ‘COCOON’

In this case we explore the design of a conceptual device to help creative remote workers navigate the increasing demand for a virtual presence. The case starts with a HCD approach to understand the needs of these users. Following this, a tangible interface comes to act as a representation of the concepts of ‘Cocoon’ and ‘virtual membrane’, with the intention to create a protective sphere for creative work and nurturing the capabilities of individual workers.

CREATIVE PROFESSIONALS AND THEIR STORIES

The process starts with a series of seven semi-structured interviews. Since the case focuses on the work practices around remote creative work, the participants are chosen based on their occupation and experience with remote work. They range from senior user experience researchers to junior interaction designers. Additionally, they all have different living situations - living either in single households, with partners, families and /or pets. The interviews all revolve around their individual experience of online communication tools, remote collaboration and how they might see work practices evolve after this experience.

The stories told by the participants indicate that with the current technology used, they have an overwhelming amount of channels and functions at their hands. The computer gets cluttered with sensory input which can cause distraction and stress. It also becomes clear that without the physical presence they have in their on-site workplace, there is an increasing demand to have a constant virtual presence. As a result, many of the interviewees state that their time gets taken up by back-to-back meetings, leaving no room in the schedule for their own work.

One of the interviewees stated to cope with this issue by blocking one day a week in the schedule to do self-contained and focused work (“actual work”) such as prototyping a GUI, or iterating a design solution. Opposed to this, the creatives we interviewed sometimes have to do open, visible and connected work like administrative tasks, sitting through unproductive meetings and simply communicating work. From this insight a distinction is made between ‘self-contained work’ and ‘open work’.

Based on the different living situations of interviewees, we also gathered that the spatial and social conditions at home had a big impact on the ways they worked and organized their daily lives in new ways. One interviewee living with a big family described how the work sphere intruded the private sphere. One example was that communication between them and their mother even got effected. Their mother started to use sign language to tell them lunch was ready if they were in a remote work meeting. Another interviewee, living with their partner, described the problematic situation of being two employees in one household, with only one working desk available. With scarcity of working spaces, other spaces in the house such as the bedroom, become working spaces. When focusing on more creative design work they would close the curtains over the bedroom window and immerse themself in a “darkmode bubble” or “cocoon”.

We can see how these new work practices reflect not only how professional and personal life are blending, but

how physical and virtual work practices are affecting each other as well. These practices of how the professionals manage their work time and space, both physically and virtually, is what pushes the project to further explore how to enable them to dynamically manage personal boundaries for their virtual work presence.

A WEARABLE VIRTUAL COCOON

Working with complex socio-technical relations, the continued process draws inspiration from the work of Strömberg, Pettersson and Ju (2020) on the enactment of metaphors to shape the interactive aspects of the design and the behaviour it aims to support. The encountered practices of closing a curtain and entering a workspace 'Cocoon', is elaborated upon as a means to concretise the act of setting boundaries. Unlike the notions of 'tele-cocooning' which negatively describes the barrier of trust between people caused by mobile technology (Kobayashi, 2014), 'Cocoon' here carries the positive notion of a protective membrane.

Following the argument from Djajadiningrat et. al (2004) and Redström (2008) the decision is made to design a device separate from the current tools of remote work and collaboration, and their screen-based interfaces. The concept takes the form of a wearable device with two main functions: Managing availability within one's online communication system and reaching out by voice user interface (VUI).

Figure 1. Closing the *light curtain*.

Primarily the user can set their availability by sliding a touch interface which gives feedback in the form of a changing light pattern (see Figure 1) i.e. opening or closing their light curtain, scaling their 'Cocoon' inwards or outwards. In this way they control their work mode within the range of 'focused on work' (being unavailable, the curtain is fully closed) to 'on a break' (being available to socialize, the curtain being fully open).

Additionally, the device has a Voice User Interface (VUI), which is activated by tapping on the device before speaking with it to make a call or check the availability of a colleague, out of the consideration of preventing surveillance. The VUI is introduced to the concept as it becomes clear that, as Redström (2008) notes, the capabilities of the tangible interface are restricted to its physical scale. The size of the device cannot offer complex overviews or show specific contacts.

Finally, when receiving a call or message, the device vibrates, and the user has to choose whether to answer or not by doing a sliding motion (opening or closing the light curtain) or tapping and speaking to the device to either accept or deny the call.

THE CONCEPT OF VIRTUAL MEMBRANE

By providing a tangible interface, the device gives a sense of control for the user to manage their time and mode of work. It provides the affordance and incitement to manage personal boundaries that current screen-based tools lack. It also keeps the user connected to their virtual workspace even when away from the computer, as long as it is carried around.

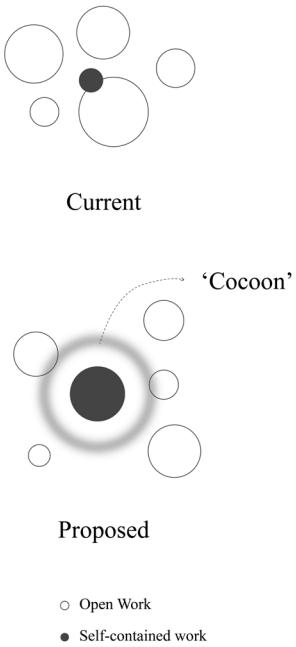

Figure 2. Comparison of current and proposed work relations.

We wish to point to the value of the user's ability to generate their own *virtual membrane* in their online workspaces (see Figure 2). Using posthuman design perspectives, we will now analyse and discuss the implications of the *'virtual membrane'* and its human-nonhuman hybrid relations.

DISCUSSION

Nowadays, there are different levels on which workers can regulate their availability towards colleagues:

- level 1: devices
- level 2: software / applications
- level 3: chat groups / message threads

Many existing devices offer discrete settings, such as loud/ vibration/ muted or on / off. Software or applications might offer availability settings, such as available / busy / do not disturb / offline. In message threads, it is possible to regulate notification settings, separately for each thread.

These discrete states do not allow for continuous regulation. It does not match the experience of moving through physical space, where the auditory experience changes, depending on where in space the worker is. These existing ways of regulating availability do not necessarily take into account how the private sphere and work sphere blend. Current solutions are embedded into work devices, such as the laptop and smartphone, which often in themselves have a more technical, rather than organic appearance and expressive modality, which influences how they integrate into private environments, such as the bedroom.

With a change of perspective, 'Cocoon' could be seen not as a tool, but a boundary, which affords to regulate permeability continuously. This might create an in-between intervention, a hybrid relation in between the individual human and the socio-technical work sphere. As a result, it would override all three previously described levels.

With the given case, 'Cocoon', we find ourselves in the midst of a paradigm shift towards More-Than-Human Design facing posthuman realities. Within the HCD framework, and with a given reality and context, it is possible to cater for the needs of a user, such as wellbeing. The emergence of a posthuman reality changes context and asks for a new framework, even if the needs for wellbeing remain the same. Upon reaching the boundaries of what can be conceived within the frames of HCD, as Giaccardi & Redström (2020) put it, we have to question the validity of it.

Forlano (2017) describes characteristics of posthumanism, which allow us to re-contextualise the case. The transition towards this hybrid, non-binary mode of thinking is not complete. But the typical blurring of clear boundaries between human and nonhuman, already becomes obvious. This process of integrating this self, situated in a work context, into a new human-nonhuman hybrid, is still at the beginning. Yet, in the case, we do not perceive the networked computational thing as a being with equal agency, but as a 'virtual membrane'. Effectively the human remains in the center. However, with the layer of the membrane, there is a potential for entanglements and dependencies.

The concept 'Cocoon' invites us to consider different dimensions of scale. It helps expand and contract one's availability within a virtual or augmented workspace. When perceived from a broader perspective, the outcome is related to the wellbeing of an individual and their abilities to structure work. This small systemic change is intended to impact a larger whole.

FROM BOUNDLESS TO MEMBRANE – SCALING OF SPHERES

We argue for the need to set boundaries. Firstly, new work spheres enter the private sphere, blending together. Secondly, users voice the need of a protected time or sphere to accomplish 'self-contained work'. 'Cocoon' comes as a 'virtual membrane', primarily to create a sphere for 'self-contained work'. Since it functions as a 'curtain', it allows the user to close off completely, effectively shielding from any distractions. However, it also allows for gradual in-between states, like dimming a light source.

In a work context, this might enable a permeable fine tuning. If the curtain is half-open, only the most relevant requests might come through and less relevant notifications might not. With two blending spheres with their own connected computational things (smart home assistants, work phone etc.) – multiple things with affordances and agency come into play. The complexity within the context increases significantly, exceeding the traditional HCD framework.

Whereas some workers might adhere to a good work ethos in the favour of productivity, others might misuse it. In our user research, the example of 'invisible vacation' has emerged. When a manager asked one of the workers we interviewed how much time a task would take to complete, the worker replied two days, despite knowing one was sufficient. This way the worker gained a free vacation day, while pretending to do some 'self-contained work'. The openness for misuse, could also be seen as a human element, facing tendencies towards technocracy or dystopia. With the notion of User-Centered Design, the design space revolves around the ideal of usefulness. With an increasing complexity, designers might have to acknowledge to know less certainly what is useful. If we design for conditions under which the human decides, self-empowered, we can broaden a prescribed area of use, towards making possible. This openness could further contribute to a shift in mindset, from designing for the 'usefulness' of technology, towards design for 'living with' technology. By breaking out of the connotation of usefulness, other objectives, such as wellbeing or creativity, might receive more attention.

Existing solutions to control availability are embedded into multi-purpose devices, such as the work computer and mobile phone, which overall have a high potential to distract. In order to fulfil the need to set boundaries and create an atmosphere free of distractions at any time and in a spontaneous manner, we added a networked computational thing, which is physically separate, yet connected to the existing communication system. This adds cluttering. It also brings an omnipresent interface. It could be interpreted as an oxymoron, since the sheer presence of the interface itself, worn as a wristband, carries an innate potential to distract. That provokes the thought: In which cases would technology be counterproductive? When would posthuman phenomena, such as networked computational things, turn against HCD objectives? When does creating a shell become a solution, facing omnipresent technology and in which cases is it required to abandon technology altogether?

From HCD perspective, the distinct human as a discrete individual has full agency, while a tool has none, and hence stands by and remains inactive if not needed. Giaccardi & Redström (2020) ask us to include networked computational things with machine agency, which makes them participants. Originally Gibson (1979) has put emphasis on affordance as a relational concept. That might give us a starting point, for how the capabilities of a human-nonhuman hybrid expand, compared to the prevailing separate entities of human and tool. Whereas in HCD the relation of the user goes towards the tool and ends there, in More-Than-Human Design, the human experience through the nonhuman, goes beyond this relation, connecting to a wider network.

Seeing affordance as the original relational concept, we can focus on the relationship between human and nonhuman, but also the horizontal and vertical connections the networked computational thing might engage in. While we have always been working with nonhumans, the membrane surrounding us is affecting our perception. Other than ease of use, as many smart home devices promise, this enables us to have more intimate and pervasive relations with and through this nonhuman.

In the past there have been different notions and metaphors for describing the relationship and outcome when the human and computational things come together as one or become equal. There has been the cyborg (Haraway, 1991), the composite (Vallgårda & Redström, 2007), actor-network theory (Latour, 2005) and object-oriented ontology (Graham, 2015). Whereas all these concepts have contributed to a new understanding, none have excelled at conveying a human connotation. They all sound rather technical. ‘Cocoon’ as a term refers to nature, even the wonders of metamorphosis. It carries the notion of an organic, protective sphere which fits like a second skin, expands and contracts. More than a semantic appropriation, it should give the human an atmosphere where they feel safe and sound, protected from external influences.

CONCLUSION

The ‘Cocoon’ concept contributes to a possible direction of future workplace design. We hope that the more universal idea of a ‘virtual membrane’ might provide some new perspectives when working with issues of blurring boundaries and hybrid human-nonhuman relationships as we move towards More-Than-Human Design practices.

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NORDES 2021

Paper Session 2

(Un)sustainability (1)

Session Chair | Maria Göransdotter

Multiple Lives of the Products: An Investigation of Products' Journey in Freecycle Community
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(Un)Weaving (Un)Sustainability
Sheida Amiri Rigi and Despina Christoforidou (F)

MULTIPLE LIVES OF THE PRODUCTS: AN INVESTIGATION OF PRODUCTS' JOURNEY IN FREECYCLE COMMUNITY

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ABSTRACT

In today's needs, it is not enough to imagine products who have only one owner in their entire lives. To create more sustainable futures, designers might increase their ability to imagine multiple lives for things. To enable it, scale is the matter of concern. By increasing the usage scale, and examining the exchange of second-hand products informs designers by imagining multiple scenarios related to things lifes.

In this paper we focus on local freecycle groups on Facebook in the context of the second-hand product's circulation. In the field research, we identify significant usage cases of second-hand products that have multiple owners. We classify them under four sections, which are student house, permanent house, families with a baby, and re-purposers according to their concerns, criteria and behaviors related to handed-over products. Finally, we present insights about users' expectations and concerns that has decisive role in determining the life cycle of the product. We propose thinking for larger usage scales through examples that we provide, guide designers and companies in terms of products' journeys in circulation.

INTRODUCTION

Since exchanging things through internet-mediated settings become popular, things could have multiple owners and life cycles that designers and companies might not foresee. Observing exchanged products' life can enlighten design processes to broaden and scale up the product usage scenarios. In order to enable scaling up the user and usage context, we focus on exchanging goods on Facebook freecycle groups. Although there are many studies about online social interactions in the freecycle community, there is limited knowledge about the product - user relations in this context (Rufas & Hine, 2018) and how the user adapts such products in her/his daily routine. Since freecycling is the circulation of products without any fee, the consumption dynamics in these groups are different from mainstream trade. For instance, the value of objects and attributed meanings to them changes in the freecycle object exchange setting; undesired objects become desired ones. Moreover, products in freecycles might have a different journey by repairing and reconsidering (Eden, 2017). Accordingly, investigating the exchanged things and their usage might invite us to think about extending the usage scales of the things through design. Besides, exchange practices in the freecycle community not only shed light on real-life user interaction stories between users and second-hand products it also extends the life cycle of the products by enabling multiple lives. Even though circular design provides strategies in extending the lifespan of the products, investigating the further possibilities for scaling up the usage scenarios of the products can facilitate the evaluation of product lives. Furthermore, freecycle creates an opportunity for local and alternative exchange models that reflects current consumption practices. This study investigates how users experience products that cycle in the freecycle community by considering all these various aspects.

LITERATURE REVIEW

According to Manzini (2013), focusing on social innovation is crucial to answering the challenging

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financial difficulties in the direction of sustainability. Furthermore, he says that social innovation can create novel approaches for ever-changing societies. He explains two types of social innovation models; top-down (driven by decision-makers) and bottom-up (driven by communities). These models might be applicable for many different cases. For example, consumers might take initiative and create or participate in alternative systems and that can evolve to bottom-up innovation. In this regard, we will explain alternative economies. Then we will look at circular design to express how these alternative systems, more specifically freecycles, can be supported by a design approach.

FREECYCLE AS AN ALTERNATIVE ECONOMIES

Transfer of goods and services can occur in different forms; it can be based on monetary value and exchange of goods in the market, or it can be in the form of alternative consumption practices like in the case of freecycling. According to Foden (2012), alternative consumption means activities of obtaining, using, transferring, or discarding goods in a way that it stays out of the mainstream economy. Alternative economies include collaborative consumption, sharing economy and the gift economy. Freecycle, exchanging second-hand goods among community members, can be classified as a gift economy.

Freecycle refers to the object circulation without reward and free from economic means. The freecycle website declares the official mission of their foundation as "to build a worldwide gifting movement that reduces waste, saves precious resources, and eases the burden on our landfills " (Freecycle, 2013). It is a type of collaborative activity that has intentions such as preventing consumption, extending the life cycle of the product and decreasing waste.

In 2003, the Freecycle website was founded to recycle reusable goods in Arizona (Aptekar, 2016). Online platforms expand the boundaries of the local communities (Fortuna & Diyamandoglu, 2017) as reaching a wide range of people. Freecycle networks also use the benefits of internet based communication while scaling up the movement on a global level. In time, the idea spread to all around the world. In Turkey, freecycle platforms were multiplied in the form of Facebook freecycle groups.

When we look at the people's freecycle experience, it is found that people who give or acquire second-hand products through alternative platforms like freecycle have some concerns and expectations like hygiene, safety, affordability and convenience (Cherry & Pidgeon, 2018). Sharing and receiving second-hand personal products like clothes, luggage or kitchen equipment for preparing food can be questionable in terms of hygiene while circulation of second-hand tools and equipment can be problematic in terms of safety issues (Cherry & Pidgeon, 2018). Besides receiving goods without paying money, acquiring second-hand products might bring sustainable benefits such as extending products life which is vital in terms of decreasing waste and environmental burden. However, some risks and problems need further solutions.

CIRCULAR DESIGN

Studies in sustainability have underlined the importance of designing the extended life cycle of the product. Products' usage time can be lengthened through promoting second-hand consumption, repair and reuse of products (Cox, Griffith, Giorgi & King, 2013). In relation with the life cycle extension of the product, the circular design aims to consider the flow of materials in a circular system instead of a linear system in order to decrease waste and protect resources. Stahel (1994) suggested some significant strategies in the circular economy field as (1) extension of the functional period of products through various activities like reusing repairing and upgrading in order to decelerate the flow of materials from producing phase to disposal phase, (2) closing resource loops between production and disposal through recycling materials.

Apart from that, the circular economy framework suggests an order of maintenance, repair, reuse first, and remanufacture and recycle later, rather than direct recycling of an object (Ellen MacArthur Foundation, 2012). Some researchers offer different strategies and tools to promote a circular economy in a product design context. For example, Van den Berg and Bakker (2015) suggest a guideline that consists of five main topics: future proof, disassembly, maintenance, remake and recycling. Stahel (2010) states that the design needs to have a modular system in order to disassemble its components and reused in other products. Wastling, Charnley and Moreno (2018) highlight that contemporary discussions on the circular economy have focused on mostly the producer-led solutions but the role of user behaviors should not be neglected while designing.

Furthermore, according to Chapman (2005), the emotional bond between the user and product increases the product's usage time and makes the product emotionally durable and sustainable. In line with this argument, Walker (2011) points out that personal meaning is also needed for the long life duration of the products. Designing the product that allows personalization and increases emotional durability is a way to create long-lasting and meaningful usage scenarios (Chapman, 2005; Cooper, 2000; Fuad-Luke, 2010). As Eden (2017, p.269) explains that an object "commodified (for purchase), then 'decommodified' (through use and personalization) and sometimes may be 'recommodified' or 'recontextualised' (for resale) "during its life cycle and products evolve till the end-user. In the

freecycle, emotional bonds between product and users and products are recreated by repairing, transforming, or hacking. Through freecycle, the process of getting rid of used goods eventually turns to a productive activity through "repackaging, redesigning and handing-over to new users" (Eden, 2017, p.269). Therefore, understanding the backgrounds of acquisition and disposal behavior provides beneficial inputs for extending the lifetime of the products. In this regard, the concepts like the extension of the life cycle and circular economy can be valuable sources for extending usage scales for designing multiple lives of the things.

METHODOLOGY

We carried out field research in order to investigate the interaction between user and second-hand products in freecycle. We seek answers for (1) what are the significant usage cases of second-hand products, (2) how the life cycle of products can be extended for second-hand usage through design strategies and (3) how can we inspire designers to scale up their designs for multiple lifecycles and owners.

In order to answer these questions, we conducted the study with 10 participants who are members of different online freecycle platforms. We focused on the most popular Facebook freecycle groups in two cities in Turkey, Ankara and Eskişehir. For the recruitment of the participants, we used our connections and snowballing methods. We sent messages to reach group members on Facebook. Three men and seven women participated in our study. Their age range was from 23 to 38 and half of them were under the 30s. We used a purposeful sampling method in our research. We grouped the participants under three categories which are students who live with other student flatmates, adults who live as couples and families with children.

We used semi-structured interviews through face to face meetings which approximately took one hour. We asked questions about how they give and receive products via freecycle platforms, what type of products they exchanged and why, their concerns and criteria to exchange second-hand products, and how they interact with exchanged products. Besides, we created a template for a graphic that is inspired by the UX curve method (Kujala, Roto,Väänänen-Vainio-Mattila, Karapanos & Sinnelä, 2011) and photos of the exchanged products which they sent us before our meeting. At the end of the interview, we displayed the template and, we introduced the graphics and explained what we expect them to do. In the graphic, we requested participants to draw a line as highlighting critical points from the time they see the product to the end of the use time. The graphics and photos were beneficial for stimulating participants to talk about the exchanged products and remind them related stories. Also, we used the graphic to identify the typical freecycle process (Figure 1), generic problems and intervention points.

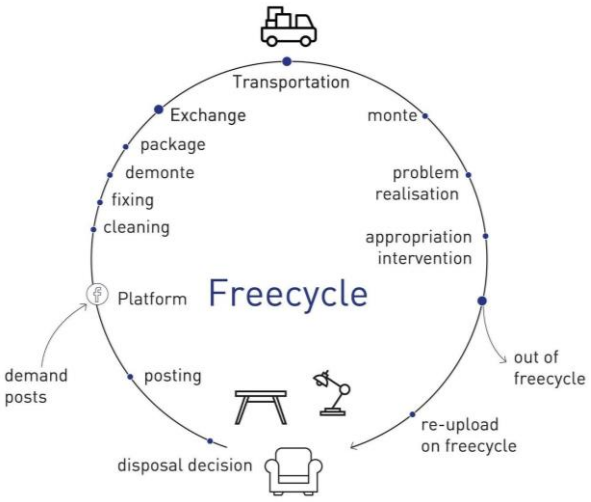

Figure 1: Typical freecycle process

DISCUSSION

According to the field research, we identify users' motivations, criteria, strategies and problems during the freecycle process both related to the online freecycle platform and the second-hand product itself. We generated the typical process of freecycling as specifying significant points in order to identify possible design interventions and suggestions. For second-hand products, four different usage cases are identified, which are student house, permanent house, families with the baby and repurposers. Although the users have common criteria for exchanging second-hand products, we see that criteria are dependent on the usage cases. Firstly, we discuss which criteria are more significant for each usage case. Secondly, we elaborate on our findings and discuss related literature. Finally, we offer some design suggestions.

STUDENT HOUSE

In our findings, the nature of student houses identified as living with other student flatmates, frequent flatmate change, temporary housing and low income. Student houses have a high circulation rate both for residents and furniture because the furniture of the house is changing when a flatmate moves in or out. In this context, the most frequently exchanged products are beds. P3 stated that students consider the house as a temporary place and it affects their product and furniture decisions. They do not want to buy brand new products for a house in which they live for a short time. Therefore, they prefer to get second-hand products through online freecycle platforms.

One of the characteristics of student houses is having a low income. Although transportation is an essential concern for all users, students are more sensitive about it because they want to avoid transportation expenses. Two

of our participants stated that in short distances, they carried second hand products on their shoulders with the help of their friends or by trolley even for big size products like beds and wardrobes. We identify that students prefer to get second hand products in short distance and this is an important criteria of selecting products on the freecycle platform. Therefore, products that are used in student houses need to be easy to carry, light-weighted, easy to assemble and have carrying apparatus like handles.

Students want to receive products for their basic needs. They agreed to receive products from the freecycle even if that product has some problems and is damaged. They prefer to use defective products with minor repairs instead of discarding them. As an example, P3 keeps using the bed taken freecycle even though it threatens his health and he consoles himself compared with sleeping on the floor. He emphasizes that his basic need is to have something to sleep on. Similarly, P9 has a lamp that can not stand by itself because of the broken structure. She tried to find a temporary solution such as attaching a lamp to some surfaces like a corner of the table or stacking between bookshelves and heater (Figure 2). Moreover, students appropriate second-hand products and change the usage context according to their preferences, as in the example of using an extra-base of the bed as a storage space for personal belongings (Figure 3).

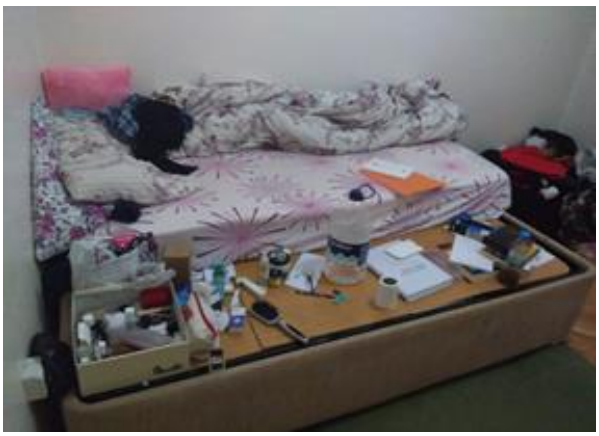

Figure 2: Broken lamp

Figure 3: Bed used as a storage space

Students prefer quick and easy repair and develop their ways to fix products like in the example of attaching a table lamp to different surfaces and putting an extra layer between the mattress of the bed and base. However, they do not change the cover of the couch by themselves because it requires specific skills. We conclude that difficulty, laziness, lack of motivation and time are the reasons for limited repair and appropriation of products in the student houses. As in the Van den Berg and Bakker's (2015) circular design guideline, disassembly and maintenance are significant for designing products for student houses; the components need to be removed, cleaned and changed for easy repair and longer usage time. Therefore, if products are open to user intervention and designed for easy repair, the exchanged products in student houses can have longer usage time and students can be encouraged to repair and appropriate them.

PERMANENT HOUSE

Participants in this group mostly have jobs and better income compared to students. They are generally living individually or with their partners. They have permanent accommodations. Those participants generally use freecycle as a product disposal platform. They are willing to sacrifice their unused products such as furniture, ovens, washing machines, televisions. While they share a wide range and amount of product, they receive fewer products.

Since unused objects occupy a place at home, they prefer to discard them rather than storing them. P8 gave an example that since he uses Netflix, he wanted to discard his movie archive to gain free space. Also, easy disposal processes and convenience are prior for them. P9 stated that she writes on the platform and someone comes and takes unused products away. Therefore, she accomplishes the discarding process without spending any effort.

Most of them have spare products in place of the given object. Although their product is still working, financial power stimulates to buy the newer version. P8 remarked that he had an oven but he wanted to upgrade it. Then he bought a new oven and gave away the old one. Another disposal reason is an unwillingness to spend money or effort on repairing the old one. Even for small problems such as broken buttons, they tend to buy a new product. Also, lack of repair knowledge results in the disposal. The designer should take into account the design easy repair process without expertise.

Furthermore, they are worried about the social acceptance of having second-hand products from online freecycle platforms. They are hesitating to comment under the post in case of the possibility of being seen by their bosses, friends or acquaintances. Social pressure limits their freecycle behaviours and causes status concerns.

In conclusion, adults in permanent houses have better living conditions and income. Therefore, they prefer to buy a new product instead of repairing and care for the aesthetics of objects compatibility to the home setting, as well as security concerns of electronics. Performance upgrade opportunities for the existing product might be developed instead of designing a new one. Designers should consider the compatibility of products and design adaptable features for different home settings. If an expert checks the second-hand electronics and states that it is safe to use it, second-hand usage might increase, and disposal of durable second-hand electronics can be prevented.

FAMILIES WITH A BABY

According to our participants, having a baby changes couples' lifestyles and the home setting is affected by this change. P7 illustrated that as saying" after having a child, everything goes upside down; study rooms become baby rooms." With the baby, parents re-decorate the house; some of the products need to be discarded for safety and space concerns and new ones are bought. For example, P7 stated that they discarded a coffee table because it has sharp edges that are dangerous for the baby. Also, she said that they would give away the couch in the children's room soon because they are planning to place a desk and a toy closet in that space. Therefore, having a baby at home brings the circulation of products in so many ways.

Baby products are expensive and have a short usage time because of babies' growthiness. Parents are willing to have second-hand products through online freecycle platforms or second-hand product selling applications like Letgo. Baby products such as clothes, strollers, cradles, carriages, shoes and toys can be used only for a couple of months. For example, P10 said that she is giving away some clothes which are too small even though the baby has not worn them yet. A couple of babies are growing with the same clothes which are circulated by freecycle or exchanges between friends or relatives.

One of the parents' concerns while exchanging second-hand products is hygiene. However, a small stain on the products is not a big problem for them as long as they are washed and ironed before the usage. The materials of baby products need to be chosen, considering the easy cleaning and health of the baby to provide hygiene and health.

Another concern is safety; P7 has a lousy experience when her baby fell from its bed. Having proper protection bars and not being so high from the floor is significant criteria. Adjustable railing for baby beds might be useful for changing the height of the railing according to the baby. Also, parents usually use exterior safety equipment in the house for sharp edges and dangerous pulling and pushing activities of babies. Designers might take into account the compatibility of safety equipment and furniture to prolong the life cycle of the product at the same time.

As explained, on the one side users are exploring their own ways to give away and receive second-hand baby products via freecycle groups and online shopping platforms. On the other side, some companies in the baby products sector attempt to run their business based on leasing systems rather than selling. Petersen and Riisberg (2017) discuss the example of a baby and toddler products leasing company in Denmark named VIGGA which position its service as an intelligent and practical option for the family and a better and sustainable way of consumption compared to traditional forms. Petersen and Riisberg (2017) explain that the company set its business model based on that products could be circulated between five and eight times among the subscribers and there is a special effort for hygiene and material and aesthetic longevity of the baby clothes.

REPURPOSERS

Some of the users of the online freecycle platform collect unwanted materials to produce something new mostly for personal art projects or creative works. We gather the examples of unwanted materials mentioned in the interviews as empty glass bottles, toilet paper rolls, plastic bottle lids, shoe boxes, pieces of MDF and ripped jeans. Users of the platform consider the freecycle platform as a source for material for their creative projects. Usually, they can not buy these products from a store because they are categorized as waste and people throw them away. Generally, they need a high amount of materials for the projects and they can not save them one by one for themselves because it would take so much time. However, they can find people on the platform who collect them.

Users with creative projects may use the unwanted materials for different purposes. For example, one participant uses glass bottles for paint on them and uses it as a decorative product (Figure 4) while another participant gets a piece of MDF to make a decorative board as putting different stickers on it (Figure 4).

Figure 4: Decorated MDF, bottle and broken table

As we can see from the examples, people might use unwanted materials for creative purposes and produce something new. They can have a personal art project for

their home decoration or for DIY projects as well as they might use them for collective works like doing creative projects with kids in the kindergarten.

Most of the participants state that only usable products should be shared on the freecycle. On the contrary, we discover that unusable objects are desirable for specific usage cases. People can share a broken object for redesign, repair or at least use as a spare part. They emphasize they cannot predict what is useful for people and point that even broken objects might be useful for someone else. For example, P4 stated that they found a broken table near garbage on the street, which did not look usable and repairable. They took the broken table and after repairing it, they used it as a decoration place (Figure 4).

P9 states that, having a broken object might be a stimulant. It might turn to a project and increase creativity and productivity. Also, P8 stated that interior design students need a broken chair to redesign and repair the scope of their lectures. In this case, the broken object becomes a desirable object as P8 states. After all, in freecycle platforms, participants collect the unwanted materials to use for personal art projects and creative works or reuse broken products to produce something else.

We stated that doing a minor intervention is the biggest driver for prolonged usage of a second hand. It helps to personalize the product, therefore creates an emotional bond between the object and user. Users need to be encouraged to make changes in the product without spending a lot of money and effort. As Agguirre (2010) stated, designers can not predict how the user transforms the product but they can suggest how it might repurpose by using labels or tags on the new products. In addition to that, materials can be chosen to be processed at home easily. Also, furniture might be designed as a DIY project and primary parts of the furniture can be sold separately to create intervention possibilities.

In the literature, we discussed extending the life cycle of the product and the circular economy. For example, one of the Stahel's (1994) strategies is extending the usage time through reusing, repairing and upgrading the products. Thus designers can make it easier to perform repurposing activities and encourage others to reuse, repair or upgrade the products which are flowing between different users.

CONCLUSION

In this research, we try to understand product' journey in the freecycle community. In the finding section, we stated four types of user cases: students who have temporary housing, adults in the context of permanent housing, families with babies and reusers who use objects for creative projects. While analyzing the findings in the discussion section, we proposed design recommendations that lead designers to think of the usage scales in terms of circularity. This thinking process might trigger the designers to provide creative solutions by rethinking their products capacity to have multiple lives. Designers, researchers and companies who are interested in circularity might consider the following implications of the study:

- Users: The users can be encouraged to improve and appropriate ready-made products according to their needs. Because second-hand products are more open to intervention compared to brand new products, a system based on the circulation of objects can empower users to have active and creative roles.
- Designers: We think that the designer has a significant role in the circular economy and life cycles of the product. If designers consider that the products are handed over, exchanged and shared between different types of users, they can make design decisions according to those various usage scenarios like second-hand usage. Designers might apply this strategy for extension of the life cycle.
- Companies: Since users are willing to own second-hand objects, new consumption practices that offer circulation of objects can be adopted quickly. Leasing the product can be a new business model based on sustainability. For example, families with babies and students appreciate temporal usage. Therefore rental companies may consider focusing on leasing baby equipment and furniture.

We would like to declare that even though we have limited participants, we could reach valuable insights related to the products' journey. We believe that this research can contribute to the work of designers and researchers who focus on circular economy and long lasting products and the companies that provide multiple ownership in regard to expectations of different users. For further studies, researchers might focus on one of the usage cases for a deeper understanding of each case. Especially, baby products in circulation might be a fruitful research area.

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(UN)WEAVING (UN)SUSTAINABILITY

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ABSTRACT

The spatio-temporal scale of design for sustainability has come full circle. What started within a technology-oriented global outlook, later evolving into a people-oriented and local view on change, now urges for a holistic, broad extent and multilevel design for sustainability. This paper enquires into the theories of social change that govern different approaches within the field, and positions the adhesion of socio-technical system innovation and transition design to classical modern theory, against an emergent design paradigm anchored in practice theory. By drawing on the literature of the field and comparing various models, a conceptual framework is suggested where "practice" serves as an alternative scale. In broadening the scope of analysis in design, this frame of thought can solve the inherent incompatibility of geographical, jurisdictional and institutional hierarchies as vessels to conceptualize the complex and dynamic processes through which social change is (can be) brought about.

INTRODUCTION

Today, sustainability is an inescapable issue. This, while relieving the researchers from the previously draining task of debating the reality of our deteriorating environment, is a constant reminder of the rapidly closing window for us to change and the sheer magnitude of the inevitable catastrophe should we fail to do so.

The extensive reach and profound depth of the current social, ecological and economic crisis, has made transformation to anything resembling sustainable ways of life immensely difficult, casting a long shadow over our alleged ability as a species not only to organize in but also to understand scale. Having gone through the modernist unyielding, linear expansion, and the relatively inconsequential counter movement of localism, the growing awareness of the potential consequences of going small (Sennett, 2012, pp. 3-4) in a world increasingly fragmented by conflict, and the inescapable entanglement of sustainability issues across space and time, has brought us full circle – to the almost "ritualistic" (Shove, 2010, p. 1276) reference to the need for a holistic approach in sustainability literature, of which design does not stand exempt.

TRACING THE SCALE OF DESIGN FOR SUSTAINABILITY

Since its inception, design for sustainability (DfS) has undergone quite an evolution of scale. Gibson and colleagues (2000, p. 218) define scale as the "spatial, temporal, quantitative, or analytical dimensions used to measure and study any phenomenon" (see Figure 1). In close relation to scale are the notions of extent and level; where the former indicates the size of the dimensions in question, the latter points to units of analysis located at similar positions along the scale

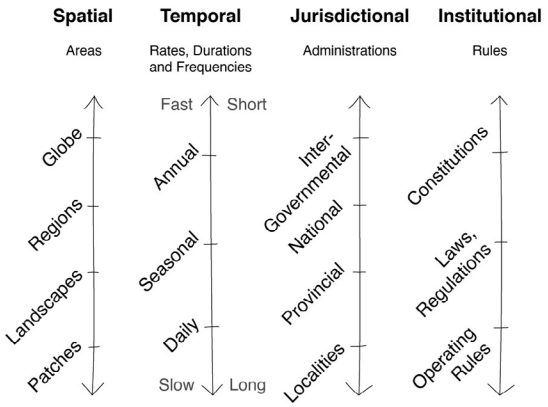

Figure 1: Selected scales often drawn on in sustainability literature (adapted from Cash et al., 2006).

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Building on the analysis of Joore and Brezet (2015) and Ceschin and Gaziulusoy (2016), this section illustrates a general overview of the spatio-temporal scale of DfS during its brief history, and distinguishes three main outlooks within the field.

THE GLOBAL, SHORT-TERM OUTLOOK

DfS merged within a broader movement concerning the impacts of human life on the environment during the 1970s. Although its early scholars like Fuller and Papanek took note of the economic and social unsustainability of modern societies, DfS for the most part is and has been retaining a narrow focus on ecology and improving technical efficiency of the status quo. Early approaches such as green design and ecodesign in the 1990s (Ceschin & Gaziulusoy, 2016) mainly subscribe to this perspective.

The first major change came when the consumption patterns and consideration of users surfaced in the field in the early 2000s (Ibid.). This resulted, on the one hand, (i) in approaches such as emotionally durable design and design for sustainable behaviour (DfSB) which focused on eliciting more sustainable patterns of consumption from users, and on the other, (ii) in product-service-system design (PSS) which reoriented focus from products toward function and access.

In spatio-temporal terms, although the outcome of DfS within this outlook was small in size (usually a product), its focus was global and short-term as it aimed for mass production and generalization. However, it began to evolve in the direction of shrinking spatial extent, as more cultural dependency and longer term involvement was triggered in DfSB and PSS.

THE LOCAL, LONG-TERM OUTLOOK

A radical change came in the second half of the 2000s, with growing emphasis on social innovation in design (Meroni, 2007). Decoupling social change from the previously indispensable innovation in technology, this turn redefined the role of designer as a facilitator in the process that is fuelled by the engagement of local people in creative activity, i.e. creative community, to "reorganise the existing state-of-things" (Ibid., p. 14).

In parallel (and possibly mutual reinforcement) to this development, a new perception of user engagement in design was emerging from the field of collaborative and participatory design. This has been described as a move away from "use before use" conception of participation, which aims to anticipate future use scenarios, toward a "design after design" approach that blurs the formerly distinct boundaries between design(er) and use(r) (Ehn, 2008).

Thus, DfS spatially condensed to match the newly achieved height of engagement with its codesigning users over a longer period of time. Yet since then, in a rapidly deteriorating social and ecological landscape and with the regressive potential of isolation revealed, a growing number of scholars are reconsidering the need for broader scope of design, with terms such as "synergies" (Meroni, 2007), "acupunctural planning" (Jégou, 2011), "amplification" (Penin, 2013) and "planning by projects" (Manzini, 2015), suggesting that a combination and connection among multiplicity of community-based efforts is needed for transition to sustainability.

MULTILEVEL SPATIO-TEMPORAL OUTLOOK

The developments of the last decade have been oriented toward a holistic outlook for sustainability, pivoting design toward the civic realm. Designers are thus taking up the task of building connections and relations among different local initiatives, and between various actors in the public and private sphere. This is exemplified in the work of "living labs" like that of Malmö university (Björgvinsson, et al., 2012) and Manzini's "public innovation places" and "enabling infrastructure" (2015, pp. 119, 154) that create a broader bedding to foster social innovation.

In the same direction, there is a new body of work known as "socio-technical system innovation" (Joore & Brezet, 2015) and "transition design" (Irwin, et al., 2015) being developed, which argues for an expanded design scope encompassing socio-technical systems[1] that fulfil a societal need such as transport, healthcare, energy, education, etc.

While Ceschin and Gaziulusoy (2016) view this as a new level of design following social innovation, Irwin and her colleagues (2015) perceive it as a new kind of design, which is different from social innovation as it does not merely challenge the existing socio-economic and political paradigm, but is a design within and of new paradigms.

Furthermore, Joore and Brezet (2015) insist on another scope of design, namely "societal system", described as "the community of people living in a particular country or region and having shared customs, laws, and organizations" (Ibid., p. 96), and position it above the socio-technical system scope in that it spans over several domains and societal functions (see Figure 2).

[1] A more detailed account is provided in the next section.

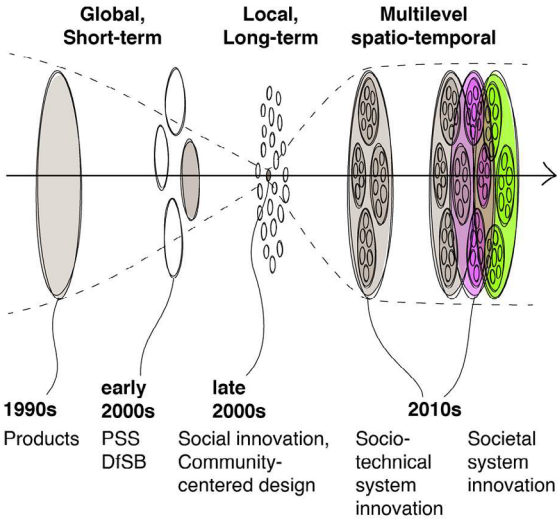

Figure 2: The evolution of three spatio-temporal outlooks within DfS (source: authors).

While DfS spans across these outlooks today, the call for a holistic approach to support broad–extent and multilevel transformation, is gaining wide acceptance in the design community. And though some authors have entertained the incorporation of a top–down approach (Manzini, 2015, p. 83), most conceptions of such "nested" structures (see Figure 3) aim to conceptualize grassroots social change toward sustainability (Irwin, et al., 2015; Kossoff, 2015; Vassão, 2017; Escobar, 2018).

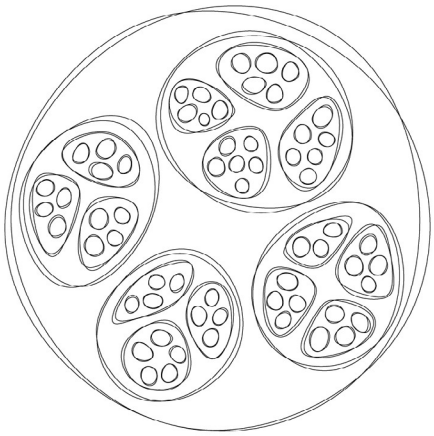

Figure 3: Nested structure, often referred to in relation to holistic perspectives (source: authors).

Here, another distinction by Gibson and colleagues (2000, p. 218) comes to the fore; inclusive and constitutive hierarchies. While in the former, higher level entities contain lower level ones within them, in the latter they are the emergent outcome of interdependence between lower level entities (Ibid.).

Taking insights from complexity theory and living systems theory, design literature draws on constitutive hierarchies by references such as "holarchy" (Kossoff, 2015) and the sequential levels of life from cells all the way to the planet (Ibid.; Vassão, 2017). From a sociology perspective, there are references to "cosmopolitan localism" (Irwin, et al., 2015; Manzini, 2015, p. 202) as a suitable structure for a sustainable society in which interdependent social entities on a multitude of levels exist within each other.

Given the relative novelty of this line of thought in design, there are basic questions regarding the use of these structures in order to understand broad–extent social change. Starting with what these entities are, how higher level entities emerge from the composite of lower level ones and how they act and relate to one another as high level entities? Placing individuals at the root of the hierarchy, some authors view households (Kossoff, 2015) as the next level, while others consider communities (Manzini, 2015; Escobar, 2018). But what comes after these small entities? Districts, municipalities, states and nations? Given that until recent times, much of the world's population couldn't accurately indicate on which side of these arbitrary "lines" they belonged, are they suitable structures for understanding social action? Furthermore, how can their action and interdependence be understood as higher level entities without the reduction and abstraction that lies at the basis of an inclusive, jurisdictional hierarchy? And beyond the spatial, how do these entities relate to the temporal scale of social change?

What limits our capacity in answering these and further questions does not lie in how DfS has evolved in its spatio-temporal scale over these outlooks, but indeed how it has not.

THE SOCIAL IN DESIGN FOR SUSTAINABILITY

Across the three main outlooks, stabilising common ground for understanding the "social" hardly seems a prerequisite for the discussing DfS as the field continues to exist almost entirely within the bounds of classical modern thinking. In relation to the approaches discussed in the previous section, adaptation of social theory in DfS can be discussed around two dualities of technology-society and structure-agency, which are used to outline four paradigms within the field. By no means a comprehensive analysis, this section only attempts to sketch a wider range of possibilities.

1. TECHNOLOGICAL PARADIGM

The first school of thought within DfS, and quite possibly the most dominant one to date, is "technological determinism". This paradigm views social change as the result of innovation in technology, and significantly undermines the role of people and other elements in the process of transformation. Therefore, it compasses approaches such as green

design and ecodesign[2] that remain focused on technical efficiency.

2. SOCIAL[3] PARADIGM

Within DfS, the "social" can be interpreted in two ways; either focusing on the non-technical aspects of designing for sustainability, or expanding the scope of sustainability beyond impacts on the environment to also consider socially unsustainable issues such as poverty, lack of access to health care, etc. While the emergence of these two interpretations has been quite interrelated in design, since the aim is to unveil how the challenge of sustainability, whether perceived as a narrow ecological issue or beyond, is framed and addressed within design, the former is in focus here.

Similar to sustainable policy literature (Shove, 2010), the social paradigm in DfS includes a multitude of approaches that draw on one or a combination of two schools of thought within classically modern social theory; economics and social psychology. The former holds the agency of rational autonomous individuals as the sole source of social change (Reckwitz, 2002, p. 245) in a purpose-oriented theory of action. In contrast, the latter depicts individuals as "norm conforming" and shifts focus to the structures that govern social order and action, which amounts to a norm-oriented theory of action (Ibid.).

Much of what falls under design for sustainable behaviour imply a classical view that focuses on "choice", "attitude" and "subjective norm" and aims at directing individuals' behaviour toward a more sustainable path with strategies such as providing information, incentive schemes, etc. (Shove, 2010; Kuijer & de Jong, 2012). Design for social innovation also draws on the same vocabularies in explaining social change. While awareness building is an inherent part of social innovation processes to persuade individuals, there is significant emphasis on reorganizing the local social networks as well as the creation of visions and even norms to be drawn on in the transition of the community toward sustainability (Meroni, 2007; Manzini, 2015).

Furthermore, the social paradigm of DfS can be viewed within a larger humanization movement that has been unfolding in design since the 1990s, which places (groups of) individual(s) in the focus.

3. SOCIO-TECHNICAL PARADIGM

Socio-technical systems, a term used to describe dynamic interplay between the social and technical side of systems (Bots, 2007), was founded in the field of science and technology studies (STS), the development in which over the past few decades has led to the emergence of a new area of research known as "transition studies" (Shove & Walker, 2007).

According to Geels, socio-technical systems can be perceived at different levels (2005, p. 1). On a small level it refers to the interdependence between the social and technical side of an organization (ibid.) which in design translates to the work of Baek and colleagues (2015; 2018) and Manzini (2015) on "collaborative services[4]", where in addition to the service or technical system, the social network associated with provision and use of it are also studied. However, the dominant understanding of the term, in transition studies (Geels, 2005, p. 1) as well as design, refers to the socio-technical systems through which a societal function such as transport, health care, energy, etc. is fulfilled (Ibid.). Therefore "system innovations and transitions" are changes in how these functions are carried out on a societal level (Ibid., p.2).

The adaptation of this research in design, known as "socio-technical system innovation" (Joore & Brezet, 2015), "transition design" (Irwin, et al., 2015) or "design for system innovation and transitions" (Gaziulusoy, 2015), is relatively novel and rapidly evolving (Gaziulusoy & Oztekin, 2019).

Early references to socio-technical systems include the work of Bots (2007) that addresses the need to combine the design of tangible (technical system) and intangible (rules that guide social interaction) artefacts in a framework integrating system design, decision process design and institutional design. Moreover, drawing on complexity theory, Herder and colleagues (2008) discuss an integrated approach that looks at actor networks as well as physical networks in infrastructure design. In later development, a group of scholars have been exploring the intersection between sustainable PSS and socio-technical system innovation (Ceschin, 2013; Vezzoli, et al., 2015).

Furthermore, there is another cluster of work anchored in multi-level perspective (MLP) model in technology transition (Rip & Kemp, 1998; Geels, 2002), which recognizes three levels to a socio-technical system, i.e. niche, regime and landscape, and discusses transition

[2] Although it has been increasingly escaping the strictly technological view.

[3] Here, "social" is used in its conventional meaning; relating to people.

[4] Collaborative services (a subset of collaborative organizations) describe local services in which the final users engage in collaborative design and production of the service they use (Manzini, 2015, p. 88).

processes in terms of interplay of elements within and between these levels. Ceschin (2014) has introduced a strategic multi-term design model in managing a path for innovations at lower levels to create changes in the broader landscape. In parallel, Gaziulusoy (2015) has put forth a framework of design for system innovation and transitions across levels, and Joore and Brezet (2015) have combined MLP with the iterative cycle of design models to develop a multilevel design model (MDM) that integrates product, service, system and societal levels of change. More recently, Öztekin and Gaziulusoy (2019) have introduced a model at the intersection of design theory, MLP and practice theory to discuss learning dynamics across multiple levels of transitions[5].

In relation to theories of social action, the approaches within this paradigm are characteristic in their attempt at bridging the technical and social elements of systems in their analysis. Yet, the lack of perceived necessity to discuss what the "social" is, along with descriptions placing "social" (Herder, et al., 2008), "social, organizational and institutional" (Ceschin & Gaziulusoy, 2016, p. 138) or "institutional and socio-cultural" (Gaziulusoy, 2015, p. 561) changes in comparison to the conventional, "technical" innovation of systems, alludes to the same classical dualities as the two previous paradigms. In other words, the "social" and the "technical", while admittedly interdependent and requiring simultaneous intervention, are two separate and inherently different entities that are being brought together as the joint unit of analysis, thus placing the socio-technical paradigm within a classical school of thought (see Figure 4).

4. PRACTICE PARADIGM

In parallel within DfS, there is a body of work that takes a more radical approach to bridging the putative society-technology divide. As part of a broader movement in the field of design that is "decentring the human" (Forlano, 2016), these studies have their ideological roots in practice theory.

Theories of practice are a family of theories that first emerged in the work of Pierre Bourdieu and Anthony Giddens (Reckwitz, 2002; Chaffee & Lemert, 2009; Shove, et al., 2012). In opposition to both norm-oriented and purpose-oriented theories of action, these authors argued for a dynamic interplay between structure and agency as the source of social action (Reckwitz, 2002; Chaffee & Lemert, 2009); accepting the existence of structures we draw on constantly in our daily lives yet conditioning their existence upon continuous reproduction through our action. To Reckwitz (2002), practice theory is part of a larger group of theories known as "cultural theories[6]" that followed the cultural turn in social studies, which he contrasts to classical theories in their emphasis on the role of "symbolic structures of knowledge" (Ibid., p. 245) in social order and action.

Practice theory explains the social as "a temporally and spatially dispersed nexus of saying and doing" (Schatzki 1996, p. 89 cited in Shove, et al., 2012) by placing it in practices. There is an often cited definition of practice offered by Reckwitz as "routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge" (2002, p. 249).

Practice theory entered design from the field of consumer studies by Elizabeth Shove in a series of workshops that led to a "manifesto of practice-oriented product design" in 2006 (Scott, et al., 2009). One of the most prominent models of practices used in design is the simplified model developed by Shove and colleagues (2012) including three elements of "meaning, material and competence" (Ibid., p. 14). Thus, rejecting the dualities of not only society and technology, but also structure and agency (see Figure 4), the practice paradigm takes "practices", in their irreducibility to their constitutive elements (Reckwitz, 2002), as the unit of analysis and design (Ingram, et al., 2007; Kuijer, et al., 2013; Pierce, et al., 2013). Rather than individuals, this paradigm focuses primarily on practices and then their "carriers" who are bodily and mental agents carrying them out (Reckwitz, 2002). The notion of "individual" in practice theory is understood as "unique crossing point of practices" (Ibid., p. 256) since each agent carries a multitude of different practices.

Attempts at merging the "behaviour" and "practice" perspective or mere interchangeable use of the two phrases (Shove, 2010) has led to sharp contrast being drawn between them (Ibid.; Kuijer & de Jong, 2012; Scott, et al., 2012); as the former focuses on causal factors and external drives to certain behaviours where the latter reconstructs the dynamics between "stuff, images and skills" (Scott, et al., 2012, p. 282) from which practices emerge. More generally, over recent years practice-oriented design has been expanding in human-computer interactions (HCI) design (Pierce, et

[5] The work of Öztekin and Gaziulusoy (2019) is discussed here as their insights from practice theory do not breach the dualities that govern this paradigm which are explained at the end of this section.

[6] Cultural theories also include Mentalism, Textualism, and Intersubjectivism (Reckwitz, 2002) which are beyond the focus of this paper.

al., 2013; Redström, 2013), Mylan (2015) has explored adaptation of practice theory in design for PSS, and Scott and colleagues (2009; 2012) and Pink (2015) have looked at a practice-oriented codesign.

This body of work that often identifies with the term "socio-material" (Redström, 2013), comes in close proximity to another growing cluster of work that draws on actor-network theory (ANT) and the writings of Bruno Latour, in fields such as architecture (Yaneva, 2009; Forlano, 2016), participatory design (Bannon & Ehn, 2013), HCI and political design (DiSalvo, 2012) and communication design (Venturini, et al., 2015). Also developed within the field of STS (Sayes, 2014), ANT has been placed in close proximity with practice theories (Reckwitz, 2002), and in the same rejection of dualities, describes the world as "made up of hybrids, assemblages, and collectives that are composed of human and nonhumans that act and organize together, sharing the delegation of power and agency" (Forlano, 2016, p. 47).

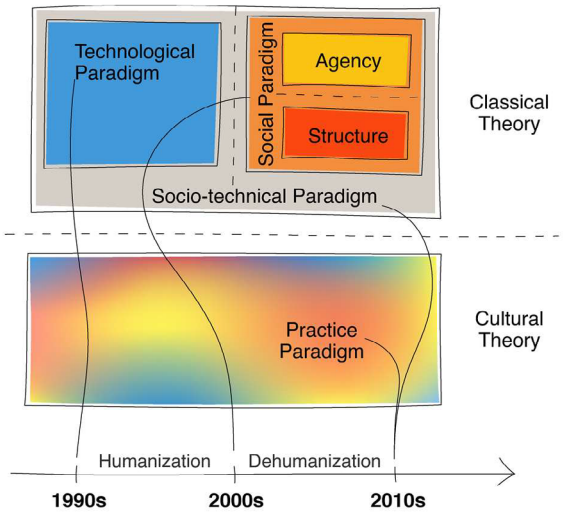

Figure 4: The four paradigms of DfS in relation to social theory (source: authors).

As figure 4 illustrates, the two most recent paradigms, the socio-technical and practice paradigm, while both acknowledging the limited capacity of strictly technology- or human-oriented approaches in the process of transformation, differ significantly in that the former does not breach the bounds of classical modern thought within which DfS mainly resides. While in policy literature, Shove (2010) connects transition studies with practice theory, in prominent models used within the socio-technical paradigm, such as Geel's evolutionary multi-level model (2002), "user practices" are understood as an entity separate from knowledge, symbolic meaning and technology (Ibid., p. 1262), which in practice theory have no separate existence but in the assembly of those elements.

PRACTICE AS SCALE

The assumed dualities of society-technology and structure-agency are modernist habits that persist even as we take bold leaps toward transitions through design. Withdrawing from these traditions, practice theory, as one among a diversity of non-modernist ways to understand social action, can fill the gaps of a holistic conceptualization of scale.

The riddles of a constitutive hierarchy, in which macro level entities result from the interdependence of a multiplicity of lower level entities, dissolve in taking practices as the scale to analyse social action. Far from being novel, this suggestion is only a conceptualization for practice theory's most basic argument. Therefore, these ideas have been explored by scholars like Shove, Watson, Ingram and others for years in various areas such as hygiene, transport and energy-consumption, etc. (See Ingram, et al., 2007; Shove, et al., 2008; Shove, et al., 2012)

Here, it is useful to draw on a distinction between "practice as do-ing and practice as spatio-temporal manifold" (Schatzki, 1996) or "practice-as-performance and practice-as-entity" (Shove, 2010; Shove, et al., 2012); the former refers to practices as enacted by a carrier in specific time and place and the latter the emergent result of a multiplicity of those performances, allowing it to extend over time and space. Thus, in a constitutive hierarchy, which depicts only a certain social practice, each spatio-temporal level is a representation of the same practice that emerges from a plurality of different practices at lower levels, all the way down to a single practice enacted by a carrier in a specific time and place (see Figure 5). The relations between different elements of the practice at each level link them to other practices which creates an upward

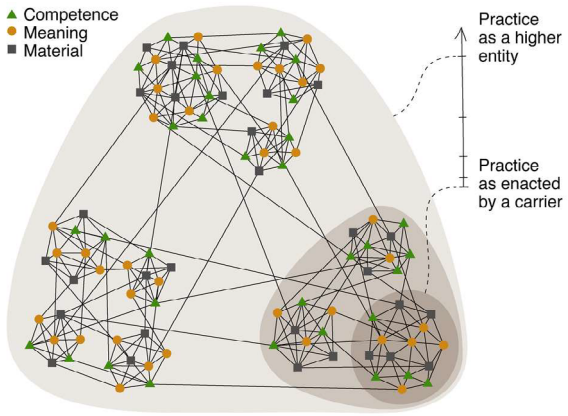

Figure 5: The web of relations that make up the constitutive hierarchy of a practice as a multilevel entity spanning across space and time (source: authors).

and downward causation between the levels of the hierarchy that is inherent to the dynamic nature of social practices.

Bathing, for instance, as a micro level entity is a practice in one of its diverse forms of fast morning shower, long relaxing baths, shower after exercise at the gym, etc., enacted by a carrier which includes a multiplicity of materials, meaning and competence, such as the bathroom space, durable and consumable hygiene products, washing methods and images of "being clean" which are socially learnt, etc.

On a higher level, these micro practices enacted by large numbers of carriers give rise to a broader order that spans across space and time and is constantly reproduced through those micro level performances. It includes elements such as the temporal order of bathing (appropriate time, frequency and duration), the shampoo and conditioner industry, advertisement and its influence on hygiene perception, impact of gym culture, etc. that together constitute "bathing" at a higher spatio-temporal level. Thus, predetermined boundaries have no role in dictating the extent or level of analysis, but instead they rise as the result of studying elements across micro level practices. For instance, the practice of bathing in northern Sweden might have more resemblance and connection to elements in that of Finland rather than southern Sweden. Furthermore, macro level entities, i.e. practices, are necessarily constituted from a plurality of different or even contrasting micro level entities. For instance, the image and use of animal-derived hygiene products by single carriers as an element that can vary based on geography, culture, religion, income, etc., does not compress into an abstract, homogenized feature of the practice at a macro level, but is instead perceived as an element that runs through different levels of bathing as a practice.

The socio-technical approach, although similarly incorporating a multilevel spatio-temporal analysis is limited by the society-technology dichotomy and the inclusive hierarchies of jurisdictions, industrial networks and institutions that inevitably follow. That is to say, while accounting for the dynamic interplay between these levels, it fails to provide a comprehensive analysis of different elements involved in shaping the social order. In doing so, it undermines the role of the apparently disconnected acts of use by individuals in sustaining and reproducing the system through socially shared ways of understating.

DISCUSSION

Rather than advocating a Totalistic view in design, the conceptual framework of practice presented in this paper is simply an alternative to the scales of populations, jurisdictions, public institutions and industrial networks, designers often resort to in broadening the scope of their analysis. While institutions to deliver design on such massive and comprehensive scale in the public or private sector may exist, the heavy reliance of socio-technical system literature on a post-political, consensual view of sustainability that disregards inherent social conflicts, cannot maintain any genuine form of collaboration with the public. Yet, apart from issues of authority, transparency, homogenization and exclusion that too often follow large–scale initiatives, most of the design that is changing the world today, for or against a sustainable human existence, happens at modest levels. This conceptual framework can hopefully serve as a tool for designers in analysing the resilience of unsustainable practices across various levels by exploring the connection between their elements and that of other practices, to look for points of intervention which can be most effective.

As we grapple with the challenge of scale in the face of ever deepening social, ecological and economic detriment of accumulating crises, it is time for design to break from the hegemonic grip of modern thought. Leaving behind the self-inflicted dualities that have restricted our understanding, a practice perspective on social action can further a much needed holistic view in DfS as it removes "layers of a priori assumptions through the detailed study of what is actually unfolding" (Redström, 2013, p. 10). There is a significant reorientation associated with such undertaking (Ingram, et al., 2007), which not only impacts how we frame challenges within the field, but also the way in which design itself as a practice is understood (Redström, 2013).

The process of changing unsustainable practices is necessarily a dynamic one (Scott, et al., 2009), which makes public engagement and the research on adopting a practice-oriented perspective in collaborative design crucial. In their collaborative model of practice-oriented design, Scott and colleagues (2012) draw on two distinctive modes of consciousness recognized by Giddens, i.e. practical and discursive consciousness (Ibid., p. 285), and cite the continuous alteration between them as a prerequisite to deliberate social change. As such, the role of design is to unveil the practices that sustain the unsustainability of our dwelling on this planet, in processes of reflection that certainly exceed the walls of the studio and classroom, starting with the monopoly of classical modern thinking on how we perceive the social.

CONCLUDING REMARK

This paper has reviewed the evolution of the spatio-temporal scale of design for sustainability across the

three outlooks of (i) global, short-term, (ii) local, long-term and (iii) multilevel spatio-temporal. Moreover, exploring the adaptation of social theories in DfS approaches, four paradigms of technical, social, socio-technical and practice are outlined within the field, of which only the last escapes the bounds of classical modern thought. The suggested conceptual framework of "practice as scale" is as an alternative to geographical, jurisdictional or institutional scales designers often draw on in broadening the scope of their analysis, and it can further a much needed holistic understanding of the complex dynamics of social change. Future work will include the development of a framework based on practice theory that can address some of the challenges of sustaining a mutually enriching collaborative experience between designers and their codesigning users in broad public engagement.

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Paper Session 3

Futures (2)

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Amphibious Scales and Anticipatory Design
Andrew Morrison, Bastien Kerspern, Palak Dudani, and Amanda Steggell (F)

Revealing Words for a Design Debate: A Design Lexicon Case
Yaprak Hamarat, Catherine Elsen and Çiğdem Yönder (E)

Design Histories for other Futures: Design in the Scale of Time
Maria Göransdotter (F)

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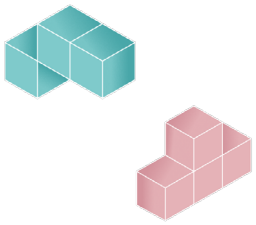

AMPHIBIOUS SCALES AND ANTICIPATORY DESIGN

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ABSTRACT

This paper considers dynamics between Anticipatory Design and relational ontological scales in imagining, articulating and shaping futures. This spans speculative, experimental and experiential engagement with imaginary futures for rethinking relations to the present and long-term sustainable ones. Such acts are situated as design futures literacies that encompass design fiction, extended choreography and arctic futurescaping. Drawing on three design fictive devices developed across two projects, a set of eight 'Amphibious Scales' we developed in the context of the Anthropocene. The scales are amphibious in their slipperiness and dynamic, and emergent status. Their genesis is given via accounts of the design fictive works centring on the persona of an octopus and scenarios on the Arctic Northern Sea Route.

INTRODUCTION

FICTIONAL FUTURES, TROUBLING PRESENTS

In Gulliver's Travels Jonathan Swift (1726) created a satirical narrative polyverse that to this day challenges readers' sensibilities of scale and mediations and critical interpretations of context. Devised as a social commentary, a narrative experiment and a discourse of political reflection, Swift used a Baroque extravagant mode of pastiche and irony (Buci-Glucksmann, 2013) to engage and challenge readers about perceptions and expectations. As the lead protagonist, Gulliver journeys through a diversity of environments and systems in the form of a series of books in which scale is repeatedly inverted, such as an entire society of miniature people called the Lilliputians struggling to overcome the giant Gulliver who then becomes the minute plaything of the Queen of Brobdingnag provoking a treatise on the politics of monarchy and the kingdom.

Swift's now legendary lengthy work remains a remarkable example of how the imaginary and a mode of satirical narrative propel us to re-think relations of scale between a complexity of conditions, contexts, systems and agency. It functions as a cultural device to characterise and to criticise while embedding readers in narratives of relational embodiment of scale from the individual to a wider polity and back. The selection of an absurd, non-mimetic representational stance allows Swift to use associative, abductive and relational logics in an 'unnatural' narrative (Alber et al. 2013). This toggles between story and discourse levels in which the imaginary and the fictive are used to juxtapose, contrast, compare and reconfigure experiences and perceptions through a scale of negotiative implicature, associatively and abductively, on the part of the reader. This is realised through their performative and reflexive scaling of the scenarios, personas and diegesis to understanding present realities and the conditions, complexities and contradictions of their lifeworlds.

We open with this mention of Swift's work to indicate the force and intricate means of engagement that may be

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fabricated through imaginary and satirical choreographic, narrative and game design fiction as a mode of cultural mediation and critique. We do not seek to replicate Swiftian tales in contemporary forms (Menzes 2005: online). Rather we tangentially use some of the techniques he adopts as part of a design Baroque mode of inquiry (Law 2016) that is subjunctive, speculative and prospective in its stance, offering and potential in a frame of Anticipatory Design.

Below we offer a new set of eight 'Amphibious Scales 'we devised through the development of a set of design fictive devices. These are centred on the persona of an octopus and its physical and imaginary lifeworld in the context of the 'changing climates' – physical, geo-political, cultural – of the Arctic Northern Sea Route.

ANTROPOCENIC REALITIES, SPECULATIVE ENQUIRIES

Accordingly, this paper draws on research and practice in critical and speculative design and related work in design fiction. As design, we weave them together with an experimental heuristic futures-oriented persona and a set of activities and scenarios that we locate within the emerging domain of Anticipatory Design (Celi & Morrison 2018). Attention to ways of fathoming complex futures, systems, conditions and context by futures design is central to Anticipatory Design (Morrison et al. 2021). Below we present Anticipatory Design that ventures into shaping an exploratory and emergent weave of complex contexts, changing conditions, and crisis of climate that in the scales of the Anthropocene.

Given the challenges of looming ecological disaster and pressure to secure equitable food and water supplies amongst others, there is a need for understanding that the future is upon us. These futures are not just plural and challenging to understand (e.g. Sardar 2013). They also necessitate particularly novel ways for engaging us. In appreciating and acting on these futures in order to effect durative and structural change in the changing face of political economies (e.g. Frase 2016), Anticipatory Design seeks to support content and communicatively centred contributions towards sustainable long term futures (Boehnert 2018). This necessarily implies its work is situated within wider critical discourses of design futures, power relations and participatory politics (Mazé 2019) and related design futures literacies (e.g. Celi & Colombi 2019).

In this paper, this is patently the case in the instance of the contextual focus on the Northern Sea Route as part of the intersecting study of two practice-based research projects. Between these projects we deploy speculative design within the actual and imagined settings of rapid, unsettling and unpredictable change, such as melting ice and permafrost. We engage with these bodily and imaginatively through visits to arctic cities, islands and seas, in a new collaborative journeying into an area of the globe with the most rapid, far reaching and tangible changes in climate, environment, life and livelihoods.

The Northern Sea Route (NSR) was the stuff of gruelling physical explorations and accounts of imagined monsters in the age of colonial discovery in which Swift's imaginary tales were penned. Today it is undergoing rapid transformation. In response we have also devised three design fictive devices around the imaginary persona of a female octopus called OCTOPA.

OCTOPA has been co-developed over the past two years between two funded research projects: *Amphibious Trilogies* and *Fuel4Design*. She has floated and darted between the main themes of the projects, extended choreography and design futures literacies respectively. In this transdisciplinary and design poetic shift and drift, and tangle of tendrils and tentacles, we have found shared interests and focus: on movement futures and language, lexis, play and the role of satire in addressing difficult, pressing, urgent contemporary and long-term issues and needs. On the one hand is embodiment, movement and an extended arctic landscape and on the other design futures literacies with a focus on language, discourse and mediation.

SLIPPERY SCALES AND RELATIONAL ONTOLOGIES

Being amphibious and working amphibiously through a mix of art, design, humanities and social science (see e.g. Nilsson, 2009), allows engagement with the role of irony, the pose of personas, the potential of the fictive, while working with contexts of the actual and societal and the futural and speculative. In our work we have adopted the notion of amphibiousness, an elusive, queer theory oriented, and excessive Baroque-like scalar term. It has allowed us to shift and dip and to change character and qualities in motion. The notion allows one to move between, within and across domains of knowledge, environment and reflections. These entail the kinetic in context, in the now, through its legacies and into futures. The slipperiness of amphibiousness also refers to being tricky, even deceptive and playful between states, ideas, movement and reflection.

Collaboration between the two projects has led to the formative and developmental co-construction of a broad set of thematic relational ontological scales, with the wider goal of supporting long terms sustainable futures by design (Benjamin 2015). The scale has been devised through linked work on embodied experimentation with the notion of an extended choreography central to *Amphibious Trilogies* (AT) and a relational semantics of the design futures lexicon in *Fuel4Design* (F4D). The scales are built from our prior and related design practice, pedagogy and research that led to three related design fiction devices centred around the biological and behavioural characteristics of an octopus. These devices were devised and deployed by design and artistic research practice: they used narrative co-design fictions

scenario building and importantly metaphor. The scales were developed thereafter and drew reflexively on narrative, speculative and situated means and methods of design-*ing* (Lury et al. 2018).

The scales, as the figure of the octopus central to our thinking suggests, are amphibious in their slipperiness, dynamic, prosessural and emergent status in a mode of becoming. We have labelled them 'Amphibious Scales' with eight 'arms': 1) Multi-perspectival, 2) Indeterminate, 3) Counterfactuality, 4) Mixed materiality, 5) Multi-temporality, 6) Poly kinetic, 7) Pan experiential, and 8) Plural engagement.

Walsh el al. (2021) note that 'relational ontologies aim to overcome the bifurcation of nature/culture and various other dualisms (e.g. mind/matter, subjectivity/objectivity) shaping the modern worldview.' For us, in the Anthropocene this entails elements of process philosophy, new materialism and diverse knowledge systems (e.g. Whitehead 1938, Stengers 2011). They acknowledge ways we may approximate and enact shifts to working towards long term sustainable futures in a mode of becoming.

The set of OCTOPA devices we developed prompt participants to speculate, consider, design and act in an anticipatory mode in relation to the rapidly changing NSR.

APPROACHES AND METHODS

This paper draws on a diversity of disciplines and methods, located in a prospective and reflexive design hermeneutics (Morrison 2018) and design oriented and digital humanities conceptualisation and practice that elaborates on ways of designing, the roles of participants and modes of critical reflection. The aim of these works is to pose and offer and explore a set of speculative, situated and critical means to approach the changing, complex conditions, historical and political contexts and cultural and communicative character of designing within the Anthropocene and climate change.

The 'account' is populated by practices of co-design situated in the critical articulations of design fiction and gaming, extended choreography and design futures literacies. The paper draws on practice-based research situated within speculative inquiry, design and art (e.g. Borgdorff 2013) in which the aim is to support transdisciplinary relational knowledge making via epistemic artifacts and uses. In doing so, we explore and critique intersections between design fiction, extended choreography and arctic landscapes.

We accentuate that engaging with emergent and even prevailing discourses of the Anthropocene for our urgent, changing, and challenging futures needs must be approached not only in terms of systemic and post-geological scales but diverse cultural, speculative, educational and communicative ones. These approaches need to engage and facilitate diverse identities and experiences to imaginatively and critically enact futures in postnormal times (Kuzmanovic & Gaffney 2017). They also need to be positioned to expand design and speculative design to more than human concerns (Akama et al. 2020). As Amsler and Facer (2017: 8) argue concerning education and anticipation, '… it is possible to create holistic, life-generating and possibility-enabling educational projects which re-establish critical relationships with the future rather than prohibiting them, and which seek to create the future open, working with novelty as a constantly evolving possibility….' For us this needs to be extended to design's imaginaries and critical situated review to address and broker urgent matters global scale as and through anticipatory design. The work presented here engages with physical and digital elements and activities, and their interplay with a diverse group of participants: designers, educators, researchers, and master's and doctoral students. Participants worked with exploratory, experimental design and artistic poetics to support qualities of a wider understanding of design futures literacies (Morrison et al. 2021), world-making and 'futureCrafting' as reconceptualising contingency and rethinking uncertainty (Marenko 2020).

By eliciting, evoking, prompting, proposing, and projecting possible, potential, putative and provoking futures, the fictive persona of OCTOPA motivates thinking, engagement and action. In this paper we include three aspects to the work in the form of 1) OCTOPA TOOLKIT, 2) OCTOPA'S JOURNEY and 3) OCTOPA REGENERATED.

The Toolkit was developed through study of the biological characteristics, amphibious qualities and behaviours and kinetic affordances and dynamics of cephalopods. The form of the creature was used to embody these qualities in two key categories (see below). The Toolkit was trialled in a set of movement-based master's level workshops in choreography and in undergraduate classes in design and form. Connecting with pedagogical learning resource development on lexis, futures and design in F4D, the persona OCTOPA was situated within 28 design fictive scenarios in the NSR by our design-art-research team. It was co-scripted and placed online for open access, with use in master's, doctoral and design teacher training sessions.

Using the metaphor of a journey, the aim was to engage users in enacting critical and reflective travels of their own and into their own work, as we had done. In the Regenerated part of the work our goal was to further engage participants in looking beyond their experience or access to aspects of the complex and increasingly important NSR, but to see how narrative and metaphorical device might be used imaginatively in their own anticipatory designing.

RELATED RESEARCH

TOWARDS ANTICIPATORY DESIGN

Anticipation Studies is an emerging transdisciplinary research domain that draws together inquiries into futures, incorporating systems, policy, governance and foresight views (Miller 2018) from Futures Studies along more culturally located studies from education (Facer 2016), sociology and design (Celi & Formia 2017). Anticipation Studies (Poli 2018) has addressed issues of systemic change and futures literacies in the context of the climate emergency of sustainable, changing circular economies. As key contributors to the field from Design, Celi and Morrison (2017: online) argue that '… Anticipation may be shaped as a future pursuit, informed through Design and supported by way of linkages with Futures Studies that are equally polymorphous and conjectural alongside other much needed procedural, factive, and necessary foundations upon which to aspire, approximate, propel, and together project designs fictions and future-oriented inquiries.' This complements systems-oriented approaches.

For Celi and Morrison, Anticipation Studies need to also encompass cultural aspects when inquiring into futures. Appadurai (2013) argues that the future is a cultural fact, while Escobar (2018) reminds us that futures are multiple and ought to cover cultural pluriverses of contextualised knowing and being. Anticipatory Design accentuates the role of design as a futures-facing and futures-shaping pursuit and tradition of practice-based research, extending futures literacies (Morrison et al. 2021).

Anticipatory Design works to shape and to interpret cultural, speculative and exploratory modes of address and engagement (Zhou & Morrison in press). It deploys aspects of critical and speculative design, such as design fiction, as complements to the more strategic decision-making character of foresight approaches in Futures Studies. It does so to expand cultural imaginaries in shaping links between Design and Futures (e.g. Candy & Potter 2018). These are links located within changing societal conditions and practices, including our relation to other species (Haraway 2008) in a nonbinary take on entities and objects, posthumanist in design orientation and emergent character and practices (Forlano 2017).

THE BAROQUE, SCALE AND DESIGN FUTURES

The Baroque may be seen as a conceptual, cultural and design affordance that burst beyond the historical boundaries of 17th century culture where it had a frame breaking effect in art, architecture and literature. Often studied in terms of aesthetics, the Baroque provides us with means to work beyond the frames of given approaches and assumptions. Buci-Glucksmann (2013) observes two embodied aspects. Drawing on the myths of Prometheus and Narcissus, a Baroque aesthetics was realised allegorically, materialised as formlessness, attending to the marvellous and extending to furore. In contrast, via the melting figure of Icarus, the Baroque is manifested in a culture of flux or slipperiness.

Eggington (2010) argues that we need to also note major and minor views on the Baroque. The first is located within core centres of power and position in Europe; the latter has been developed in Latin America as a subaltern, resistant and alternative expressive and critical mode of knowing and being (Salgado 1999). Sack (2015: 59) suggests that drawing on a neo-Baroque allows ' … the creation of a design strategy that is purposeful, indeterminate and speculative, circumventing any caricature of nature as "scenic beauty".'

The STS scholar Law (2016) also motivates that we approach the Baroque as a register less an aesthetic. He advances six techniques of the Baroque connected to 'messy' ways of knowing in social science: 1) Theatricality, 2) Boundlessness: 3) Heterogeneity, 4) Folding, 5) Distribution, Movement & Self-Consciousness, 6) Mediation. Law's categories were part of a previous design fiction project on personas and arctic experiential and research futures landscape project (Morrison 2018) and indirectly informed the design of the OCTOPA related devices and the 'Amphibious Scales' communicated here.

SPECULATIVE DESIGN

Design fiction has become an established constituent of Speculative Design (Dunne & Raby 2013, Augur 2013, Maplass 2015, Lindley & Coulton 2015), entering different domains such as HCI from its original, critical and creative design origins. Design fiction concerns the suspension of belief, a means to making changes through diegetic prototypes (e.g. Sterling 2009).

Relations between futures and alternate narratives has begun to appear in Futures Studies (Ravan & Shirin, 2015) but little on design fiction has appeared there. Coulton et al. (2019: 166ff) view design fictions as not necessarily rhetorical devices infused by narrative but rather by diegetic prototypes (after Kirby). They see that such prototypes may be positioned in relation to scales (akin to the Eames' power of 1-10) that extend to the wider environments in which they occur or are situated. Lindley and Coulton (2015) also argue we think of storyworlds (Ryan 2006) and world-making in which we cast works in terms of fabrication and world-building (Dunne & Raby 2016; Haraway 2016). These diegetic prototypes function to 'tell worlds' not stories.

Focus on the fictive and gender does appear in design fiction in which personas are taken up to make problematic, awkward and powerful relations between gender and technology in near future imaginary lifeworlds (e.g. Morrison et al. 2014; Morrison 2018).

Such works may be seen as a mode of queering design fiction into how vetriloquising technology and life critiques may be turned back on us in a wider posthuman environment in more reciprocal relations between which humans and nonhumans. Connecting to similar work in multispecies discourses, Westerlaken (2020) suggests, we may see multispecies creatures as imaginary hyphenations of the fictive and the factual.

They function as personas through which we are able to further embody and perceive processes and potentials of 'multispecies worldings' inspired by actual creatures and the imaginary of legends and myths. Given these qualities, it is perhaps no surprise that the polymorphous, historically monstrous figure of the kraken and literal, biological characteristics of the octopus or cephalopod, zoomed into view.

The octopus is a truly enchanting creature. It changes texture and colour, transforms its shape, defensively dissembles its outline in a cloud of ink and propels itself through a variety of motions, in the water, tentacles rippling over rocks and even walking across the sea bed. Recently it has appeared in the Oscar winning documentary on NETFLIX (Erlich & Reed 2020).

After serious reading of scientific journals, popular science communication and accounts of maritime studies and aquariums, such as Sy Montgomery's *The Soul of an Octopus* (2015) this 'bestiary of design fiction personas was extended in Amphibious Trilogies to include a new, imaginary, futures rich being called OCTOPA. Her name for us slips between the contemporary physicality of the Occupy movement and the always just beyond our reach, in the shadowy dreams of utopia. Her name symbolises a universal figure for some perhaps, god-like in her capitalised proper noun name, yet suggesting a state of preoccupation. None of these words fit, nor can they be bound together, to anchor her polymorphous, slithery selfhood in one time, place or, indeed, scale.

AMPHIBIOUS THEMATIC SCALES

The 'Amphibious Scales' we have developed function within, across and between states, contexts and domains and hence are amphibious in character (Table 1). As relational ontologies, they are dynamic, emergent, fluid and flexible markers of 'Themes'. The Themes allow the scales to be applied and interpreted on the needs, pressures, demands, potentials, constraints and pitfalls of designing within the complex, uncertain and changing contexts of the Anthropocene. This is suggested as lexical semantics under 'Characteristics'.

As pliable and reflexive vectoral constructs, the 'Amphibious Scales' have been co-created through transdisciplinary design from practice-based inquiry in design futures literacies, 'extended choreography' and arctic landscapes. They are open to multiple perspectives on context and culture and the force of uncertainty and indeterminacy. Perception is also crucial in scaling world views and practices in terms of fact and fiction; these may be mediated through mixed materialities related to articulations of diverse genres and discourses. Multitemporal and chronotopical multiplicities concern movement (spatial, transversal, poly kinetic). Negotiation involves multisensory experience, a plurality of engagement, offers and prompts for transformations via human agency.

Table 1 'Amphibious Scales' and Anticipatory Design

1. Scale: Multiperspectival
Theme: Complexity. *Characteristics*: Systems, autonomy, Anthropocene and climate change, esoteric, obscured, dense, profound, enigmatic, flux, shape shifting, rhizomatic
2. Scale: Indeterminate
Theme: Comprehension.*Characteristics*: Uncertainty, intangibility, abstract, remote, Indistinct, unfathomable, unanchored, ineffable
3. Scale: Counterfactuality
Theme: Perception. *Characteristics*: Truth relations slide between fact and fiction, speculative, prospective, reflexive
4. Scale: Mixed materiality
Theme: Mediation. *Characteristics*: multimodal, semiotic, narrative, physical-digital, personas, scenarios, play
5. Scale: Multi-temporality
Theme: Time. *Characteristics*: Multiple timescales, linear to dynamic, expansion, contraction, divergence, disruption, delay, pause, speed
6. Scale: Poly-kinetic
Theme: Movement. *Characteristics*: Friction, fluidity, viscosity, vectors, speed, pattern, spread, diffused, concentrated, connected, osmotic, undulating, jettisoning etc
7. Scale: Pan-experiential
Theme: Negotiation. *Characteristics*: Multimodal embodiment, sensorial, participative processes, serious play
8. Scale: Plural engagement
Theme: Transformation
Characteristics: Action and agency, identifying, recognizing, locating, positioning, shaping, sharing changing futures

Concerning Design, the 'Amphibious Scales' have been conceptualised within a wider anticipatory design perspective that splice, weaves and knots together research and practice from Speculative Design in Design and from aspects of design and foresight in Futures Studies.

From choreography, the scales extend from the rehearsal and performance stage to environmental and societal ones. On Arctic landscapes, the scales concern the changing nature of maritime- and coastal-scapes as ice and permafrost melts, erosion and extreme weather advance, livelihoods are denuded.

The scales may be understood as a set of amphibious semantic devices (cat's cradles, regenerative arms) and a means to devising (cultural material future-facing resources) for imaginary mappings of anticipatory design futures and related design futures literacies. These scales are posed to suggest ways of 'staying with the trouble' (Haraway (2016) of living, designing, teaching and learning in contexts of local/global change.

SHAPING OCTOPA

Drawing on a previous transdisciplinary landscape, urbanism and design project *Future North* (Kampevold-Larsen & Hemmersam 2018), we were motivated to conjure a figure who might assist us in deciphering the complexity of the Northern Sea Route, one of the sub projects in *Amphibious Trilogies*. We drew on a similar persona called Narratta who was co-authored by core designer-researchers in *Future North* (Morrison 2018). Narratta functioned as a mediated imaginary in making sense through personas and design fiction (Morrison & Chisin 2017). Experience with ventriloquising content through the mediating device of Narratta suggested promise in shifting to the co-design of a narratively informed fictional poetic experimental device (Knutz et al. 2013). Between our two new projects we chose to focus on movement, language and perception, including making and receiving humorous and critical responses to 'seriously silly design fiction (Blythe et al. 2016).'

OCTOPA was conceived of a new imaginary creature. She is a generation of our times, a creature beyond our ken, a deliberative, even 'excessive', device that is always skilled in her grasp but able to evade containment and reductionism. She is able to 'stay with the trouble' (Haraway, 2016). She is a device to serve us our own troubles and ways to think about facing them, considering their construction and perpetuation, playfully and challenging asking us and provoking us to think, and to reflect on how we might act. OCTOPA is fluid: she jettisons herself between time and space and across distances. She swirls and hides, reveals and conceals, exposes and catches, grips and repels. These are all acts of sensitive embodied knowing, propulsion with repulsion, amphibiously testing her distributed intelligence across the Anthropocene and NSR.

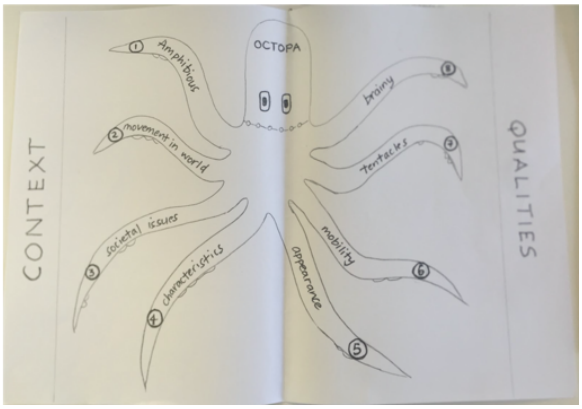

Figure 1 A hand drawn illustration of OCTOPA, her tentacles relating to key themes of wider context and her own qualities.

Working with this arctic context, language and movement, Eight aspects of an octopus' characteristics and features were discussed, revised and placed on a large hand drawing of an octopus designed to be cut out in a participatory workshop (Fig.1). Two main aspects were selected to cover sets of fours arms each: 'Contexts' (Persona, Movement in the world, Societal issues, Characteristics) and 'Conditions' (Appearance, Mobility, Tentacles, Brainiess). These aspects provided the basis for the 'Amphibious Scales'. The paper device was taken up in 4 Master's and 4 PhD workshops in design and choreography and presented in 3 research settings (Fig. 2), over two years. For mediation and access, an online Toolkit was developed together with a reflection on a workshop.

Next, we present and discuss further ways in which OCTOPA has taken on a life in set of deliberately diverse but connected co-designed and experienced initiatives. This encompasses a mix of travelling and communicating visually and verbally in an online format. This involves material generated by the choreography and design researchers on shared practices and reflection on arctic environments, fiction and embodied experience, especially on the NSR.

It extends in *Fuel4Design* to a contribution on language and movement to the Lexicon, also contributing to the wider interplay of language-discourse relation where Semantic Categories have in turn informed the design of the 'Amphibious Scales'. The section below draws on blog entries by OCTOPA in a mode of self-reflexive story making. This accentuated her qualities and characteristics so as to decipher and query climate change, cultural histories, present experience and future strategies.

Figure 2 Workshop with a group of design and choreography researchers and practitioners.

The NSR is a complex, emergent and Arctic phenomenon. For many, outside of The Russian Federation, it is obscure and remote (Vakhtin 2019). It is increasingly in the news as for marking the passage of climate change, from melting ice to navigable shipping Østreng et al. 2013). Carbon fuel extraction.

Nuclear energy and militarisation. Methane and anthrax exposure on its adjacent land mass. Much here is undergoing transformation; movement is central to changes. The ice as solid, surface, barrier and a given is under erasure as increased commercial tonnage and military expansion, including nuclear vessels, continue to carve new routes (Savitzky 2016), and ones recently unattended by icebreakers.

Our response was to venture into 'Building a poetics of design fiction' (Markussen & Knutz, 2013) in the wider context of 'being ecological' (Morton, 2018) in an ecosphere in which design, ecology and politics are entwined via design. This entwining would be shaped through a transdisciplinary co-design mode of connecting movement, narrative scenarios, critical play, and the facilitation of 'anticipation-oriented thinking' (Kerspern 2019). Kerspern has conceptualised this as a slippery interweaving of game design and design fiction to produce 3 hybrids: 1) playing (with futures, 2) replaying futures, and 3) counterplaying futures. In addressing the range of issues, possible, likely and conjectural survivable futures and the NSR, we would need to engage people in a design fiction that would both play with and play the future through limited options (Coulton et al. 2016). However, those given and contemporary projected futures, from utopian to supremacist, linear to dystopian, would need to be repositioned to facilitate a mode of 'replaying futures'. As transductive method and multimodal digital rhetoric, we used irony as a key mode of address and 'hook'.

OCTOPA'S JOURNEY

The game design fiction OCTOPA'S JOURNEY (Fig. 3) is a satirical take of using scenarios (Blythe & Wright 2006) in a mode of critical play marked by pastiche, and a Baroque-like non-literal, non-mimetic worlding.

Figure 3 Splash page of OCTOPA'S JOURNEY.

Through OCTOPA and the 28 scenarios we co-devised (e.g. nuclear+oil spill, a NSR blockade, a sea of data, last chance tourism, Fig, 3), we wanted to escape ghosts and monstrous sea creatures. Instead, the being of a multi- brained, many armed and shape shifting character would demand of us similar tenacity, regenerative acts, distributed and connected thinking and an ability to move amphibiously, literally and physically. As 'counterplaying' futures (Kerspern 2019) this would employ irony and satire to make apparent and to reveal entanglements and potentialities that accentuate the fictions of proposed developments in the NSR.

We designed this as a way of 'gaming futures literacy' (Candy, 2018), intwining movement and language. It would also reveal that in such play we are engaged in acts of alternate world-building in which narrative is a central co-creative futures resource (Raven & Elahi, 2015). This is not for play itself but for moving into, being moved by and moving on discourses of the NSR in the time and dynamics of the Anthropocene

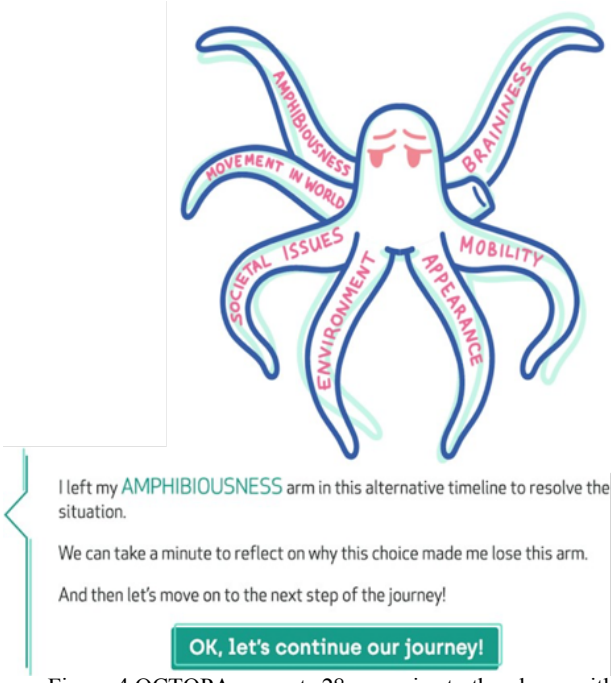

Figure 4 OCTOPA presents 28 scenarios to the player with multiple, branching possibilities and consequences.

Here were we reminded of the practice differentiations Malpass (2015) makes between associative, speculative, and critical design. Kerspern (2019) charted this as a mode of bridging mediation through games and design fiction with the purpose of facilitating anticipatory thinking. This was built on game mechanics to form anticipatory scenarios and alternate futures. Making a future scenario more experiential and accessible may be achieved by turning it into a game, as offered in the branching options. Kerspern sees the potential of a game experience to include browsing between scenarios and to thereby confront future visions. This too was embodied in the online game design fiction space.

OCTOPA REGENERATED

Within OCTOPA's JOURNEY, there is a regenerative element of limb and holistic regrowth as choice in scenarios eventually return one to a different beginning, scenarios and problematics, building experience and critique together. Drawing on this aspect of the online NSR scenarios, OCTOPA REGENERATED is made up of three further reflexive and critically anticipatory

cyclical, adaptive and regenerative elements. OCTOPA's ability to turn herself inside out, and to refresh and alter her appearance and her survivability.

We have been concerned as to how to shift participants' experiences of working with what were inbuilt but unarticulated 'Amphibious Scales'. We have been concerned to engage participants in more than an experiential here-and-now use of the devices. A regenerative twist offers suggestions and prompts, troubling and unresolved questions and potentials application in actual projects, and beyond design, in times of uncertainty (Lindström & Ståhl 2016).

OCTOPA REGENERATED comprises three main themes underway. 1) To add the eight 'Amphibious Scales' to a newly hand drawn outline of the OCTOPA TOOLKIT. This re-kits the tool by adding the purpose of the individual or group design student or researcher or project to her head. Meta cognitive questions are marked out. Related themes are then added to the reverse side with a request to elaborate on the qualities in relation the aims or methods depending on focus and need. 2) To ask questions as to what each of the scenarios in OCTOPA'S JOURNEY asks an individual or group to consider in relation to a personal or joint educational or research design project. This too may be cross-connected to the 8 Amphibious Scales. 3). Such regenerative acts as just mentioned could be carried forward, directly and abductively as anticipatory design, to other domains of futures inquiry, such a policy and governance, participatory local decision-making etc.

On reflection, we see a need to motivate, facilitate and engage us all to look more deeply into the content and diversity of materials in terms of media and research and design, policy and geo-strategy that are embedded in the scenarios. By not adding a reflexive look behind the scenarios, from satire, irony and pastiche, we may miss attention a scale of underlying detail and an opportunity to discuss the scales themselves.

Importantly, this also related to delving further into to the layers behind scenarios and their seeming playfulness to sculpting matters of more serious critical play (Flanagan 2010) in an Anticipatory Design sense. The additional layers of mediated meaning making that on our own parts demanded intensive and diverse inquiry, from site visits, arctic sea journeys, immense online searches and research itself.

AMPHIBIOUS SCALES & DESIGN FUTURES

Anticipatory Design has immense work to do between the human and nonhuman, the tangible and intangible. The scale of our 'new normal' is populated by the COVID-19 virus that is invisible to our human eye and where infection may manifest in a loss of the sense of smell that may endure. Design needs to consider how we work with, through and beyond scales; we suggest amphibious ones may help us to do this in ways that are anticipatory in the sense of taking care ahead of time in a wider cultural, ecology of shared shaping futures. The multiscalar device OCTOPA has been taken up in critical research writing for troubling times (Morrison 2020) akin to reflections on 'futureCrafting' that motivates for narratives, and returns us to the classical Greek figure of the thoughtful octopus (Marenko 2020). This reminds us that we have been engaged in precisely such ventures and mediations, experiences and qualities of relational thinking, and a 'travelling of becoming' in arctic waters, islands, cities and a medley of discourses, historical, contemporary geo-political and imaginary.

Here we have presented a set of novel, contextually fashioned 'Amphibious Scales' developed out of design fictional experimentation and connection. The related projects projects also indicate some of the ways such scales may be imagined, motivated and generated.They could be mapped onto OCTOPA's arms and repurposed as to need, interest and propsects. The scales offer a set of flexible, generative and adaptive future facing concepts that are 1) *multi-perspectival*. They allow the positioning of views and responses to changing contexts of climate change and the Anthropocene and the 2) *indeterminate*. The contested nature of truth and design fiction allow exploratory work via 3) *counterfactuality*. A relational anticipatory design, needs to address 4) *mixed materiality*. On the rate and consequences of change 5) *multi-temporality* is an added dimension of the slipperiness of the given and emergent. Speed and movement shift us into unexpected situations in a 7) *poli-kinetic* scale. Amphibious Scales are nondualist between 'actors', senses, multimodalities and ecologies, thus 7) *pan experiential*. As the future is plural, we need a scale that allows it to be 8) *experienced plurally* in an anticipatory futures design view.

For Sack (2015: 68), 'The Baroque straddles the categories of the intellectual and the physical in the forms of delight and play.' She motivates for strategies that are purposeful, translational, actionable and diverse. We concur that it is the matter of *meraviglia* - wonder, astonishment, surprise - that needs to be incorporated in ways we build engaging speculative design futures projects and works, and imaginatively so. Hope and engagement are keys to dynamic, relational anticipatory design ontologies (Celi & Formia 2017) and change.

Octopa's several brains, munificent sensory tentacles, many armed simultaneous and directed movements (probe, secure, jettison, propel etc) present and facilitate a vocabulary of articulating potential thinking and acts of transformation. They also allow us to think through the role of scenarios and narratives as modes of agency and articulation that have potential to further interest in agency and engagement, for designers, by way of choreography and as mediated communication.

The 21st century Northern Sea Route has an imaginary, brainy, challenging and quirky creature in its multimodal and cultural water of the future, not a monstrous squid of the maelstroms of Swift's more Baroque oceans. OCTOPA's tentacles reach out towards us cognitively and imaginatively and tickle and push us into thinking afresh. They may jettison us into action and design futures that may be propelled by a multiple, distributed intelligence of multiple, networked, individual and simultaneously armed agentive acts of our own in shaping our learning, work and lifeworlds. OCTOPA's inversions, camouflage and mutability offer ways to motivate us to rethink relational scales of the Anthropocene and to act to adaptively change its futures today into ones for survivable shared tomorrows.

OCTOPA has suddenly re-appeared. Then with a squirt of ink she vanishes. We are left clutching the eight 'Amphibious Scales' in surprise, wonder and anticipation as we are returned to our present materialities and their situated contexts of designerly collaborations and imaginative shaping of futures in posthuman, post normal times.

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REVEALING WORDS FOR A DESIGN DEBATE: A DESIGN LEXICON CASE

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ABSTRACT

In Autumn 2020, the Belgian association Wallonie Design dedicated to promoting design published a call tender to define and illustrate more than 100 words used in design practice. This Lexicon aims to complete an existing set of internal mediation tools, developed by the association to better explain the potential and benefits of design to different stakeholders and to promote design by and for other professions. Inter'Act research lab of University of Liege specialized in design and architectural research conducted this two-months project called "the Walloon Design Lexicon". It was developed through a collaborative writing process, a call for illustrative examples and two workshops. Through these participatory activities, the scale gap between words and practice revealed other intern and inter-professional communicational scale issues. The debate on the words generated a precious knowledge on design practice and designers in a macro (design industry) and global scale (economy of innovation).

INTRODUCTION

Communicating design process and its creative nature is already an historically well-known issue (Cross, 1982). But considering the shifting nature of design, from objects to services (Findeli & Bousbaci, 2005) and even towards policy design (Bason, 2016), as well as the increasing interdisciplinarity and participatory approaches (Luck, 2018), communicating about design implies more than ever communicating towards an incredible diversity of stakeholders, thus calling for a real shared language.

The project presented here is an exploratory analysis of the results obtained during the "Walloon Design Lexicon" project. The Lexicon issued from this project is a context-based solution essentially trying to tackle design communication issues. It attempts to build bridges between different communities, publics and networks, but also through various scales of design, from product to policy.

Through this paper, we will focus on one particular workshop conducted in November 2020 with the local design community of the Walloon region in Belgium. The participants were invited to react to a selection of words and modify the suggested definitions, to better reflect their vision, practice, methods and tools.

The discussion generated during the process turned out to be an incredible generator of paradoxes, controversies and insights on design and designers' visions of their profession and relations to others. The results show different matters of scale when it comes to issues a) between designers; b) between designers and other professions; c) between design and the global context.

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These issues and scales unfold at the intersection of two worlds, the one of language and the one of actions.

After introducing the related literature and existing tools, we present the project context and its methodology as well as the knowledge produced through this project.

DESIGN, COMMUNICATION & LANGUAGE: SIMILAR BUT DIFFERENT SUPPORTS

The need to define and describe design is not new. Design communication is tackled by several authors for different issues. Among other works, we highlight communication within design teams (Eckert et al., 2000); communication with users and clients (Norouzi et al., 2014); explaining design (Cross, 1982; 2011; Zinna, 2020), and writing about and for design (Lees-Maffei, 2013). All these dimensions have a common point: the language. "For a collaborative future making, sharing a common ground is necessary" and the way toward such common ground is notably through language, and therefore words (Hillgren et al., 2020), among other media for communication.

Increasing adoption of design for innovation, transformation, problem-solving and transfer of best-practices generates the need to better understand its added value, methods, and tools. Often, it is not designers themselves who undertake such popularization initiatives to promote design, which makes this mission of demystification even harder.

On the one hand, considering for instance the divide between design and design thinking (DT), the latter became an autonomous entity when facing other fields and thus had to develop several descriptive and explicative tools, such as manuals, guidelines, frameworks and books. An important body of work (tools and methods used in DT) can thus be found (e.g., IDEO Toolkits; UK Design Council Toolkits; Curedale, 2012; Martin & Hannington, 2013). Although aiming for some "pedagogy" when communicating about design, its process, tools, and benefits, DT tools do not meet the communication gap between stakeholders.

On the other hand, the heterogeneous and plural growing practices in design force the design community (both in research and practice) to clarify its intentions too, notably through the use of its own vocabulary. In that regard, we can highlight several publications, starting with the work conducted in 2008 by the Board of International Research in Design, with the "Design Dictionary: Perspectives on Design Terminology". More recently, in 2020, the Collaborative Future-Making Research platform (Malmo University) also published a Glossary to create some common ground between platform researchers (Hillgren et al., 2020).

The "Design Futures Lexicon" recently published by Fuel4Futures research program particularly focuses on design education: "located in design and primarily for design" (Morrison et al., 2020). It offers a set of toolkits to build a bottom-up shared vocabulary with and for the local design community of Oslo School of Architecture and Design. Finally, we would like to mention the upcoming book of S. Vial, the "Vocabulaire du design" for the French community, who deals with the evolving anglicisms besides the heterogeneity of such a design lexicon.

Worth to mention, there are differences between these existing works and the Lexicon presented here. Among them, we underline: 1) the contextual use of some words in Wallonia; 2) the list of words that is separated not through the lens of methods and tools, but rather through the lens of actions and deliverables; 3) the end-users of the Lexicon are here primarily design mediators, who are not themselves designers and 4) the Lexicon will complete a set of tools used in action when promoting design to companies, as a support to innovate through their projects and development strategies. For these reasons and others, undertaking a proper design lexicon project was considered a legitimate request, in complementarity to the references listed above.

THE COMPLEX MISSION OF PROMOTING DESIGN

Wallonie Design (WD) is an independent organization who aims to promote design practices and methods as to increase sustainable and economic development of the Walloon Region and its companies. WD assists designers and companies at different levels, undertakes projects and collaborations with public local and European institutions, and improves accessibility to design.

In French and international contexts, we can compare it to the UK Design Council, Montreal City' Design Office, Danish Design Center or French Agency for promotion of Industrial Creation. The punchline of the Wallonie Design (below: WD) summarizes well its mission: "The hyphen between designers and companies". Thus, the WD team needs to master the culture and language of diverse professions, cultures, innovation strategies, public and private institutions services, in order to support design practice in the broader area of the labour market.

The team members (12) have backgrounds in management (4); project managers with art, design and architecture (4); human and social sciences (2) and communication (2). Even if they are acculturated to design culture and hold unique expertise on it, they are not themselves designers, as they openly mention. The increasing heterogeneous and complex practices in

design, going through important transformational dynamics, do not help the team overcome the gap they encounter in that regard on an everyday basis.

The team members therefore constantly need to question their understanding of design, designers, their tools and methods to act as mediators and better explain the added value, potentials and benefits that design might bring to the local ecosystem.

The request expressed by WD is i) to define 120 words separated into two categories – actions (50) and deliverables (70), and organised in seven design phases (see examples in Table 1 below); ii) to illustrate 70 deliverables with local design examples; iii) to undertake a participatory method (e.g. workshops) through the entire process.

Design Phases	Actions	Deliverables
Explore opportunities	UX	Ethnographic reporting
Shape the concept	2D visuals	Journey mapping
Study the feasibility	Benchmarking	Proof of Concept
Challenge the prototype	Useflows	Prototypes
Technical conception	3D Modelling	Technical plans
Prepare the project launch	Visual identity	User manual
Give Meaning	Co-design	Design specifications

Table 1: Examples of words extracted from the call tender (translated from FR to EN)

We would like to highlight here two observations, as to better understand the nature and construction process of the list of words itself. First, about the confidentiality of the word list itself: as part of the mediation tool, the selected words are part of the services offered by WD to its members. We have thus no possibility to openly share it.

Second, about the methodology through which the list was constituted: the list is based partly on other tools developed by WD, called IRL-D and DISC. The IRL-D (for "Design" version) is an interpretation and adaptation of the Innovation Readiness Level (IRL), itself based and inspired by The Technology Readiness Level (TRL) developed by NASA in 1974. This latter allows evaluating the maturity and state of a technological project. The "Design Innovation Support & Collaboration" tool (DISC) aims to explain and expose how design can contribute and improve project development through different phases. On basis of these two existing tools, WD worked with an external design agency showing service, social & public design practice to define and complement the list of words. Additional words were thus deliberately chosen for their link with user/experience-based design fields, rarely practiced in Wallonia, as a way to orientate the local community knowledge not only towards techno-centric understanding of design, but also towards global design practice transformations. In that regard, the lead designer told us that the list is thus the result of an intern collaborative approach, but not per se a participatory one including the local professional community. Also, they added some concepts that they invented to show the creative relation that designers have with language.

As eventually submitted to us, the list of words uses actions and deliverables as main categories, which reveals the very pragmatic nature of the whole approach. These existing tools complemented with the Lexicon are mainly for people who need to convince others about integrating design in their companies, why they should do it and how much they should pay for it. In the list we can thus identify words designating design outcomes, supports, methods, tools, competencies, techniques proper to the field, but also words from broader professional fields (e.g. consulting, benchmark, prospective, coordination and planification). Design as such is understood and exposed here in a complex, intertwined matter.

The Lexicon project is therefore related to a larger ecology of tools that WD uses to promote design in the local context. Such a global toolkit aims to improve communication and operate in a very pragmatic and intimate scale of understanding, language and speaking. The toolkit operates as "mediating object" as understood by Freach (n.d.) and Dalsgaard (2017). It helps WD workers explain and build design knowledge with stakeholders, according to their problematics.

This filiation between technology, innovation, and design (already imbued in the IRL-D and DISC tools) to promote design for local companies and industries undoubtedly shapes the list of words, its goals and impacts, despite the attempt to include words from social-oriented design fields. The majority of words is indeed rather associated with industrial design, and bears technological resonance.

This toolkit supports and sustains frameworks or helps evaluate projects of different scales through design. The Lexicon, as its latest addition, is thus not a solitary object. It is connected at an intimate scale to design in its essence, but linked more broadly to a global network of tools provided to other professionals who try to grab what design is about.

PROJECT METHODOLOGY

The mission was structured in three main phases, as illustrated in Figure 1. The first collaborative writing process was conducted between two researchers (architect and designer) to define and describe 48 commonly used or controversy words of the list, based on grey and scientific literature. As our main analysis is based on the data collected through the first Workshop (W#1) conducted with professional designers, we will develop only the parameters of the latter, as the data produced there was the most relevant, rich and meaningful one, regarding both the definitions' iterations and this conference thematic.

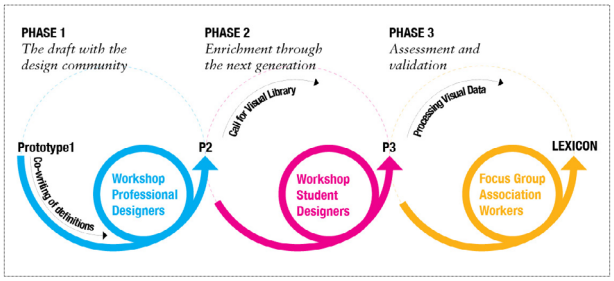

Figure 1: The project methodology to build the lexicon

This first two-hours online workshop was conducted on November 6th with 21 participants: 14 compensated professional designers recruited by WD; four commissioner team members; three public mediators who support technological innovation. First, seven groups of three participants were accompanied by an animator in a visual collaboration tool, presenting the selected definitions and a framework to modify them. We tested the structure, the meaning, the recognition of six selected words in each group.

This activity was followed with a second one, more open and half-controlled, as to explore the form, the use, the expectations and needs expressed in regard of the Lexicon, through a brainstorming and user journey tool (see Figure 2). This time four groups were constituted. Before, between and after both activities a general discussion was animated with all participants. At the end, we launched an online questionnaire to find illustrations for the words. Participant designers selected "actions" and "deliverables" that they would accept to illustrate through their design production. At the end of the project, 289 visual documents (.jpeg and multiple pages .PDF) were processed, archived, named as "action" or "deliverable", as suggested by the designers.

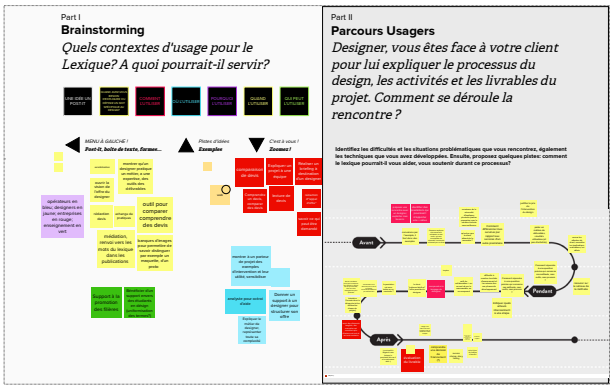

Figure 2: A screenshot from Workshop #1's second part (in FR)

RAW DATA & ANALYSIS

The data generated in the lexicon project turned out to be a fertile field to reveal insights on design and designers' visions of their discipline. We based our analysis on 1) video and sound recordings of the workshop session; 2) screenshots; 3) notes taken during the entire project process. We focus on 1) the content of general discussions before and after group exercises; 2) the discussion and reactions during activities in smaller groups; 3) the modifications done by participants; 4) discussions' content during the meetings with the commissioner.

RESULTS

What do "words" tell us about design? Considering the exploratory nature of this work, we highlight both singular and common manifestations of paradoxes, astonishments, controversies, reflections and interrogations that reveal enlightening insights on design and designers' practices.

We observed that the concerns lie in different pragmatic and philosophical dimensions, but they all revolve around three scales: 1) What happens inside the design practice itself, what happens in between designers and between design fields (product, graphic, interior, etc.); 2) What happens between designers and directly connected professional bodies such as mediators or technological innovation agents; 3) What happens between design fields and the global economy, such as industry or innovation.

We will give an example of each scale, but also add other insights that were identified. As we are in an exploratory stage of the data analysis, we can also expect more heterogeneous results connected or not to those scales.

DEFINITIONS SEEN AS AN ENEMY OF FREEDOM

On the one hand, there is a need to name and describe things. On the other hand, describing designers' activities through language and words disturbed many participants. In regard of design practice itself, and as a whole, the lexicon has been first seen as a liberticide act against designers' freedom when establishing their relations with their clients. This was felt both by the dominant category of designers (product designers) and other, more isolated representants of design (graphic and service). They all pushed for more undefined, vague and general description without too much precision. A constructive way to resolve this issue was found by not "defining" but by "describing" the "actions" and "deliverables". The aim thus became to not describe the outcome, but rather describe what it is for, the objective or the benefit of it, i.e. not focusing on meanings but added-values. In the long run, the designer or WD employee indeed needs to explain what design brings, why paying for specific deliverables or activities.

The gap between graphic and product design became more tangible when looking at the words themselves. For example, some designers used "mock-up" and "prototype" interchangeably, while others never used some of the words and refused to be strongly associated to them. Trying to find some "universal" definition for those words was also perceived as a liberticide act, this time against the specifics of each sub-field.

Eventually, instead of finding systematic consensus or some collective understanding for each word, we observed that the debate rather allowed and contributed to community building as secondary outcome, as it is often the case in such participatory activities. The workshop thus rather contributed to ease and decrease the scale-gap still existing in between design sub-fields.

THE END-USER DILEMMA: THE (IM)POSSIBLE SATISFACTION OF MULTIPLES USERS

The lexicon is first intended for the use of WD team members when approaching companies and other stakeholders who wish to include design and designers into their strategy. This crucial, concrete need implies to define the actions undertaken by designers and the nature of their productions in a pragmatic way. Yet, to be considered true and faithful to design practice, the lexicon should also be recognized and supported by the practitioners. It should reflect and remain connected to the design community, while serving the culture and language of other professional communities. Both approaches are essential for the success of the tool, and yet somehow conflicting.

As previously stated, designers felt danger for their freedom if their actions and deliverables were too precisely defined. However, defining words in a very broad and conceptual manner is of no help to mediators. It risks to turn the lexicon into some purposeless list of words and make it useless. In the workshop, we thus observed a lack of methodology or a missing step, as to first increase designers' empathy towards people who need to communicate *for* design. We attempted to solve this issue by creating layers of definition: a first short general sentence explains the aim of each action or deliverable; it is followed by a more consistent and practical explanation on broader applications. We added when needed a third layer of text to inform about the controversies and different uses of some vocabulary. This second scale illustrates the challenges, through the words, of connecting sub-fields of design to other communities, directly linked to their practice.

DESIGN THROUGH ACTIONS AND DELIVERABLES

The list constituted by WD is separated into actions and deliverables and includes design outcomes, supports, methods, tools, competencies, techniques proper to the field, but also words from management, prospective studies, ethnography, innovation culture, so on. This tentative to explain design through words classified into these two categories can wrongly echo to another existing controversy debate: design versus design thinking. In the lexicon case, the design is not separated solely into methods and tools. It is understood and reflected about in a more complex way. The objective is clearly to promote design and designers WITH their approaches, competencies, and ways of doing and WITHOUT disconnecting them from other professional actions such as management. This approach articulates design in dialogue with global context and workflows.

The debate revealed that participants still hold a strong attachment to a very personal way of practising, the need to remain flexible and to adapt according to the client, to change and adapt tools and methods, to invent their own words… During the workshop, designers explained that any explicitation step is done during meetings, phone calls, project presentations. In short, it is entirely based on the designer's communicational and relational competencies and thus not require any additional Lexicon. According to one designer, the duty of each designer is indeed to make its supports understandable and intelligible; as such, "the designer did his/her job wrong" if the client needs an additional lexicon. Identified as it is, it sounds like the classical design practice: according to this viewpoint, without a designer, clients and external stakeholders quickly reach their limits when comparing quotations, prices, deliverables or when trying to make sense of design as a whole. This can be seen as an idealist and controlling conception of the collaborative workflow of design, as it dispossesses other professionals to build an

empowering, balanced and rich dialogue with designers. The debate revealed another tension. For some designers, design is presented as a very complex process, but in their practice, it is much simpler and mainly based on human relations.

DISCUSSION

We observed how words became the field for design debate. Naming and defining actions and deliverables undertaken by designers triggered reflections about multiple scales of connection, to their own practice, to other designers, other professions and the general world view of design. Words, the design vocabulary, are also designers' tools, and are considered their properties. The use, the meaning and the content they attribute to them are very personal. This singularity even reflects the plurality and richness of the practice, but doesn't overshadow the need for understanding and communication with the rest of the community.

Our exploratory observations reveal how personal scale of practice and conceptualizing one's design profession becomes an urgent, even though challenging task. The three scales of design communication (between designers, designer's verbal relationship with their client and other professionals, and communicating design without designers in a more global context) reveal also the dynamic dimensions of design vocabulary. The words' choices are context- and person-based, and even invented. Even though a lexicon itself might not address such intertwined communication and vision issues, it will directly feed some common ground of shared concepts, avoiding some misunderstandings about sometimes complex concepts, and thus hopefully avoid the potential erosion of professional relationships.

Beyond its content, the lexicon, as a concept, generated valuable debate on design communication and improved awareness on different stakeholders' communication needs. Thereby it shifted from a design outcome to a design debate tool, prone to explore these communicational issues. In that sense, we argue that further research is needed in this field through pragmatic tools such as lexicons but also through participative activities, as to explore other ways of addressing these communicational issues and as to improve empathy between different professional communities, but also design relations to different scales of ecology.

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TRANSITIONAL DESIGN HISTORIES: PRESENT-ING HISTORY IN DESIGN

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ABSTRACT

In design, the big questions are typically not where we come from, but where we are heading. History, thus, rarely has a prominent place in the understandings of how, or why, design is done in certain ways. Yet, the methods, processes and ways of thinking that shape contemporary design practices have come about over time, and are thus historically constructed. This paper argues that making visible – present-ing – the historicity of designing is crucial to making visible mechanisms that work on a conceptual level of design, and that need to be addressed in the re-framing and development of emerging design approaches and practices. Taking Scandinavian user-centered (industrial) design as an example, I suggest a shift in scale and perspective for making design histories that contribute to present-ing historically formed concepts and ideas in designing. This shift of scale can provide a provisional and propositional scaffolding to activate an awareness of how – and why – designing has been formed over time. Making histories of designing that start on the scale of concepts, can highlight contexts, practices and approaches that expand contemporary understandings of what design might become.

INTRODUCTION

Industrial design is oriented towards the future, envisioning and proposing things and actions aiming to bring about changes perceived to be 'better than' or 'preferable to' existing situations. In this kind of projection, the outlook of design is placed in present-day contexts. But the present is not only the starting point for taking off towards what is to come. It is equally a condition and a context shaped historically over years, decades, centuries, and millennia (Hendon & Massey, 2019).

The scale of time frames the outlooks of what we humans can envision of what is to come; the near or far future. Where we find ourselves, how we understand the world, the material structures that support our everyday lives: All of this has been shaped over time. The scales of time in industrial design, however, do not often stretch towards the direction of the past and the long trajectories of historical time. That perspective, instead, pertains to the field of design history.

While industrial design has its outlook honed towards the future and design history gazes towards the past, they both share a common ground in that their respective queries spring from challenges in the present.

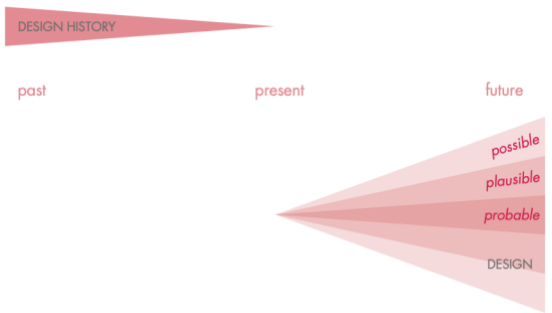

Figure 1 (adapted from Hancock & Bezold 1994): The cones of the past and of possible futures from the non-aligned outlooks of design history and design.

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The above illustration of the disconnect between design and design history, is based on how the 'futures cone' is often used to describe the relationship between present situations and the futures possible to envision. From design's point of view, the line of vision opens up towards a range of futures, more or less probable, that could be made to come about through proposals and interventions made through acts of designing; through practice. Design history's outlook tends to sit in relation to design understood as a product or result of designing. This in no way means that design history only engages with 'objects' – its scope is much wider than so. Contemporary design history critically questions both present and past understandings of design, and it does so with regard to investigating what has been regarded as practices of designing, how ideas of design have been mediated, and how consumption and everyday practices have formed understandings and meaning-making in the field of design.

These diagrams build on taxonomies established in futurology, taking on the form of a cone that expands and broadens from a point in the present towards futures that range between probable, possible, potential and preferable (Henchey 1978; Hancock & Bezold 1994). Depending on choices made and actions taken in the present, the idea is that the line of vision opens up towards a range of possibilities, among which what is 'preferable' can be called into question in different ways. These cones of potential futures have become fairly frequently used to visualize and critically discuss how to handle complex issues of possibility and preferability in relation to futuring (Dunne & Raby 2013) and de-futuring (Redström 2017) in design. In these projections, however, the past is all but invisible.

My proposal is that history would need to be made more present in designing, and that this opens up spaces for thinking otherwise about futures in terms of possibility and preferability (Abdullah 2017). This present-ing of history can speak to to temporality, extending explorations of designing in time to considering time in experiences and impacts of design in scales of everything from seconds to centuries (Hendon & Massey, 2019). Another way to make history present would be to go about the making of design histories with the aim of drawing forth the historicity of design itself: of the ways of thinking and working that are so fundamental to ideas of what design 'is', that they are more or less taken for granted. These design histories do not aim to describe what design is or has been, but instead aim to probe what design could become if we could think or approach it otherwise.

Present-ing history in design through investigations of core concepts that frame and ground much of contemporary design practice and design inquiry, two things follow: One is that other events, situations, things and contexts will be highlighted as relevant to understanding design in the present. The other is that such design histories are transitional (Göransdotter 2020), in that they scaffold other outlooks on contemporary issues in design through re-framing the outlook of design history from a conceptual level.

HISTORIES OF WHAT?

When industrial design once was called into being, much attention was focused on questioning what things should look and be like, and what the relationship between designing and production should be. With time, a wide range of methods, tools and processes for designing have been developed to allow industrial design to take on challenges that changes in materials, technologies, and societal structures have brought to design and to the situations in which designing takes place. Throughout these transformations, designing has always been about making things as much as about developing ways of designing that support handling changes in the present and proposing alternatives and futures that could be both possible and somehow also preferable to strive towards. (Sanders & Stappers 2014).

Questions of what designing can be have thus increasingly moved towards issues of process and practice. In developing theories and practices within designing, this has shifted the emphasis to *how* design should be done – in which constellations, with which methods – to support transformations, rather than beginning with questions of *what* design results or design objects should be like. How, for example, do situations of designing relate to situations of use, and how would open-ended processes of designing work, where there might be no definitive beginnings or endings of design projects or no clear boundaries between 'designers' and 'users'? (Giaccardi & Redström 2020; Le Dantec & DiSalvo 2013; Björgvinsson 2008).

The purpose of making design histories from the viewpoints of contemporary core concepts in designing is therefore not a matter of tracing the geneaology of the design profession, of certain methods, or of specific ways of working in designing. It is more of an archeology of ideas and approaches that have shaped the methods, tools and processes introduced into designing – investigating the contexts and situations that have called for establishing certain ways of doing design. Framing design histories in light of the historicity of how contemporary design concepts have emerged and become established provides a scaffolding for seeing other potential futures (Hunt 2020). Following Hunt's proposal of a scalar framing that opens up new perspectives and possibilities of addressing a problem or situation, when changing the scales design historical studies, the questions posed will change, as will the conceptual spaces that become visible. From a perspective of investigating how core concepts and

foundational practices have entered and formed designing, the inquiry becomes redirected from what it is that design makes, to questioning what it is that makes design.

HISTORIES FROM WHERE?

As industrial design has shifted and expanded its field of interest towards inquiring into processes of designing, the orientation towards design understood as products is still quite prominent in design history. This does not mean that design history is only interested in objects or things. Indeed, critical approaches in design history open up for understanding design things and design practices in relation to contexts of the past as well as in light of present-day issues with regard to production, consumption and mediation, and to processes of the creation of meaning and value. (Julier et al. 2019; Margolin 2015; Maffei 2009).

Handling complexities in various ways in order to find a space from where to aim for a preferable future, is at the core of design. Thus, inherent to design are fluid and changing approaches to its own practice as well as to the definitions of what 'design' can be. Johan Redström (2017) has proposed approaching definitions of 'design' as a fluid and continuous spectrum spanning between what 'a design' could be to what 'designing' is understood to be. In this spectrum, or scale, ideas and definitions of what design 'is' work simultaneously and interconnectedly on different levels: from particulars, such as products, to the scale of paradigms formed and forming certain ideas and world views of design that are more or less expressly articulated as 'universal' or 'general'—not in the sense of being universally valid, but in the sense of having a strong impact on and central position in understandings of what designing is about.

Figure 2 (adapted from Redström 2017, p 39): Design understood fluidly, as a spectrum ranging between the particular and the general.

My point here, is not that design history would deal only with objects – but rather that design history often looks towards the past from an object-oriented *position*. The questions design history grapples with critically engage with matters of design in terms of meanings and concepts, practice and profession. It does so from positions of questioning, amongst other, what design things might be, and what kinds of understandings of design could be sparked from considering things differently – or different things – in making design histories (e.g. Attfield 2000; Fallan 2019; Huppatz 2020)

In much of current design research and contemporary design practice, the outlook from which questions are raised and probed is predominantly one that is *positioned* in designing as practice: By means of what kinds of methods could design address complex contemporary and emerging challenges? What would design processes look like, to allow working from a non-anthropocentric standpoint?

As design situations change, the ways designing is done also need to change. With design moving into other fields than those from which it once sprang, questions arise that at once radically and gradually will affect the core concepts in design. What is it to work with 'form-giving' – one of the very foundations from which designing has sprung – when 'form' becomes intangible, experiential and temporally fleeting rather than material, physical and lasting? Or, in a design approach such as user-centered design: how should the designer's intent weigh against users' influence on design decisions? How should design situations be set up to open up for broad participation in designing and use by not only 'users', but for broader understandings of stakeholders and situations before, during and after designing taking place?

In design's transformation, there has over time been a continuous development of methods, processes and concepts in designing that are anything but stable over time. In making histories that speak to this changing character of design and designing, there a stable definition of design would not be the starting point. Instead, the outlook of design history shifts to a position that takes on view-points of concepts and ideas that shape the ways designing currently is done.

This way of thinking of 'design' is "not to be read as a shift from design as a thing on one end to design as activity on the other, but rather as the span between a distinct outcome and the overall effort that produces such outcomes." (Redström 2017, p. 39). Instead of contributing to accounting for past practices that could affirm or dispute definitions of design and designing, the scope here is to make histories that contribute to expanding the conceptual spaces of thinking and doing design.

By shifting the outlook of design history from product to process – from things to thinking – foundational concepts and central methods in design become key to explore. This shift of position, in which design histories can provide a sort of provisional and propositional scaffolding (Hunt 2020) that activates an awareness of how – and why – the ways we design have been formed over time. Transitional design histories aim to engage in a continued re-positioning of perspectives on what is

perceived as relevant, and difficult, in present design situations.

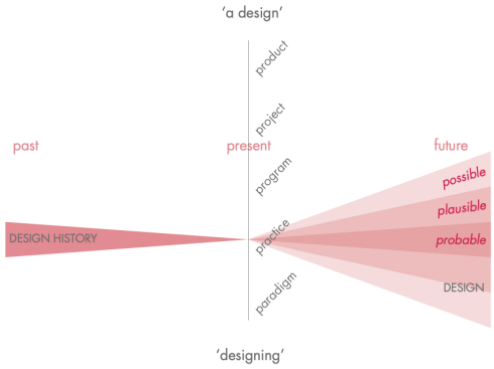


Figure 3 Bringing toether the outlooks of design history and design.

WHERE WE STAND, WHAT WE SEE

When transitional design histories are made from other perspectives, from designing, what seems relevant for us to pay attention to in the past will change as will the methods applied to probe new aspects of making histories. The 'transition' intended is thus not meant to be a passage from one clearly defined state or practice to another, or from a 'now' to a 'then,' but something more akin to a quality or a logic in how this sort of history proposes to work.

The above illustrations of the cone of potential futures and its relation to the histories of design are built around the idea of gazing in a certain direction, from a particular point that gives a specific perspective allowing some things and not others to come into view. Taking a perspective on something has to do with several things: Where we place ourselves in order to look at something, what we use to help us look. A perspective, historically, was a sort of telescope – something to look through that made it possible to see distant things up close. What a perspective enables us to see and how we then represent and handle that which was previously hidden from sight, varies depending on what types of lenses we apply.

What is possible or not to see depends on how wide or narrow the frame of vision becomes when applying a perspective, and where the focus point of the perspective as lens lies. As the intention of transitional design histories is to contribute to critically exploring what design could become through activating an awareness of design's historicity, the shift in perspective here consists of applying historical lenses from a position in contemporary designing, shifting both frame of vision and focus in regard to what sorts of histories to go looking for.

From a position in present-day designing, looking to the past through the lenses of core concepts and methods in current design, this will bring into view ideas, practices and contexts within cultural and societal agendas that not only have allowed but perhaps also pushed for certain types of design practices to take form (Göransdotter & Redström 2018). But we might also see what that means for the limits these ways of doing design carry with them in the situations they are expected to address, and in terms of the norms and values that shaped them and that now might be perpetuated through design.

PRODUCTS AND PRACTICES: AN EXAMPLE FROM SWEDISH USER-CENTERED DESIGN

What would change, then, if one were to shift the outlook of design histories towards practices rather than products, working with illuminating core concepts in contemporary designing? To give a very brief example, let us consider the user-centered design approaches that have held a strong presence in the Scandinavian industrial design context that I am a part of, and how histories of these have so far been narrated.

Considering that user-centered design has had a quite substantial impact in Sweden – and in the kinds of designing that have continued to build on approaches of 'Scandinavian user-centered and participatory design' – it might be somewhat surprising to note that Swedish design histories do not to any prominent extent include narratives of user-centered design. While collaborative and user-centered designing brought about the exploration and invention of new methods and different processes in design, the considerations of what that meant for developments in designing are relatively invisible in a Swedish design historical context.

Even in cases where the "common knowledge" is that the period between 1960 and 1980 was one when designers increasingly begin to develop new methods for understanding and working with users, the processual, conceptual and methodological perspectives on design as design*ing* are rarely present. While ergonomic or design-for-all-aspects are indeed included in some in Swedish design histories, the focus is rather on the formgiving of products that came out of these processes, and not on methods development of collaborative designing or what that meant for changes in design practices.

At design consultancies such as Stockholm-based Ergonomi Design Gruppen, explorations of new methods for designing together with people emerged in the late 1960s and early 1970s. The work carried out,

for example, together with 'disabled' people in the development of different aids and tools, led to the introduction of user-centered methods in designing tools also for professional use. In the mid-1970s, a series of screwdrivers was redesigned with a starting point in ergonomic user studies and interviews with people working professionally with these tools. Using video filming, different work situations were studied and analysed, and iterative prototyping then took place together with users in regard to grips, torques, and handle sizes.

This way of working with users at Ergonomi Design Gruppen is described by Swedish design historian Lasse Brunnström as a "tangible work method with consumers as co-creators in the design process [that] shall be seen as a further development of the 1940s Swedish tradition of consumer research." (Brunnström 1997, 302) While noting this longer historical trajectory of the emergence of new design methods, the shift in design practice brought about in working with users is not further highlighted in this Swedish design history publication, besides stating that it has "given exceptionally good results, but at the price of both time-consuming work and high costs." Risks with the process are noted, such as designers possibly nudging "test persons" in desired design directions, or that the methods might entail the designer abdicating from "design responsibility and simply give people what they want". (Brunnström 1997, 321)

Similarly, design historian Kerstin Wickman also does bring attention to the rise of ergonomics in Swedish industrial design in her history over the design consultancy A&E (Wickman 2018). Against a background of the crafts-based and traditional Swedish design education of the 1950s and 1960s, she highlights the dissatisfaction and critique among young designers that surfaced as critiques of the roles of designers in relation to social responsibility. While the publication does pay a good deal of attention to design processes from the perspective of form work, and different stages of iterative prototyping of products in relation to ergonomics, materials and production techniques, there is hardly any mention of what the new user-centered methods for designing entailed.

Overviews of Swedish industrial design point to the 1970s turn towards 'design for the disabled' or 'design for all' as important for establishing ergonomics and inclusion as central aspects of Swedish design. Examples presented are mainly everyday utensils such as knives and forks designed for disabled persons, and screwdrivers or other ergonomic hand tools for professionals. Products tend to be described as things in which the aspects of "function" and "aesthetics" came together, for example in "handicap adapted products", which would make these suited to "everyone". With the focus on design as products rather than as process, in the turn towards 'design for all' these are presented as designers' reactions to broader societal issues and discussions on equality, democracy and critiques of consumption. Simultaneously, and perhaps sometimes more explicitly, the formal qualities of these designed object are emphasised from a perspective of their having been "awarded design prizes and are exhibited in design museums around the world, not least because they, besides being ergonomically functional, have had a beautiful form." (Brunnström 1997, 321)

In the focus on design as materiality, as actions of continuity and disruption in form, design's history is largely approached from a form-giving point of view. In these Swedish design histories, the changes in process and perspective in designing brought about when developing methods for user-centered design is, at best, touched upon in relation to ergonomic design and design for all. Overall, what comes across in this historical account is a strong emphasis on the role that work-life ergonomics, safety and security perspectives and design for disabilities have had on Swedish design. This is of course a valid account in many ways. The innovative design and engineering work carried out in this context are undisputable – but in telling the story in this way, a blind eye is turned to what contexts and design situations have brought in terms of opening up new spaces for design, and new methods and practices through formulating ideas of 'design' and 'use' through practice. How ideas of 'use' and 'users' have entered into design practices, adapting methods, tools and processes brought in from other fields into the realm of designing, will not very easily be visible in histories of design that have the main emphasis on design as result or product.

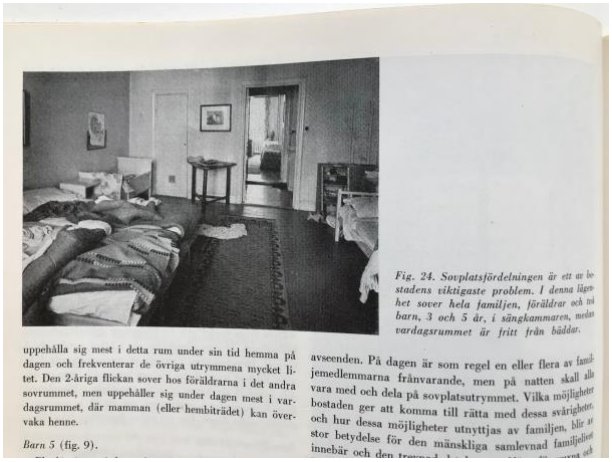
As research and approaches in user-centered and participatory design have continued to evolve, one of its core concepts seems to have become increasingly difficult to handle: that of the 'user'.(Ahmed 2019; Ebbesen 2019; Redström 2008). In participatory user-centered design, conceptual difficulties also emerge when collaboration in designing take on formats that blur the boundaries between 'designers' and 'users' – not only in terms of roles, power, expertise and accountability but also in terms of non-human agency in designing (Forlano 2017).

Despite, or perhaps because of, its centrality to many methods and orientations in design, who or what a 'user' is in regard to roles and agency in designing is not at all very straightforward. As design moves into situations that are not clearly defined as to when designing starts and ends, the 'use' designed for is neither easily attributed to a single context, a stable technology, nor to a readily defined type of profession or group of people. Who the 'user' might be, what 'use'

will entail, and how it might change over time is, therefore, becoming increasingly hard to say.

At the same time, many of the methods and tools adopted within user-centered designing continue to form central components in emerging practices that aim to challenge generalizing, instrumentalist and anthropocentrinc ideas in 'user'-centered designing. Design histories that could support shedding new light on the historicity of conceptual components embedded in ways of thinking and doing design, therefore, would need to engage with design*ing* in order to probe what this means for shaping or limiting emerging practices.

Shifting the outlook towards histories of user-centered Swedish design from a perspective of practice, I have previously explored what might become visible in applying the concept of "use" (Göransdotter 2020, 135-201). In a study of 1940s Sweden and the programme of designing a new type of welfare state – materially as well as ideally – I investigated how the concept of 'use' emerged in so-called dwelling-habit investigations.



uppehålla sig mest i detta rum under sin tid hemma på dagen och frekventerar de övriga utrymmena mycket litet. Den 2-åriga flickan sover hos föräldrarna i det andra sovrummet, men uppehåller sig under dagen mest i vardagsrummet, där mamman (eller hembiträdet) kan övervaka henne.

Barn 5 (fig. 9).

Fig. 24. Sovplatsfördelningen är ett av bostadens viktigaste problem. I denna lägenhet sover hela familjen, föräldrar och tre barn, 3 och 5 år, i sängkammaren, medan vardagsrummet är fritt från bäddar.

avseenden. På dagen är som regel en eller flera av familjemedlemmarna frånvarande, men på natten skall alla vara med och dela på sovplatsutrymmet. Vilka möjligheter bostaden ger att komma till rätta med dessa svårigheter och hur dessa möjligheter utnyttjas av familjen, blir av stor betydelse för den mänskliga samlevnad familjeliv innebär och den

Figure 4. A 'voluntary overcrowding' illustrating a mismatch between intended and actual use, from a dwelling survey conducted in the early 1940s and published as *Bostadsvanor och bostadsnormer* (1964). A family of 4 all sleep in one room, while the parlor remains un-used on a daily basis.

These were studies of ordinary people's everyday life conducted with the aims of improving the design of dwellings as well as the design of furniture and household objects. In surveys, interviews and observations the interiors of Swedish families' homes were documented in writing as well as in images and plan drawings, and the main question of the surveys revolved around 'use': How and where did people sleep, eat, do homework, listen to the radio, carry out chores or just spend time together? What kinds of things did they have in their homes, and how were they used on a daily basis?

The concept of use, as approached in the context of dwelling surveys and home reform, was formed in a historical situation where the explicit intention was to enable certain ways of using the home, while disabling others, through design. Simultaneously, active efforts were made to shape the ways people lived on an everyday basis by initiating broad educational programs that targeted the consumption of certain things and specific ways to use them. This goes both for the instrumental or rational use tied to enabling or fostering a particular individual behaviour in relation to specific things or environments, and for a more collective and systemic design program aiming to bring about new norms, practices and socio-material (infra)structures that would support new ways of life.

The case study of applying the concept of 'use' in making a transitional design history of 1940s home and furniture design provided a backdrop for the understanding certain mechanisms that shaped the latter emergence of Scandinavian user-centered and participatory design. Articulations of ideas of 'use' and 'users' in design came forth in activities aiming to address housing issues and reforms of everyday practices. In this process, the tensions between design intent and real use came to be explicitly considered and addressed, in ways that might also provide entry points to reflecting on how to negotiate the inherent tensions between ideal and real, potentiality and actuality, embedded in concepts and methods associated with contemporary user-centered designing.

Applying the concept of 'use' in design not only requires attention to the process and future proposed situations of design in regard to the expectations or limitations envisioned in future use. Going back to the historical contexts in which ideas of 'use' became important to address in the process of designing, one can argue that the concepts of 'use' and 'user' will most likely always come with embedded understandings and mechanisms of intentionality and limitation in regard to what 'use' can be. Rather than trying to find ways to upheave or dismantle perceived problems associated with dichotomies such as designer-user, or intended use-actual use, we might approach these inherent conflicts historically embedded within the concept of 'use' as that which might make it possible to create openings for thinking and doing things differently.

PROTOTYPING HISTORIES

One way of scaffolding an awareness of design's historicity, is through approaching design histories as suggestions for a way of seeing design rather than as accounts of what design actually is or has been. This means that design histories, as sketched in the very brief above example, can be made and handled as prototypes in a way similar to how prototyping is applied in iterative and explorative manners in design and design research. Following this, histories made as prototypes must be open, possible to adjust and change after trying them out, but still solid enough to be able to provide a

certain functionality or experience that allows for specific aspects of an idea or a proposal to be investigated.

Prototypes can be made in different degrees of fidelity and finish, choosing materials and assemblies to make them look or work similarly or the same as a finished version would. The prototypes made in this study were made to look and work as histories, as historical representations. That these prototypes have worked as histories seems reasonable enough, but the question is if they work as transitional design histories? For that to be the case, these histories would have activated an awareness of design's historicity in designing, provided openings towards thinking and doing design differently, and also themselves be open to shifting and changing as designing changes.

Taking historical perspectives on concepts and methods at the core of designing today, it becomes clear that design's foundations are not all that stable as they sometimes might seem to be. (Redström 2017) What also comes across, is that ideas and practices have come into design at certain points in time that have contributed to forming embedded concepts and methods that design still uses, but without there being an awareness of what this historical layering implies for designing.

The proposal that design histories should be made as prototypes that are open and changing largely springs out of an attention to the conceptual foundations of designing and their inherent instabilities. Since design is directed towards change, and based in conceptual foundations that themselves are fluid and unstable, design histories that aim to support such change must also themselves be unstable and open to change. This means that transitional design histories will need to change in relation to designing, in response to what the conceptual foundations seem to be and how activating an awareness of design's historicity could open up for seeing certain situations and practices differently.

INSTABILITIES AND POSSIBILITIES

Turning a historical attention towards designing, and using concepts as lenses for the analysis, central concepts in design can come actively into view as not only 'being there,' but actually 'having become' what they are at certain points in time, and over time. With time, however, they change form and shift meaning, as ideas proposing new understandings or practices play into defining the concept. Activating the historicity of designing thus also activates the instabilities that design necessarily has to work with, if the ambition is to not only replicate the existing but to make possible understanding how designing could be something different.

Approaching design histories as transitional aims to highlight what it could mean for design that several of its core concepts – use, participation, and even the concept of 'design' itself – are anything but stable, temporally as well as situationally. As design moves in different directions, the outlooks from designing towards relevant histories also changes. In working with instability rather than solidity, questions rather than definitions can support in finding historical instances that shed light on why certain aspects of designing are difficult to handle given the concepts and methods we have at hand.

Through histories that address the historicity of designing, values and world views embedded in design's foundations can be drawn forth in terms of their capacity to respond to issues at hand. In order to work towards doing design in ways that make other futures possible than ones that are visible from our current perspective of practice, design's conceptual foundations will necessarily need to change. In tackling issues of living together, sharing resources and making decisions in ways different from those that have been guided by the logics of progress, industrialism and consumerism, design needs to change (Escobar 2018; Fry 2019). For this, the frameworks and world views governing how design is understood and practiced also need to change. (Willis 2006). An awareness of design's historicity can open up other understandings of what is made possible in design – in terms of proposing changes of how design could be done differently.

In contemporary and emerging design practices that emphasise the need for design-driven change towards more sustainable futures (eg. participatory design, transition design, design for social innovation), a foundational idea is that power needs to be redistributed and renegotiated on global as well as local scales of designing. Transition design, for example, aims to change postures and mindsets, activating participatory design practices in new ways of designing that can support behavioural change on individual levels as well as systemic and values-based changes in order to create conditions for a sustainable and resilient society. (Kossoff et al. 2015; Tonkinwise 2019; Irwin 2019) The perspectives applied in transition design bring together multiple disciplines and practices, emphasising that transitions towards sustainment are complex processes that take time – and that fundamentally need to actively work with changing ways of thinking. These are by no means easy things to address. Bringing the historicity of design concepts to the fore will not in any way resolve these difficulties. But what it can contribute with is an awareness of how such negotiations between prescribing and making possible, limiting and opening up designing, have been formed historically and how the historicity of these concepts is at work in contemporary and emerging design practices.

Different complex design decisions and programmatic ambitions will necessarily bring about conflicting agendas on both practical and project levels when we try to design differently. Over time, as other design practices emerge, the design histories that resonate with these will also need to change if they are to be meaningful for design. From what we see and where we stand, then, practices of designing will probably call for yet other histories. In some parts, they will build on previous design histories: in other aspects, the histories we make will need to be completely different in order to contribute something for design – and also to the histories of what becomes design. Activating historicity in design through the making of transitional design histories aims towards opening up conceptual spaces for thinking and doing design differently.

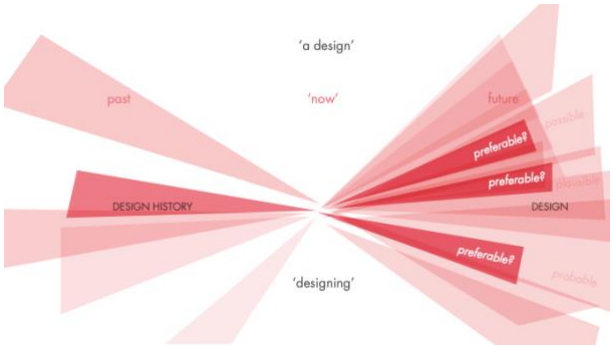


Figure 5. Different perspectives in the present, connecting to various trajectories of possible pasts, make many potential futures visible and can highlight questions of what is preferable for whom, for what, and for what scale of future vision.

These other outlooks can in turn make it possible to think and see in directions that open up for other potential futures. In this, transitional design histories that work as prototypes help us to understand how our present once might have been an unthinkable future. Activating the scales of temporality, where the past and the future are enmeshed in the present makes a difference for how possibilities in design are envisioned. What might have seemed unreasonable or less-than-plausible routes to take towards the future, can be re-considered in the light of historical time, from conceptual perspectives.

PASTS, PRESENTS, FUTURES

History is made by people. We make it through the way we choose to remember the past, and how we choose to tell stories of it – which is often that which we think of as 'history'. But we make history in many more ways than that. Everything we make and put in the world becomes history that shapes our ideas of the past as well as our understandings of the present. How we think, how we behave, how we relate to each other – in short, how we live our everyday lives and how we make sense of the world – is thoroughly conditioned by the historical materiality of what we have around us.

As Clive Dilnot (2015) has pointed out, we now find ourselves in a situation where human activity has brought about a state where it is the artificial that conditions existence – human as well as non-human. But design is not only – or even primarily – about making things that take on material presence in our lives. Even more, design is about proposing that things could be otherwise. It is about proposing that we could do things differently: there could be other things that support us living our lives, but above all, there could be different ways to think about what it means to live life.. The ways of living that we can envision are dependent on where we stand, and what we can see from that point of view. If we are to make it possible to see other things, think other thoughts, propose other futures, we need to move to other places that allow for other lines of sight. Purposely re-forming design on the scale of its categories and concepts, could open up new conceptual spaces for actually making different futures both visible and possible.

With this, then, the proposals for what to take action on in the present, given different trajectories possible to discern from the past to our 'now', will also be different. This view continues to change as design's contexts, outlooks, practices and histories change in relation to each other. Different pasts lead to different presents, from which the perspectives on potential futures can be turned in several different directions, depending on where we are able to find footing stable enough to provide a different outlook.

In activating design history in the drawing up of trajectories towards possible futures for design, comes responsibilities of ensuring that the outlooks towards pasts as well as towards futures encompass as many aspects as possible. Even if we cannot unmake what has once been made, we can at least do our best to avoid repeating or reinforcing structures and attitudes that further ways of being we actually wish to leave behind. To not end up following trajectories that lead towards defuturing, increased unsustainment, or continued inequity and inequality, the past trajectories that point in those directions need to be challenged through finding other possible histories that re-direct the paths visible to take from here. The futures possible to discern from situated understandings of the present, of the 'now', depend on where that 'now' comes from. The more present positions from where to see different pasts, the broader and more divergent the outlooks towards the future can be. Activating different histories will expand and make a bigger 'now', needed to propose plural potential ways of moving towards other design practices.

HISTORICITY AND POSSIBLITY

The ways designing is done – and by/with whom – will necessarily change, as will the outlooks towards what could be relevant histories for making preferable futures (Lindström & Ståhl 2016). And as design always takes place in the present, in a 'now', the future previously envisioned will eventually become a new 'now'. From there, what becomes visible – in the past, in the present, and as potential futures – will lead to yet other probings into the conceptual foundations of designing.

Even if certain of the foundational concepts in design might seem stable and constant, and even sometimes a-historical, they do change over time – and they *can* be changed. Through present-ing assumptions and ideas that form these conceptual spaces for designing, it is also possible to address aspects of historicity of the very ways of thinking that guide the choices of what to do, and how to do it, in design.

What it is that we take for granted and what we challenge in design differs depending on the scale and scope of what we make visible in the process. If the conceptual foundations on which design methods and processes are built begin to increasingly be in conflict with emerging understandings governing situations in which design takes place, it is precisely this that calls for a need to explore this in terms of historicity and to call new practices of design into being. (Boehnert 2014)

Unpacking the ideological contents and historical contexts embedded in current designing supports conscious and critical approaches in rethinking and developing existing and emerging design practices. It is crucial that an awareness of design's historicity can support unlearning and unmaking some of the methods, concepts and processes that designing historically was built around (Jones 1980) .This will unavoidably bring about other relationships, other priorities, and thus other dilemmas into designing.

Though history seemingly is about the past, it always has to do with what is relevant and meaningful in the present. The stories we make in the present – the enacted narratives about who 'we' are, what 'we' expect in life, and what futures 'we' aim for – are all shaped by the stories told about the past. Changing the stories we tell about what 'the present' is and where it comes from supports changing how and on what we choose to take action in negotiating what design could actually be making possible *now*. Making things possible, however, is not the same as making things become a reality. The actions and choices that are made based on what could be are always anchored in particular ways of thinking and understanding the world – in certain concepts that guide our interpretations, that form our actions, and that make certain paths more likely to be taken than others.

Making transitional design histories is one way of shifting perspectives not only on, but in, the present. Making many, and other, potential futures come into sight requires creating spaces for a more multi-faceted and diverse 'now.' Many potential pasts speak to many potential understandings of what 'now' could be. This making of a bigger 'now' does not mean including as many perspectives as possible. Going to the etymology of the word, to 'include' originally means 'shutting in' or 'imprisoning'. Rather than shutting in diverse perspectives in a position where their outlooks converge into one, the ambition with prototyping multiple pasts is the drawing forth of many possible trajectories, through multiple presents, towards divergent potential futures.

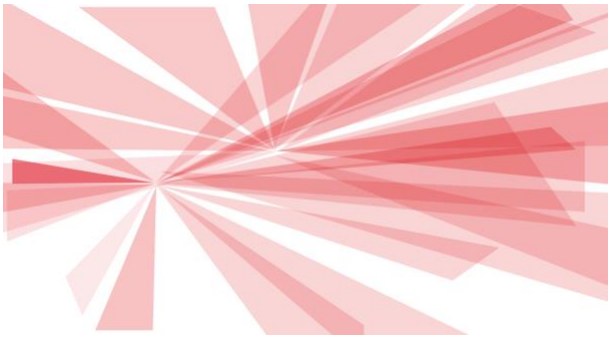


Figure 6. Transitional design histories respond to fluidity and change, scaffolding conceptual spaces for thinking and doing design differently.

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NORDES 2021

Paper Session 3

Bodily Scales

Session Chair | Trine Møller

Where did the Body Go? Re-Framing Human Scale
Andrea Victoria Hernandez Bueno, Cecilie Breinholm Christensen and Shelley Smith (F)

Breathing Commons: Affective and Somatic Relations Between Self and Others
Vasiliki Tsaknaki, Stina Hasse Jørgensen, Lena Kühn, Karin Ryding, Mai Hartmann, Jonas Fritsch and Maria Foverskov (E)

Scaling Bodily Fluids for Utopian Fabulations
Karey Helms, Marie Louise Juul Søndergaard and Nadia Campo Woytuk (E)

NORDES 2021

WHERE DID THE BODY GO?

RE-FRAMING HUMAN SCALE

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ABSTRACT

Scale can be considered as both a cartographic tool for design that allows designers to work with large scale objects such as buildings and urban spaces. However, scale is equally a relational understanding of the sensorial and perceptive reactions of the human body to its surrounding environment. As designers it is important to not only consider the human body as a measuring stick for dimensioning space according to standardised solutions and building codes, but also in a sensorial capacity as a perceptual tool for embodied experiences. Especially in 'large scale' design, the human body is easily lost in the zooming out through scale as a design tool. Therefore, this paper suggests a re-framing of human scale that turns attention to the ambiguous invitations environments offer for human action. In this way, *we* extend an invitation to designers to remember the human body across scales of design.

INTRODUCTION

In their film *Powers of Ten* (Eames Office, 1977), architects Ray and Charles Eames show a succession of scales available from a particular situation (a picnic in a park in Chicago) that progressively increase and decrease by the power of ten. The Eames' note that this is 'A film dealing with the relative size of things in the universe and the effect of adding another zero' (ibid.), and in fact do not mention the word scale although their indication of 'relative size' can link to an idea of relationality. The film starts with human beings in this particular picnic situation and zooms out to galactic proportions and then back in, through the humans, into atomic levels within the body. Despite the fact that the film moves us mathematically, and in some part temporally and physically, through a dizzying array of relations and indicates as well the relational connection between different objects inside and outside of human beings, the role the human beings play in this film could be looked at more closely. The picnicking humans provide the point of departure for the film and in all of the films' actions the human body is used as a kind of relational measuring stick. But perhaps relative sizes can also be relative scales, and relate to other aspects of the human body, namely that of the sensorial capacity of the body to relate to its surroundings.

Creating and manifesting physical surroundings as products of design is encased in a blur of numbers. Design concepts are free from numbers as they are the essence of an idea, a diagram, a thought, but as soon as the reality of making comes into the equation, another language enters into the design process. That of scale. Relating 'one' to another numerical value. Scale is a tool for communication and representation via design drawings and models, but used in this way as a tool, it emphasises the place of the body as being outside of design. There are scales at which the body as a relational component is present and there are scales at which the body disappears entirely from view. Designing a city space or a building, the ability to have

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an overview is needed and the tool of scale can provide this e.g., with scales of 1:5000, 1:2000, 1:1000, 1:500. The outside view. At these scales we are not 'inside' in any way that the body is present. A scale figure of 1:500 resembles a snowflake and is easily lost. It is first at the scale of 1:200 that we enter a building, that a wall has thickness – but a door does not. From there we continue on a journey where elements of the built environment come into focus and their stories become more detailed. In a 1:50 plan, how environmentally correct, or not a window is, becomes apparent – the number of layers of glazing are visible, how the glass sits in a frame separate from the window casement can be seen. The scale of 1:20 is the standard constructional section scale showing the materials making up buildings, and through this how rain is kept out, how warmth is retained, how frost is kept from cracking concrete. And materials have their own codes at the scale of 1:10, 1:5, 1:2 – plywood, marble, poured concrete and concrete block are easily distinguished from each other. They each have their own abstract material representations. The body is invited in at the scale of 1:200. Here a physical presence in a physical spatiality enters the dialogue between numbers and stays there still at 1:100 where the body is 'distantly present' through physical elements representing physically inhabitable spatialities. But at 1:50 something else happen. The presence of material specificity occurs. The scale of 1:50 starts the dialogue of how things fit together, the details of their making and the variety of materials that constitutes them. And this story continues to the scale of 1:1. The scale of 'reality' – of the physical world the body actually inhabits. Scales though, in addition to being a tool, also hold the potential for experience.

THE NOTION OF SCALE – A DESIGN TOOL AND A RELATIONAL CONCEPT

The notion of scale is often confused with size. Scale is a relational concept rather than a dimensional one and when we refer to the scale of something, we are referring to it in relationship to something else. But what isn't often considered regarding scale is how different scales relate to one another, what experiential qualities different scales contain and what type of invitations they send out – regarding both perception and behaviour. We not only exist and notice at different scales we act and react at different scales. Implicit in the notion of scale is a relational and a reactional experience.

Working in the field of urban design and to a certain degree, the field of architecture, is considered working in large scale – working at the scale of the city, at the scale of a landscape, at the scale of the building, and its context. Working in this way requires a cartographic approach – using scale as a tool for accessing that which is enormously larger than the human body – and in the creating process - removed from it in order to 'design' it. However, it is the human body that inhabits the city, the landscape, the building - that sits on the bench, picnics on the grass, moves along the street, that enters the building, engaging, or not, with others – but always engaging with the physical environment. A distinction can be made here between scale as a tool, the use of scale drawings, of relational ratios of 1 to another number making overview, structure and organisation possible with a common language of communication between designers and the 'making trades', and scale understood as a situational, relational encounter requiring a perceptual design approach and an awareness of the human body present and experiencing within variously scaled contexts.

And as designers our considerations are not only in solving the technical parameters and dimensional challenges the design problem poses. The process of design that occurs in three dimensions combining technical and visual forms of expression, also contains the human component, a co-relational and experiential aspect in which the body responds to sensory input and via a multi-sensorial and haptic whole-body presence responds to its physical surroundings. However, the human body is often lost in numbers during the process of turning design ideas into hard reality.

Different scales can be found co-existing within one another and changing the relations between each other in a dynamic, non- hierarchical way as the philosopher and sociologist Henri Lefebvre suggests in his concept of 'nesting scales' (Lefebvre, [1974] 1991). Lefebvre's notion of nested scales revolves around two aspects. Firstly, focusing on scale and identifying a transitional scale as the mediator (M) between the private (P) and the global (G). And secondly, stating that each of these scales is found within the other two (Pollak 2006: 129-130). The integration of scales within each other provides for a transitioning and dynamic relationality that supersedes a hierarchy or dominance of one scale over another. It is often the human, as in 'human-scale' that becomes the mediator (M), however, the openness of the private (P) and the global (G) allow for a tremendous variation in dynamic relationships. *The private* evokes a notion of intimacy of sensorial presence through material, spatiality, memory while *the global* alludes to connection to issues, gestures, culture. The role of mediation is key in Lefebvre's nesting scale concept. In the field of architecture and urban design in which the large scale can represent policy, global issues, buildings, land- and cityscapes themselves on one side, and the human body on the other as related to material and detail, it is the experiential capacity that is of the utmost importance underlining the relational. As the Finnish architect Juhani Pallasmaa notes:

"Architecture is the art of reconciliation between ourselves and the world, and this mediation takes place through the senses." (Pallasmaa 2012:77).

HUMAN BODIES ACROSS SCALES – RELATIONS BETWEEN BODIES AND ENVIRONMENTS

The body is relationally connected to the world through the senses and bridges the gap between scales with these. However, in contemporary urbanity there has been a focus on increased size, increased speed, increased information. (Augé, 1995; Koolhaas, 1995; Ibelings, 1998; Smith, 2004). With a largely technological point of departure, the sensorial and experiential qualities of the physical environment have not been greatly considered. In many ways the body has been lost in large spaces, at great velocities and in massive amounts of information. Perhaps then, designing through the lens of scales could bring the experiential more into focus and activate scale as more than a practical tool to assist design, but as a design tool in its own right. In the following section we will introduce theoretical standpoints that illuminate relational aspects of scale, (by) pointing to the ambiguous character and in-betweenness of the human-environment relation.

Contemporary urban environments – and contemporary urban lives - are incredibly complex and multi-layered. In both the physical environment and the understanding of it, ambiguity has become a factor. With societal complexity, ambiguity offers choices for different and differing groups, allowing for autonomy and democracy. However, without the ability to detect meaning and to feel a sense of personal connection, ambiguity becomes a barrier for use and sensorial experience. Examples of some of the spaces of contemporary urbanism – that also fall into a large-scale category, are car parks, shopping malls, amusement parks, airports. Sociologist Maarten Hajer and urban planner Arnold Reijndorp consider these as "ambiguous in-between areas" (2001: 14) – areas, rather than spaces even. They advocate for awareness of the socio-cultural meaning of the urban realm for specific groups, how such meanings evolve, the dynamic and informal ways in which the urban realm is appropriated and the 'struggle' when an 'exchange' takes place:

"The essence of a cultural geography is precisely that analysis of the ambiguity or, in more political terms, the struggle between various meanings." (Hajer and Reijndorp: 37)

Hajer and Reijndorp argue for an understanding of the urban realm and its future design as a 'public domain': "those spaces where an exchange between different social groups is possible and also actually occurs." (ibid.:11). Exchange responds to a contemporary complexity – contra the traditional 'meeting' - and allows for a performative unfolding in the presences of others. Although Hajer and Reijndorp focus on exchange as that which is taking place between human beings, this idea of exchange could also be extrapolated as also happening between humans and their environments. Exchange is also a form of in-between and this can happen between humans, but also between objects in the physical environment and between human bodies and their environments.

When Pallasmaa says, 'The door handle is the handshake of the building.' (Pallasmaa, 2012:62), he is attributing the building itself with a humanness, 'a bodyness' and directing attention to the act of interaction – the exchange between building and body in this very human act of shaking hands. Bringing in Lefebvre's notion of nesting scales, the scale of the building is mediated through a gesture between it and the human being. By extending an invitation across scales, the body is granted experiential entrance. We are invited in. The gesture in this case, and the subsequent exchange, comprises the in-between here.

Another concept highlighting the 'in-betweenness' of humans and environment is the concept of 'affordances.' This concept, developed by the psychologist James J. Gibson (Gibson, 1986) is widely used in contemporary architecture and urban design fields to understand the co-existence between people and the built environment. It has the potential to guide solutions and encourage creative explorations of design and material interventions because it addresses the physical world and our psychological and physiological responses to it (Jensen, Lanng and Wind, 2017). The notion of affordance offers that objects in our environments are always available to be experienced and that this is an implicit character of their existence. This transforms the idea of physical environment to one of fields of existence, where the objects comprising these fields, whether they be material, space or scape, contain potential for encounter and in fact invite this.

The notion of affordance is related to experiencing that which surrounds us – our physical environment. This presupposes the presence of the physical body in a physical environment – a co-existence. The way in which we take in information about this environment – and interact with it - is through our senses. A key point of Gibson's theory is furthermore that such sensorial perception is *active*, that we – as humans – actively sense our environment as we move through it (Gibson, 1986). If 'affordance' denotes a potential experience between human beings (and humans being) and their environments, it seems to follow that the character of the affordance i.e., what is being offered by the environment would also change with changes in scale. Although the body would stay the same physically, different aspects of the sensorial apparatus meeting the world and making 'sense' of it, would be (potentially)

activated and make associations and experiences across scales. This would also denote the possibilities of 'different' bodies, i.e., that the human body – that which forms the basis for 'human- scale' is not necessarily a constant, but is in fact changing as it experiences at different scales, the experiences potentially being activated by the 'valence' of the objects in the physical environment. As the scale of the environment and the objects changes, shifts, transforms and zooms, so does the experiential apparatus of the body itself.

The concept of affordances implies that materials are understood as being imbued with abilities to 'reach out' and invite use. Delving into the potential affordances hold for experience could provide a window to reflect on existing understandings of scale and perhaps point to an expanded toolbox for designers in both their understanding and making as related to the human body in the material environment.

"The valence of an object was bestowed upon it in experience, and bestowed by the need of the observer… The concept of affordance is derived from these concepts of valence, invitation, and demand but with a crucial difference. The affordance of something does *not change* as the need of the observer changes. The observer may or may not perceive or attend to the affordance, according to his needs, but the affordance, being invariant, is always there to be perceived. An affordance is not bestowed upon an object by a need of an observer and his act of perceiving it. The object offers what it does because it is what it is." (Gibson, 1986:138-139)

In Gibson's description, objects have certain qualities that are constantly present but not always noticed. As such, affordances lie in the domain *between* the environment and the observer i.e., the human body, moving through it. And affordances can be multiple and happening on multiple levels. When noticed by an observer – or a subject - a certain exchange takes place. The concept of affordances in this way is akin to the concept of 'atmosphere' developed by the German philosopher, Gernot Böhme. Böhme redefined the classical art history/philosophical definitions of the subject object dichotomy. His concept of atmosphere addresses the perception of the physical environment through the notion that both the subject and the object are active. (Böhme 1993; 1998) For Böhme, objects in the field of the physical environment are not inanimate. They exude a kind of sense-able energy – that affects other objects, creates constellations of objects, and that enters into a kind of relationship with the subject. They are *in ecstase*. In addition, the subject is not 'just' a viewing subject, it is present and invested fully sensorially – it is a sensing body. Böhme calls atmosphere an 'in-between concept' (Böhme 1998). It is what happens between subject and objects, it is active and it is experiential.

Affordances also address what happens in-between the subject and the object, but while for Böhme the overarching concept of atmosphere exists as a kind of relational spatiality, for Gibson the concept of affordance is more about a kind of relational behaviour. It is what resides intrinsically in the object itself that elicits – potentially – a response from the observer, or subject, in the active perception of it. This has significance for design in the need for a heightened awareness of the perception of materiality - and perhaps a question of what constitutes materiality in a relational – scalar – context.

These theoretical points illustrate that the contemporary built environment and the human sensorial perception (their co-existence) are complex and multiple. John Sanders (1997) when analysing the concept of affordances from an ontological perspective explains this:

"The environment in which affordances present themselves to human beings is thus extraordinarily complex, and includes not only a physical component but symbolic components, even purely imaginative and conceptual components." (Sanders, 1997: 97).

Linking to Hajer and Reijndorp, urban environments can be understood as not only complex, but also ambiguous, offering an 'exchange' of multiple socio-material, cultural and imaginative experiences. In designing urban spaces, then, the designer must take into account the 'struggle between various meanings' and the multiplicity of experiences that an urban exchange has the potential to offer. This requires an attentiveness to the 'in-betweenness' of the human-environment relation, allowing urban environments to be open for interpretation, active perception, multiplicity of use and 'exchange', and to the human body not only as a measuring stick for dimensioning space, but also as a perceptual tool for embodied experiences.

In this way, we contend that there is a need for re-introducing(/framing) the human body in design, particularly in urban design, as a relational tool, i.e. as a 'human scale'.

RE-FRAMING HUMAN SCALE

Re-framing human scale is then about bringing the human body back into design from a multi-sensorial and relational perspective. This is not an easy task. The sensorial invitations and perceptual qualities of urban spaces are usually difficult to explain, grasp and design. Our intention is to offer suggestions as to how we can attune ourselves as designers to the struggles and multiplicities of experiences that arise between humans and their environments, rather than to provide a checklist for design.

As a way of entering various scales of experiences, this section will weave themed stories that highlight ambiguous affordances, atmospheres and multiplicities of use across scales and through theoretical musings that link to the previous section. Dronning Louise's Bridge in Copenhagen provides the scene for the unfolding of those stories in each of the themes. The stories are conveyed in written text (highlighted in italics) that attempt to elicit a perceptual experience of the spaces, objects, materials and environments described, rather than giving a cartographical view. The stories will be unfolded using the selected themes of: movement and stasis, materiality and surface, and perception and intimacy. These themes highlight different aspects of relational co-existing as various entrances to re-frame the human scale. The stories are accompanied by selected photographs to illustrate their points and bring the reader closer to the material reality and tactile environment of the stories. As will be shown, Dronning Louise's Bridge is an example of exactly such an urban space that 'works' in various scales, inviting use through various speeds, materials, levels of intimacy and activities, and eliciting autonomous behaviours.

Dronning Louise's Bridge as a continuation of the road across 'the lakes' in Copenhagen.

MOVEMENT AND STASIS

Contemporary urbanism is to a large degree characterised by movement. Factors such as globalisation, information technologies, increased mobility of both goods and people describe not only movement but seamless movement – and seamlessness can be understood as flow – a constant movement with a specific destination, a stopping point, ahead. So, focus is not on the place where the body is located, it is ahead, elsewhere. In addition, much of the movement that characterises contemporary urbanism is vehicular. In his book *Zoomscape* (2004), Mitchell Schwarzer identifies modes of transportation – cars, trains and planes – as being significant factors in a change in sensorial connection to the environment. Navigating in movement relies almost exclusively on the sense of sight. The faster the movement, the less reliance there is the other senses.

Different scales of vehicular speed meet on the bridge.

But on closer examination, movement is comprised, to a large degree of pause – of waiting. Movement is not constant. Even on regular journeys with e.g. the metro, passengers' bodies will come to a halt along the way, such as in the transition between reaching the platform and waiting to board the train (Christensen, 2020). This highlights how 'movement' is not uniform, but has varying speeds, intensities and is punctuated by stillness. Pauses are not just 'pauses' or a sacrilege of desired seamless travel, they are in fact events of social and sensorial interaction between the human body (their intentions and motivations to move), other human bodies, and space. As Phillip Vannini points out in his ethnography of ferry travel on the Canadian West Coast, waiting time also provides an opportunity of 'stealing time back' (Vannini, 2012). As bodies are still, they are dwelling or inhabiting space, giving waiting spaces a 'place-like' character, however, as places under constant construction and without boundaries (ibid.: 203-204). The rhythms of people's coming and going, their passing by and staying put for a while before eventually moving on, leaves ephemeral traces of movement (ibid.: 210).

Through time Dronning Louises's Bridge has been a connector and a separator. Already known at its current location from the 1500's – though then called Peblinge Bridge - it connected Nørrebro, once an area outside of Copenhagen to Inner Copenhagen. In the process of connecting land, it separates water - Peblinge Lake from Sortedam Lake – giving them each an identity. The current bridge, dating from 1867, is heavy, stable,

steady. An embankment as much as it is a bridge. It enters Copenhagen between the Nile and the Tiber, between 2 bronze statues personifying 2 of the great rivers of the world. Bronze cast from marble. Marble from Antiquity. Lounging gods surrounded by symbolism. One telling the story of Rome's founding, the other telling of Egypt's fertility. Connections made outwards from the bridge in time and in space. While the bridge enters Copenhagen through history, myth and geography, it enters Nørrebro through Conversation – a bronze sculpture of a young man and a young woman facing each other in intimate dialogue with each other. Oblivious to the passing of cars, of bikes, of shoes on the bridge and of the gods on the other side.

The bronze statue *Conversation*.

MATERIALITY AND SURFACE

In the large scale of city space, there is a danger of losing connection – to both physical surroundings and to each other. The sensing apparatus of the human body can be challenged by an excess of space and speed. We move on surfaces and the materiality, the cladding of our surroundings, is the place at which we make contact (Smith, 2019). In contemporary urbanism there seems to have been a focus on a large scale with priority given to mobility and speed.

However, the sensorial experience of the urban environment whether by car, metro, bike or foot is sensed and perceived through its materials and surfaces. The human body navigates across spaces that are differentiated by their aesthetical character of overlapping materials and surfaces. They speak to and communicate with us. They reveal invitations and uncover stories and history. They get old, worn out, look and react differently in different weather and cultural conditions. Materiality and surfaces create and augment contrast, relations and juxtapositions of spatiality and perception of scales, the differences of being here or there, of feeling outside or inside a place (Cullen, [1961] 1971: 29).

The interplay of materiality and surface has the potential to connect with human sensorial scale and people's minds and emotions, they provide a human sense of position and of identity with urban space, which is termed 'enclosure' and a sense of 'hereness' by Gordon Cullen (ibid.: 29). The drama of everyday urban life and the spatiality experienced by human bodies in urban spaces are created and mediated by the interplay of materials and surfaces with sunlight and shadows, people and flows, appropriation and identity, culture and tradition.

"Surfaces could activate verbal capacities such as 'continuous, syncopated, choppy, smooth' and so on, going beyond the notion of 'surface treatment' and into a spatial understanding that taps into bodies moving and experiencing. Addressing much more than the wallpaper covering, surface is the 'definer' of space (the 'wall' itself) that has a role in the actual making of space and space in conjunction with other elements. An element that can itself be entered and sensed. Surface is the link between the spatial and the material – and contains both." (Smith, 2015: 5)

Walking alongside 'bridging'.

On the surface Dronning Louise's Bridge is a road continuing – through city, over water, and through city again. But the spatiality of the bridge – it's very heaviness and solidity enclose a space and offers a sheltering. And the road changes character because of its surrounding materials. On either side of the bridge's 2-lane road is a 6-lane sidewalk separated from the road by enormously broad bike lanes. The sidewalks are comprised of lines of concrete tiles, their bridging lengths separated by granite pavers. There is room for everyone – for people walking side-by-side, for stilettos and stroller wheels, for running shoes and for people sitting. In the summer the bridge invites you to take a seat and watch the passing spectacle it presents you with. Its solidity changes directions of focus by giving you a backrest. Materials collect the sun's warmth and radiate it into you. Pausing here you are 'bridging' – a concept coined, responding to the primacy of the pedestrian, on the bridge, in the sun.

PERCEPTION AND INTIMACY

Perception is relational to movement and emotional state. People move in different ways and in different modalities. When they walk, bike or ride in a car they perceive the environment differently and different affordances emerge. These affordances are not just mechanical and practical responses to what the environment intends to do or to offer (e.g. avoiding an obstacle, slowing down when a bump is about to be crossed, leaning against a fence); they are relational to people's personal intentions and motivations as well.

Working with perception in urban spaces is usually related to feelings of safety, comfort and delight, and the ideas of giving opportunities to stay, move and interact with others (Gehl, 2010: 239). These qualities of good, liveable, and human urban spaces should provide opportunities and invitations for interaction and co-habitation between strangers and choices of urban dwelling (Whyte, 2001; Lofland, [1998] 2009; Gehl, 2010) as well as the exchange and intersection of multiple socio-material and imaginative experiences across diverse groups (Hajer and Reijndorp, 2001). These invitations for interactions and communication with other people are based on the understandings of people's senses and perception of distance. For example, Edward T. Hall defines different types of human communication based on the human perception of distance, which is embedded in people's cultural background, such as the intimate, personal, social and public distances (Hall, 1966 cited by Gehl, 2010: 47).

The intimate scale comprises an emotional engagement to others, mostly people that are close to us (e.g. family and friends), but not always. At this scale, feelings and emotions are activated since facial expressions and smells are augmented due to the close proximity to others (Gehl, 2010). The feeling and perception of intimacy are rarely activated and even overlooked in urban public spaces. Providing opportunities to connect with the most intimate human scale in urban spaces is a way to re- define human scale and activate spontaneous and playful human affordances and interactions across scales.

Crossing Dronning Louises's Bridge daily becomes both natural and monotonous. By foot, views of the lakes and the city areas around them seduce. Stopping or slowing happens without concern. Here, the concrete slab and the cobbled stones are felt, the position of benches located safely along the embankment are sensed, the width of the path holds activities, gestures and verbal expressions. Safety in numbers, safety in light. Speeds are regulated with time for a quick smile to strangers approaching in the opposite direction. By bike, smoothness, slope and space to pass other cyclists take precedence. The bridge is peopled daily – on foot, on bike. But at night, the peopling is reduced, other things are sensed and other events take place. The spaciousness of the bike path seems exaggerated, as does sound in dark quiet. Voices are louder, gestures are larger and approaching these creates a mixture of anxiety and curiosity. Now the speed the bike on the asphalt affords gives safety. But an extended arm into the bike lane is an extended invitation, an unexpected gesture calling for a high five. One cyclist, two cyclists, three cyclists in succession clap – a string of high fives each eliciting euphoric cries. Connection is made between strangers on foot and on bike. At night.

Potentials of exchange and connection.

CONCLUSIONS

As we have argued above, a huge range of scales are available to us constantly and simultaneously as we pass through them – zooming in and zooming out – as a result of an endless supply of situations and velocities in our physical environments. But we are also affected emotionally, and words such as connection, memory, intimacy come into play.

This points back to our point of departure with this paper, namely the importance of the human body across scales of design and particularly for 'large scale' design, where the human body is easily lost in the zooming through scales utilised as a design tool for communication and representation. As designers it is important to be aware of the limitations the cartographic usage of scale results in, and to not only consider the human body as a measuring stick for dimensioning space according to standardized solutions and building codes, but also as a sensorial presence evoking embodied experience.

There is no doubt that our lives are shaped by the built environment and our interactions with people and things. Historically places have shaped societies in the same way societies shape places. How can we then re-frame the notion of human scale in a way that re-introduces the human body in (urban) design? Firstly, is conscious attention towards the body and the nature of human beings. Many scholars argue for recovering the plasticity of the built environment by considering the bodily senses (Pallasmaa, 1997; 2012; Malnar and Vodvarka, 2004; MacKeith, 2005), which means going beyond functionality and efficiency, standardisation and ornament. Then looking at the body in our designs is a way to also recover attention towards materialities and the scale of environments and objects (Jensen and Lanng, 2017). Attention to the ambiguity and in-betweenness of the human-environment relationship can then aid the designer in taking responsibility for attuning environments to the sensorial and perceptive potentials of how these are experienced. This begins with awareness of the multiplicity of experiences and exchanges that take place between humans and their environments, as well as an awareness of the intended invitations we want our designs to offer, and, finally, how such intended invitations can be materialised into the designs we conceive.

As a way to attune our awareness to human scale as designers, we suggest highlighting the multiplicity of experiences and uses of urban space as an opportunity for bringing the body into play. As in the example of Dronning Louise's Bridge, its design, materials and use allow for a multiplicity of experiences that further allows for creativity, connectivity, ownership, the unexpected, and for activation of the affordances that are already there, but perhaps hidden in layers of everyday routines.

And now that we have 're-framed human scale' through the stories that highlight the human body across various scales of experience, we wish to extend an invitation to designers, particularly those working with 'large scale', to re-introduce human scale into urban space(s). Not only as a tool for maintaining overview and dimensioning environments, but also as a relational understanding of the sensorial and perceptive human body reacting to and experiencing its surrounding environment.

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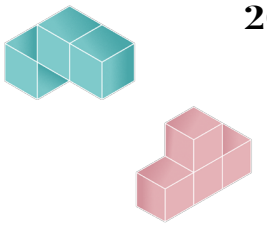

BREATHING COMMONS: AFFECTIVE AND SOMATIC RELATIONS BETWEEN SELF AND OTHERS

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ABSTRACT

This paper reports on our ongoing research focusing on cultivating and exploring the topic of what we refer to as *breathing commons*. We approach breathing as an affective and somatic bodily function that ties the individual with the collective, and through that aim to foster affective commoning among bodies. We present two workshops, one physical and one online, that we have ran amongst our research group on breathing commons. Three themes emerged from the analysis of the workshop activities: a) The body as a membrane, b) feelings of intimacy, vulnerability and awkwardness, and c) mutual engagement and care. These show a path towards engaging with breathing, and potentially with other bodily functions and biodata, aiming to open up the design space of doing affective commoning through bodily functions that act as a connection between bodies – both human and non-human.

INTRODUCTION

Breathing is a vital bodily function, experienced as the individual somatic practice of inhaling and exhaling. But breathing is also shared and social, which our current times, with prevailing themes such as Covid-19 and the Black Lives Matter movement, greatly illustrate. The events connected to the latter, recently demonstrated to the world that the right to breathe is not equal for all but is linked to the skin colour and social and economic status: The words “I can’t breathe” have painfully become one of the most characterizing sentences of our time, chanted by millions of demonstrators during the global George Floyd protests in 2020. At the same time, in this Covid-19 pandemic, we wear face masks and keep social distance to our fellow citizens in order to prevent our exhalation to mix with another person’s inhalation. Breathing is that which keeps us alive, but also something that can potentially spread and contract airborne diseases; breathing folds exterior and interior, living and dying. These examples show how breathing has increasingly been becoming political, scaling from individuals to society, and vice versa.

Our work aims to open up the design space of exploring breathing in interaction design (e.g. Prpa *et al.,* 2020; Ståhl *et al*., 2016) as an affective and somatic bodily function that ties individual with intersubjective experiences, which we have articulated as *breathing commons*. We draw on Singh (2017), who uses Caffentzis and Federici’s (2014) notion of *commons* as the practices for sharing the resources we produce in an egalitarian manner, but also as a commitment to the

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fostering of common interest in certain aspects of our lives and political work. We build on theories and practices established within the two areas of Affective Interaction Design (Fritch, 2018) and Soma Design (Höök, 2018). What we draw on from both these design approaches is the strong focus on affect and somatic experiences. We use these as a joint point of departure for exploring breathing as a bodily function that connects us to our own soma, acts as a connection between bodies – both human and non-human – is bodily performed and political, both on an individual level and as a common resource.

We present our ongoing research on the topic of *breathing commons* focusing on two workshops - one physical and one online - that we organised and ran among our research group. In each workshop we used breathing as a path towards unpacking and becoming attentive to affective and somatic experiences that emerged on a spectrum ranging from first-person, to intersubjective and collective. Breathing was approached both as a personal, subjective bodily function (soma) and at the same time as a 'commoning' experience that is shared among many bodies (affective interaction). The workshops were held in continuation of online breathing and other exercises, initiated in the spring as part of the Covid-19 lockdown to keep a sense of collectivity in the group when apart.

Reflecting on our experiences from the two workshops, we have identified 3 themes: a) the body as a membrane, b) feelings of intimacy, vulnerability and awkwardness, and c) mutual engagement and care. Our research shows a path towards engaging in affective commoning through breathing, drawing on the notion of *commons* that nurtures an ethics of care (Singh, 2017). It further opens up the space of engaging *with* and *through* bodily functions and biodata, emerging at the intersection of affective interaction and soma design.

THEORETICAL BACKGROUND: AFFECTIVE INTERACTION AND SOMA DESIGN

Affective Interaction Design has been proposed by Fritsch (2018) as an approach to HCI and interaction design, which takes into account the *relational* and *more-than-human* aspects of affect. Fritsch draws on a strand of affect theory, that has become prominent within the humanities and which builds on the philosophy of Spinoza (Deleuze, 2001; Massumi, 2002). Building on Deleuze's understanding of Spinoza, Massumi (2002) has put forward a conceptualisation of affect centred around the ability of bodies to *affect and be affected*. This includes how living bodies are influenced, moulded, and changed during encounters with other bodies. Further articulated by Gregg and Seigworth, affect "*arises in the midst of in-betweenness*" as "*those intensities that pass body to body (human, nonhuman, part-body and otherwise*" (2010, p.1). Affect, then, should neither be seen as purely natural/physiological processes, nor solely cultural. According to Massumi (2002), affect is part of the pre/non-conscious dimensions of experience and is felt as transitions in our capacity to act: While positive affect is characterised by the ability to affect and be affected, negative affect leads to the inability to act or be acted upon.

Soma Design is a method of doing design research in HCI that takes a holistic perspective on the (human) mind and body – the soma – as a starting point in design processes (Höök, 2018). It has roots in theories of somaesthetics (Shusterman, 2008) and emphasises becoming attentive to and improving connections between movement, sensation, feeling, emotion, subjective understanding and values. Through this particular approach to designing interactive systems, one can approach the materials used in a design context (both physical and digital) from a perspective that places the whole soma at the core, which potentially leads to designing better systems for end-users (Tsaknaki et al., 2019). There is a variety of soma-based design strategies for engaging with the whole body, aiming to improve designers' somaesthetic awareness and ultimately their ability to design rich experiences with technologies. Two of these strategies, that we adopted in our workshops, are: a) becoming attentive to one's soma through practicing bodily exercises, and b) defamiliarising already familiar experiences for opening up a design space.

We see these two approaches as complimentary to one another and we deployed both for exploring the topic of *breathing commons*: On the one hand, affect is understood as an in-between, relational and more-than-human concept that colours our engagement with ourselves, each other and the world. Soma design, on the other hand, is a pragmatic design method offering concrete ways of engaging with one's soma (body and mind as a whole), which supports the slow enhancement of one's sensibilities to discern somatic and felt experiences with technologies.

OVERVIEW OF THE TWO WORKSHOPS

Both workshops took place in Autumn 2020, each lasting for two hours. All authors have participated in both workshops and some were involved in planning the workshop activities. While the first workshop took place in our research lab, where we were all present in the same physical space, the second one took place online, since our university closed down due to the second wave Covid-19 lockdown. Running two similar workshops on the same topic, one physical and the other online, offered a fertile ground for experiencing and reflecting on the topic of breathing commons from an affective and soma design perspective. In particular they opened up a space for considering how breathing can offer a concrete lens for becoming attentive to our own

body, and to other bodies in each context (physical and online). We will describe the activities of both workshops and specify the differences between the physical and the digital one, including what adaptations we made to accommodate for an online setting. The activities we engaged in during the sessions, centered on different aspects of breathing, foregrounding either the felt, acoustic or tactile sensorial impact of breathing. All of them aimed to support us in a) becoming attentive to our soma through connecting with our bodies via the breath, b) defamiliarising the familiar through novel ways of engaging with the breath and c) moving from reflecting on individual experiences of breathing to affective commoning through breathing.

BREATHING EXERCISES

We started both workshops with a guided breathing meditation activity in order to somatically tune into our bodies and become attentive to our breathing patterns, inspired by similar bodily activities used in soma design methods in interaction design (Höök, 2018). We followed the verbal instructions of a connoisseur in this domain, by playing a YouTube video suggested by one author (Lena), whose research is focused on mindfulness and designing for healthcare. While the video with the breathing meditation instructions was played, we all listened and followed the instructions simultaneously, as a group. We allocated some time before and after this activity to reflect on our first person experiences and document them in body maps (Loke & Khut, 2014) and ended this activity by sharing our experiences in the group.

LISTENING COLLECTIVELY TO RECORDED BREATHINGS

The second activity was focused on collectively listening to pre-recorded sound files that consisted of individual breathings of each participant (1st workshop) and a collective soundscape of individual recorded breathings (2nd workshop). This activity was based on a preparatory task that everyone had to complete before the workshops, namely to record, with a mobile phone, several breathing instances taking place in different contexts and days, and each lasting between 10 to 20 seconds. In addition to the breathings, each person also had to record brief reflections of this activity, which we played and listened to collectively. Participants were invited to reflect, for example, on their affective state while doing this activity, the context in which they recorded their breathings as well as how their somatic experience of becoming attentive to their breathing was influenced by the context and the activity itself. A few days prior to the second workshop, one of the organisers gathered the sound recorded breaths of everybody and combined them in a sound file, consisting of all the individual breaths. During the workshop we then all listened to this compiled sound file together. Upon listening to the breathings as a group (the individual in the first, and the collective in the second workshop), we shared reflections on what the recordings of breaths do to our affective experiences of breathing as a sociosonic material, embedded in our everyday contexts.

EXPERIENCING BREATHING THROUGH SHAPE-CHANGE MATERIALS

In the first workshop that took place physically, we also experienced breathing through inflatable shape-change latex materials. We used inflatable air pockets in different shapes and sizes, which connect to an air pump system through long transparent tubes. One can manually inflate and deflate them at different rates and speeds, exploring different 'breathing' patterns. One by one, all participants experienced the 'breathing' of these materials against their skin. This was facilitated by one person holding the air pocket against the experiencer's body and another mimicking inhalation and exhalation patterns by manually inflating and deflating them. Afterwards participants shared their first-person experiences of having these 'other material bodies' breathe against their own.

BREATHING UNDER SOCIAL CONSTRAINTS

In the second workshop we included an exercise, which we called 'breathing under social constraints'. The purpose was to explore the sociopolitcal aspects of breathing, even in the small context of our research group. The exercise was carried out in pairs. As it took place online, we used breakout rooms in Zoom. In groups of two, the participants were instructed to take one of two roles; a leader or a follower. The leader was instructed to take control over the breath of the follower during two minutes of time. During this time they could ask the follower to breathe fast or slow, deep or shallow, silent or with sound or to hold their breath and so on. It was up to the leader to experiment with different commands or requests. The follower was instructed to follow if they felt comfortable in doing so, being made aware that they could choose to resist at any moment. After around four minutes when everyone had tried both roles, the exercise ended with a discussion back in the main Zoom-room. We took turns reflecting on what had happened between us during the exercise and how this had made us feel, focusing on extracting key moments of interest, including experiences that had evoked feelings of comfort or discomfort among the pairs.

WORKSHOP REFLECTIONS: "COMMONING" BREATHING

From the reflections and discussions that took place during the two workshops and from returning to the recorded data (photos, sound recordings and notes) and discussing them in light of the experiences they offered, three themes emerged. These highlight concrete situations when breathing allowed us to shift from individual experiences to experiencing our group as

commons. They also show a path to engage in affective commoning through breathing, facilitated by combining affective interaction design and soma design.

THE BODY AS A MEMBRANE

The experience of focusing on breathing, a vital bodily function that most of the time passes unnoticed, surfaced particular qualities of our bodies and the perception of self and others. A notable reflection was that breathing, happening both inside one's body (inhalation) and also outside it (exhalation), put a focus on the 'in-betweeness' among bodies. Having to breathe collectively and paying attention to this act in the same space, digital or physical, and at the same time, made us aware of our own and of other bodies surrounding our own. Thus, we experienced a shift from the self to commons. Breathing was perceived as a connecting material with 'sticky qualities' (both vital and deadly in these times). Perceiving breathing in that way highlighted each body as a type of membrane that extends from the inside to the outside, and vice versa. The phrase "*observe the air that breathes you*" from the recorded breathing meditation was considered an evocative prompt that contributed to experiencing the body as a membrane: Although we, to some extent, are able to manipulate and consciously steer our breath, we cannot control the circumstance that, eventually, air *will* enter our bodies and we will 'be breathed'. In that sense breathing is at the threshold between controllable and uncontrollable, leaving us both autonomous and forever permeable at the same time. Just like membranes we will, despite of appearing and perceiving ourselves as separate entities, always be in a state of constant exchange with our environment. Furthermore, breathing, as an affective process, challenged the notion of the body as something merely 'fleshy': The perception of the body was shifted towards noticing the space in-between the flesh and the air outside of it, as breathing was externalised to the outside; it was heard and seen (as change on one's chest for example) or even controlled by the other workshop participants. The body as a membrane was also highlighted during the activity of experiencing the shape-change air pockets on our bodies. One reflection was that the illusion of breathing patterns from an external, non-human 'other body', put a focus on breathing as an action that fills the lungs with air that is then exhaled into the common air-space. The porous qualities of the latex air pockets resembled the porous qualities of our bodies and lungs, giving the material an almost organic character.

INTIMACY, VULNERABILITY AND AWKWARDNESS

Focusing on breathing also surfaced aspects of intimacy, vulnerability and awkwardness in our group. These were experienced mainly during our collective listening to the individual recorded breathings and the recorded reflections. A personal and private moment and space – the one in which the recording of the individual breathing took place – suddenly became a public and shared experience that had an audience to which it was directed. This turned breathing into a 'performative' experience and moment, manifested as a recorded instance that was played out loud, listened to, and scrutinised by all the participants. Thus, in commoning breathing and in shifting the experience from the self to becoming attentive to other people's breathings, new experiences arose both for the person 'performing' breathing and for the one 'listening' to breathing, manifested as a shared intimacy for both. Similar experiences and feelings were evoked through the activity of 'breathing under social constraints' that took place during the online workshop. We shared and discussed how awkward, and to some extent uncomfortable it felt to be told how to breathe by a colleague, especially in front of a screen. Additionally, some participants shared that they felt vulnerable to be given instructions on how to breathe, which was also the reason why we tried this activity: To explore the space of both comfortable and uncomfortable shared experiences of breathing commons emerging among bodies. Having everyone taking the roles of the 'performer' and the 'listener' as well as the 'leader' and 'follower', disolved any hierarchies that might have occurred otherwise and allowed all participants to experience both positions.

MUTUAL ENGAGEMENT AND CARE

Sharing experiences of intimacy, vulnerability and awkwardness among our research group, surfaced through breathing, also created a safe space of mutual engagement and care. Especially during the activity we all listened to the combined soundscape of the individual recorded breathings (2nd workshop), feelings of awkwardness were overshadowed by feelings of mutual care for one another. As we shared in our reflections that followed this activity, listening to the collective breathing soundscape highlighted notions of shared ownership of breathing. We found a novel sense of being connected through the message that was powerfully transported in these recordings: You are not the only person that breathes. Others breathe together with you, in their different bodies and everyday life contexts. This evoked feelings of mutual engagement and care for the others, whose breathings were heard in combination with one's own, verbalised as questions: Which situation were the other bodies in during these recordings? How did they feel?

DISCUSSION AND CONCLUSION

With the two workshops we organised and ran among our research group we have looked into breathing as a subjective bodily practice that is both intimate and personal, but shared and common at the same time. Through questions such as *what feelings are evoked when listening to individual recorded breathings or when listening to common breathing patterns as a group,* and *how does it feel when we verbally control or guide another person's breathing*, we sought to

experience and reflect on breathing, extending from the self to others. This allowed us to scaffold a space for the emergence of *breathing commons*, as being part of our research group. When playing the recorded individual and common breathings we experienced breathing as something intimate and intimately linked to the body – where sounds of the mouth and internal organs were also heard, revealing something private and deeply personal. But we also heard the breathings as something constantly shared and interrelated to others, something we all do every second of the day. In the second online workshop, we found that the focus on breathing connected us as a group of commons, despite of the non-physical presence. Witnessing and attending to our own and to one anothers' breathing in an online setting, brought about a strong somatic presence and connection, that we experienced to be surprisingly valuable in the digital sphere. Overall, our own perception of breathing was shifted through experiencing breathing commons, which surfaced the membrane qualities of the body, feelings of intimacy, vulnerability and awkwardness, but also feelings of mutual engagement and care for one-another.

Our ongoing research on exploring breathing as a commoning practice shows a path towards creating new relations with our bodies and other bodies. It can ultimately open up the design space of engaging with bodily functions and data produced by bodies, to account for becoming attentive to subjective somatic experiences and shared affective ones. We found the combination of affective theories and soma design methods for exploring this space to be very fruitful and generative, allowing us to constantly shift the focus from our own bodies to the surrounding ones, and vice versa, without prioritising one over the other. Along these lines, in future research it would be important to explore, how affective commoning can expand to include other, non-human bodies. Additionally, a limitation that we would like to address in future work is to look more critically into the 'commons' part in relation to breathing, expanding the concept of breathing commons from the rather small context of our research group, to explore affective commoning through breathing on a broader scale and social context.

We believe that there is value in becoming attentive to breathing commons, and to the shared ownership of breathing. Especially since, as previously articulated by Núñez-Pacheco and Loke (2020), connecting with the sensory realities of others can show us a path towards building empathic ties and thinking outside the boundaries of our preconceived ideas. Finally, we also hope that our work could contribute with bringing the domains of affects, emotions, and subjectivity in the study of the commons, something which has been somewhat neglected, as stated by Singh (2017).

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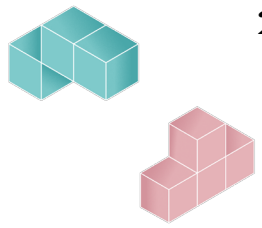

SCALING BODILY FLUIDS FOR UTOPIAN FABULATIONS

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ABSTRACT

This paper explores human bodily fluids for more-than-human *collaborative survival*. We present four utopian fabulations in which urine, menstrual blood, and human milk are designed with beyond the scale of a singular human body. Each fabulation illustrates *queer scales* and *uses* of bodily fluids through extended or improper uses as pathways towards caring multi-species relations within a damaged environment. From these narratives, we reflect on *imagining generous collaborations* for an openness towards unknowable possibilities and *crafting different measures* through the tensions of coinciding scales.

INTRODUCTION

Bodily fluids are essential to anthropocentric flourishing through their distribution of nutrients, filtering of toxins, and sustenance of reproduction. Yet a lens of usefulness often remains at the scale of a body - a human body - which can be misleading as bodily fluids mix and mingle at microscopic and macroscopic scales before, during, and after when they might be considered used by or useful to humans.

Bacteria from a child's saliva are shared with a mother during breastfeeding, which informs the composition of subsequent milk and microbiome colonization (Hird, 2007). As urine is directly and indirectly pooled into much bigger bodies - bodies of groundwater, salt water, and drinking water - hormones might find themselves in someone or something else (Haraway, 2012), and nitrogen and phosphorus can have drastic effects on the growth of nonhuman ecologies (Cordell et al., 2009). Menstrual blood, as a combination of blood and endometrial tissue from the uterus, is rich in nutrients and stem cells that can sustain and generate existing and new lives across species (Allickson et al., 2011). Thus, it is clear that the "bodily" of bodily fluids could more generously extend to the entanglement of a diversity of bodily beings and meanings beyond the scale and notion of a singular human body.

We build upon this research to further investigate what it might mean to design with bodily fluids at *queer scales* and *uses*. By playfully zooming in and out to understand what bodily fluids compositionally are and might materially do, the coinciding scales and "wrong" uses might be disorienting, or *queer* (Ahmed, 2019).

In the following, we present four utopian fabulations within which particular human bodily fluids are reimagined at queer scales and uses for more-than-human *collaborative survival* (Tsing, 2017). We draw upon design pathways towards caring multi-species relations within a damaged environment (Liu et al., 2018); as well as related feminist technoscience research that attends to noticing and fostering kinship of human life as entangled in more-than-human worlds (Haraway, 2016). From our fabulating, we present two reflections: *imagining generous collaborations* and *crafting different measures*. The first reflects upon challenges of imagining more-than-human collaborations beyond known entanglements. It points to an openness, or generosity, towards unknowable possibilities in the form of lingering questions. The second reflects upon crafting narratives with coinciding micro and macro scales. It points to tensions in scales as

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resources for different ways of valuing, or "measuring", bodily fluids as usable and useful.

FOUR UTOPIAN FABULATIONS

Our design process began with the motivation to reimagine human bodily fluids as valuable and abundant resources for more-than-human utopias. In this way, we sought to *queer* (Giffney & Hird, 2016) bodily fluids by challenging stigma and normative associations of them as unusable byproducts or waste, and doing so, to imagine *queer uses* (Ahmed, 2019) in their deviation from human-centered biological "uses".

With the aim of creating a collection of visual narratives, our process followed three steps. First, each author collected aesthetic inspiration from related academic or artistic projects, and individually created five visual explorations that communicated back to our conceptual starting point. The latter included sketches, water-colors, and collages that used photographs from gathered inspiration and our own previous experiences of caring for, researching, and designing with menstrual blood, urine, and human milk (Campo Woytuk et al., 2020; Helms, 2019; Helms, 2021; Søndergaard et al., 2020; Søndergaard & Hansen, 2016; Tsaknaki et al., 2021). On a shared wall, we pinned up this material to discuss and annotate with post-it notes how bodily fluids might conceptually scale beyond the notion of a human body. We brought forth encounters with containment, concealment, and scarcity that we wanted to problematize; and encounters with rituals, knowledge, and nourishment that we wanted to extend.

For a second step, we formulated four main themes from which we each developed one or two singular images that alone could suggest a rich narrative. During two additional in-person meetings we printed, pinned-up, discussed, and annotated images for revision. We documented our process through photos and written notes. In a third step, the notes were revisited for the writing of the accompanying textual narratives that were collaboratively reviewed by all authors.

The resulting visual and textual narratives are not intended as futures to strive for or against, but instead as fables to think with for the present (Haraway, 2016). In this way, they could be situated in a future, or a parallel now; and regardless of their temporality, they are shaped by feminist utopian commitments (Bardzell, 2018) towards other ways of designing and radically being in the world as and with more-than-human bodies (Jönsson et al., 2019; Lilja, 2019).

We present the four utopian fabulations in an order corresponding to how we think they shift in scale from a singular human body to other bodily ways of collaboratively surviving, but we also welcome other orderings for ongoing interpretations of them as individual and collective fabulations.

Figure 1: Magical Discharge Rituals visual narrative.

MAGICAL DISCHARGE RITUALS: SPIRITUAL BLEEDING AND CAREFUL WITCHCRAFT

Human and canine menstruators commune in a garden whereby locally grown herbs are used to brew tea particular to a menstrual cycle. In this ritual of care (Schalk & Brolund de Carvalho, 2019), participants begin their human-food interaction (Dolejšová et al., 2020) by contributing biodata from a vessel of menstrual blood, a basal thermometer, or a petri dish of saliva. Tools of collection are provided or brought as part of an ecology of menstrual experiences that accommodates and encourages "touching" (Campo Woytuk et al., 2020). Biodata can be publicly gathered at the table, or privately prepared in advance and then brought. From the biodata, a lunar analyzer draws upon the current phase of the moon to interpret menstrual cycle desires for the personalized crafting of tea.

Once brewed, the ceremony host relinquishes each herbal concoction to the gathering via a moving band that traverses the table. Although a particular brew is intended for a particular menstruator, as the fluids travel within the collaborative space, tea for others might be observed, shared, mixed, swapped, or gifted out of curiosity and generosity.

Individual rituals mingle with collective rituals. Human rituals mingle with animal rituals. Earthly rituals mingle with interstellar rituals.

In this magical discharge ritual, there are no shadows, and without shadows movement is indistinct and directionless. This ceremony has no beginning or ending, and instead has many beginnings and endings like the moving band that offers ongoing opportunities for shared rituals.

What are the bodily fluids? Those that are collected or those that are concocted? And what bodies do these bodily fluids belong to? Those that touch or those that are touched?

Figure 2: Community Menstruation Practices visual narrative.

Figure 3: Bodily Fluid Infrastructures visual narrative.

COMMUNITY MENSTRUATION PRACTICES: MATERIAL HARVESTING WITH CIRCULAR ORIGINS

A community gathers moss as absorbent material to make menstrual underwear ecologies. This *vibrant wearable* (Tsaknaki et al., 2021) is bound together with rope and tubing that allows for blood to travel over, around, and against human skin. The bindings are lively veins that nourish the moss. Following a menstruation period of bodily change (Søndergaard et al., 2020) - such as menarche, a monthly cycle, menopause, or a lack of menstruation due to pregnancy or contraception - the moss is given back to the forest and ritually hung as kokedama - ornamental balls of soil covered with moss - for new and continued flourishings. These cycles are ritualistically repeated as reciprocal acts of care between human communities and local ecologies (Kimmerer, 2003).

This community menstruation practice is intergenerational whereby a non-menstruating parent and a future menstruator might gather moss for a menstruating parent; or a non-menstruator might wear moss for a hopeful menstruation; or a former menstruator might hang moss for a future menstruator. Like humans, forests are also intergenerational.

This practice is for learning about cycles through harvesting and cultivating, wearing and adorning, acknowledging and appreciating. Like forests, humans also learn.

Bodies move. Seasons change. Fluids move. Bodies change. The forest is never still, and bodily cycles are simultaneously fast and slow, predictable and erratic, in sync and at odds.

What are the bodily origins of materials? What are the materials origins of bodies? Does moss only grow where blood flows? Does blood only flow where moss grows?

BODILY FLUID INFRASTRUCTURES: VISIBLE TUBES FOR TRAVELING NOURISHMENT

Exposed industrial pipes ebb and flow along a block of modular housing. They pulse in red, yellow, and cream as menstrual blood, urine, and human milk are transported within and from different domestic containers. The colors of the moving fluids are also in motion as they shift in hue, saturation, and opacity as a dynamic palette of pipes. From this deliberate exposure, change and variation are visible and noticeable (Helms, 2019; Helms, 2021; Søndergaard & Hansen, 2016; Tsaknaki et al., 2021).

In one scene, a menstrual cup is emptied. The blood and menses are diluted with water for plant nourishment inside another home while also floating upwards to fertilize a community rooftop garden. In another scene, a catheter of urine freely couples with the structural tubing, which distributes the effervescent liquid to sustain vertical gardens and cleanse clothes in a washing machine. Human milk is generously collected in another scene to carefully nurture a kitten and lavishly refresh a man.

These scenes are mundane yet spectacular. These scenes are glimpses of bodily ways of knowing and maintaining the commons.

The infrastructure continues. Fluids wander further, much further, beyond these bodies of housing and into bodies of land, bodies of water, and bodies of thought.

They are resources for plants, animals, and humans. They are provocations for plants, animals, and humans.

Where else do bodily fluids travel? What other scenes are out of sight? What other scenes are ways of knowing? What else does this fluid infrastructure challenge and maintain? What else challenges and maintains this fluid infrastructure?

Figure 4: Spilled Breast Milk visual narrative.

SPILLED BREAST MILK: SITUATED FLOURISHINGS AMONG UNCONTAINED ABUNDANCE

A tanker of human breast milk travels across an ocean. It flies a flag for universal breastfeeding and no-breastfeeding (Jardine, n.d.) as this abundance of milk is diverse in origin and intent. Its destination is unclear, yet its orientation is obvious. In the wake of a fierce storm amid arid landscapes and melting icebergs, lightning strikes the nomadic milk bank. From the resulting spill, marine life and lush gardens flourish. Paradise is not a white beach, but instead a diverse mess of situated growth. Endangered and non-endangered species thrive in unexpected dimensions and configurations.

The ocean swells forward and backward in a circular motion. Fluids leak, nutrients drift, bodies mingle, boundaries blur (Helms, 2021; Tsaknaki et al., 2021). It is unclear what bodies are fluids, and what fluids are bodies.

There are conflicting narratives in this interspecies worlding (Deloughrey, 2015):

Spilled breast milk is catastrophic if interpreted as lost labor and unrequited love. In this way, it is an apocalyptic narrative in which milk represents human exceptionalism.

Spilled breast milk is generous if interpreted as ongoing labor and open love. In this way, it is an ordinary narrative in which milk represents human accountability.

The lightning is exceptional and accountable. The spilled milk is accidental and intentional.

How are bodily fluids responsive and responsible? Through a yielding to bodily change? Or through a permeation of bodily boundaries? How are fluids bounded in collaboration? And how do bodies change in surviving?

REFLECTIONS

IMAGINING GENEROUS COLLABORATIONS

During our design process, we often discussed the unfolding visual fabulations as a series of dependent or interconnected events. For example, this can be seen in the gathering of bio-data in order to craft personalized tea in Magical Discharge Rituals (Figure 1), or in the specific scenes in which fluids were collected and then distributed in Bodily Fluid Infrastructures (Figure 3). This form of worlding helped us situate particular collaborations and species survival from proposed queer uses, yet it also limited our imagining to known and "closed" more-than-human encounters.

In reflecting upon this, within the written narratives we aimed to cultivate more *generous* (Diprose, 2012) collaborations through an openness towards unknowable possibilities in the form of lingering and unresolved questions. For example, in Community Menstruation Practices (Figure 2) we sought to challenge a visual linearity evidenced in the sequential harvesting, wearing, and hanging of moss underwear by revisiting notions of material origins; and in Spilled Breast Milk (Figure 4) we sought to similarly reopen a linear progression of environmental conditions by questioning depictions of response-ability amid change.

CRAFTING DIFFERENT MEASURES

We see our hopeful imagining towards generous collaborations as inseparable from designing with bodily fluids at conflicting scales that might be disorienting, or *queer*. An openness towards fluid interpretations of "bodies" at micro and macro formations contributed to thinking beyond a singular human body. For example, forests as intergenerational in Community Menstruation Practices (Figure 2) frames new possibilities for interspecies communities despite possible strange and conflicting temporalities of bodily cycles; and the exposed pipes in Bodily Fluid Infrastructures (Figure 3) imply oddly immense quantities of bodily fluids from trivial modes of collection to be capable of traveling and nourishing.

In this way, crafting queer scales is not only an absurd scaling up, but also the tensions between coinciding scales of zooming in and out that crafts new modes of "measuring" bodily fluids in more-than-human worlds. For example, in Magical Discharge Rituals (Figure 1) the lunar analyzer calculates menstruation desires according to planetary orbits; and in Spilled Breast Milk (Figure 4) an everyday bottle might just be absurdly large or the milk inside absurdly more powerful than previously considered. We speculate that the tensions themselves might also be put to queer uses for the further crafting of more-than-human utopian fabulations.

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Paper Session 3

(Un)sustainability (2)

Session Chair | Anna Seravalli

Exploring Implications for Designing for Sociotechnical Transitions: Taking Reflexivity as s Matter of Scale
Peng Lu and Daniela Sangiorgi (F)

Rethinking Food: Co-Creating Citizen Science for Sustainability Transitions
Danielle Wilde, Anna Lena Hupe, Sarah Trahan, Caroline Guinita Abel, Solvejg Kjærsgaard Longueval and Corey McLaughlin (F)

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EXPLORING IMPLICATIONS FOR DESIGNING FOR SOCIOTECHNICAL TRANSITIONS: TAKING REFLEXIVITY AS A MATTER OF SCALE

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ABSTRACT

There is increasing interest of design for paradigmatic and sociotechnical changes, in which the significance of actor is recognized. However, design studies that aim to connect actors at the micro level and sociotechnical systems at the macro level is limited. Based on institutional theory in sociotechnical theory, this paper proposes reflexivity as a useful concept to be associated with matters of scale in Design. Based on literature review, we explore the ways "cultivating reflexivity" has been applied in critical design, norm creative innovation and service ecosystem design. This preliminary work seems to suggest an evolution in the application of reflexivity, from a focus on individuals and their own critical attitudes, to the facilitation of a more reflexive design process to the facilitation of collective feedback loops of reflexivity and reformation of institutions and their socio-material manifestations, pointing toward a very relevant area of study for Design and sociotechnical transitions.

INTRODUCTION

The current call for a sustainable transition of our societies and economies, is motivating the increase interest of design for paradigmatic and sociotechnical changes, which redefine how we think about the state and purpose of the object, and thus, its ways of functioning, operating and managing (O'Flynn, 2007); and those changes "not only entail new technologies, but also changes in markets, user practices, policy and cultural meanings" (Geels, 2010, p.495)

In light of the complexity of this scale of change dedicated design concepts have been articulated, such as *DesignX* (Norman & Stappers, 2015), *Transition Design* (Irwin, 2015), *Systemic Design* (Jones, 2014) and *Social Innovation Design* (Manzini, 2015). While aiming to utilize design approaches to favour a sociotechnical transition for a sustainable development of the society (Norman and Stappers, 2015; Ceschin and Gaziulusoy, 2016; Irwin, 2018), the importance of engaging multiple stakeholders or actors, at the micro level of the sociotechnical systems, is recognized: Irwin argues stakeholder relations can be seen as the "connective tissue" (2018, p.970); Norman and Stappers suggest that "the most powerful knowledge for changing any system lies with its deep users and stakeholders" (2015, p.103). As a response to societal changes, design is "forced to engage more with society to gain legitimacy and support from society" (Mulder & Loorbach, 2018, p.19). Nevertheless, although those large scale design disciplines acknowledge the potential of leveraging actors and stakeholders in designing interventions (Reed et al., 2009), how and which design strategies can better connect actors operating at the micro level with the

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wider transformation of sociotechnical systems at the macro level, is still difficult to understand.

This paper will explore the potential of the concept of *reflexivity* to inform these multilevel interventions and implications. *Reflexivity* could be defined as "an *individual*'s general awareness of the constraints and opportunities created by the norms, values, beliefs and expectations of the *social structure* that surround them." (Suddaby et al., 2016, p.229). As *reflexivity* helps revealing these social norms at the micro and macro level, we assume it can be discussed as a medium to enrich current transformational design approaches.

While there is a history of work of Design research around reflective practice and reflexivity (Schön, 1984; Cross, 1999), only very recently reflexivity has been related to system changes (e.g., Sangiorgi et al., 2019; Vink et al., 2020). Furthermore, based on the strong link between reflexivity and institutional theory (Lawrence & Suddaby, 2006, p.219; Ruebottom & Auster, 2018) and the importance of institutional theory in sociotechnical theory (Fuenfschilling & Truffer, 2016), the introduction of reflexivity into design also means that institutional theory needs to be judiciously reviewed in design. Although the importance of institutional contexts have been recognized in recent design research, such as in Participatory Design (e.g. Huybrechts et al., 2017), they have been only very recently discussed in the large scale design scope as mentioned above.

For this reason, with this paper we aim to review existing design theories adopting reflexivity as a core theoretical construct, in conjunction with institutional theory, to reflect on the implications to consider reflexivity better connect micro-level actors with macro-level sociotechnical systems.

In particular this paper will review current studies into design approaches for paradigmatic and sociotechnical system transformation, to then articulate three examples of application of reflexivity in design, respectively *Critical Design*, *Norm-Creative Innovation*, and *Service Ecosystem Design*. This review will then inform the final considerations on the relationship between reflexivity and largescale design interventions to project possible future research.

DESIGN AND SCALE

SOCIOTECHNICAL SYSTEM ORIENTATION IN DESIGN

According to Buchanan's Orders of Design model, there are four broad areas explored by design practitioners, respectively *symbols (communication), things (construction), action (strategic planning) and thought (systemic integration)* (1998; 2001). Here, the thought order can be also interpreted as *complex systems* (Buchanan, 1992) which are "human systems, the integration of information, physical artifacts, and interactions in environments of living, working, playing, and learning" (Buchanan, 2001, p.12). As anticipated by Buchanan, in recent decade, Design is increasingly working on larger scale projects, lately considering the need for sociotechnical transitions, meaning the system-exceeding change that goes beyond the ordering of current system (Bergman et al., 2008); those sociotechnical sense of changes not only entail new technologies, but also markets, user practices, policy and cultural meanings (Geels, 2010), which should be allocated in the fourth order of change in Buchanan's model.

The reasons for this evolution of design connotations can be explained by both internal and external factors. From the internal point of view, the main reason lies in the changing positioning of the design and designers themselves. Design is increasingly considered and recognized to be able to contribute to complex sociotechnical arenas (Norman & Stappers, 2015; Irwin, 2015). And designers are "increasingly working with activities that mostly have societal implications" (Westerlund & Wetter-Edman, 2017, p.S886). In terms of external factors, this is mainly due to the urgent need for a sustainable development, which includes factors such as resources, climate change, equity and justice in human society (Norman & Stappers, 2015; Manzini, 2015; Irwin, 2015; Ceschin & Gaziulusoy, 2016).

Many design concepts have been proposed in response to such a trend. Norman and Stappers (2015) propose *DesignX* which focuses on complex sociotechnical systems resulting from modern issues in terms of human behaviour and cognition; social, political, and economic framework; and technologies. In the DesignX proposal, the authors suggest designers must play an active role from design to implementation stages and develop solutions through incremental steps (ibid). *Transition Design* is another design concept focusing on societal wicked problems as proposed by Irwin (2015), which advocates a circular, iterative, and error-friendly future-oriented design process. In her proposal, Irwin argues that in transition design, theories of change are a "continually co-evolving body of knowledge", and designers need to have "a new, more holistic mindset" (2015, pp.234–235). Transition design also calls for highly transdisciplinary, collaborative design approaches that are based on deep understanding of changes within complex systems (Irwin, 2015). Some more examples could be *Systemic Design* (Jones, 2014) and *Social Innovation Design* (Manzini, 2015). Besides, some established design disciplines have also expanded their scale to the sociotechnical level, including *Participatory Design* (e.g. Pilemalm et al., 2007) and *Design for Sustainability* (Ceschin & Gaziulusoy, 2016) which covering multileveled design objects ranging from products to sociotechnical systems. Despite the differences in design approaches, those design

disciplines all consider sociotechnical systems as the object of design interventions, in order to bring about sociotechnical system changes or even transitions.

However, although changes within sociotechnical systems can be catalysed by individuals such as designers, those changes "cannot be managed or controlled, nor can outcomes be accurately predicted" (Irwin, 2015, p.234). In these large scale design visions, the central position of the designer is challenged while the importance of engaging multiple stakeholders or actors, at the micro level of the sociotechnical system, is recognised, as "the most powerful knowledge for changing any system lies with its deep users and stakeholders" (Norman & Stappers, 2015, p.103).

SOCIOTECHNICAL SYSTEMS AND INSTITUTIONS

In parallel, apart from being taken as a design object, sociotechnical systems have also been connected with institutional theory (Geels, 2004), in order to conceptualize "the dynamic interplay between actors and structures" (Geels, 2004, p.897), and "influence sociotechnical systems towards more sustainable consumption and production patterns" (Fuenfschilling & Truffer, 2016, p.298). Here, *institution* is similar to the concept of norms and rules, and "comprise regulative, normative and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life" (Scott, 2014, p.56). In sociotechnical theory, the core concept related to institution is *sociotechnical regime* (Dosi, 1982; Rip & Kemp, 1998; Geels, 2002; Smith et al., 2005), which investigates the coevolution of institutional and technological elements that enables the fulfillment of specific societal functions (Fuenfschilling & Truffer, 2016). As a consequence of the institutional turn in sociotechnical regime research, sociotechnical transitions "can essentially be interpreted as processes of institutional change" (Fuenfschilling & Truffer, 2016, p.298) or "regime shifts" (Geels, 2010, p.495), in which regime is "highly stable", and "has proven to be very resistant to change" (Fuenfschilling & Truffer, 2016, p.302).

Besides, in original sociotechnical theory, the *multi-level perspective* (MLP) is proposed as a framework for understanding sustainability transitions in sociotechnical systems with an overall view of multi-dimensional complexity of changes (Rip & Kemp, 1998; Geels, 2002; Geels, 2004; Geels & Schot, 2007; Geels, 2010). The MLP distinguishes three analytical levels, which refer to heterogeneous configurations of increasing stability, respectively *niches*, *sociotechnical regimes*, and *an exogenous sociotechnical landscape* (Geels, 2010). And the MLP proposes that sociotechnical transitions come from interactions within and between these levels (Geels, 2010; Ravena et al., 2012). It is also suggested that long-term changes on the landscape level is due to the regime-shifts that emerge from changes of actor practices (Ravena et al., 2012).

REFLEXIVITY AS A MATTER OF SCALE

From a micro-individual perspective, there are some disciplines that respond to the constraints or influences of the social context on the individual. For instance, Gregory Bateson's Theory of Logic Types (c.f. Bateson, 1972) "helps relate individual and social aspects of change", which highlights how individual's "learning is framed and affected by its social context." (Bredo, 1989, p.37). Another inevitable example could be Pierre Bourdieu's concept of "habitus" (e.g. Bourdieu, 1977).

On another side, according to institutional theory, actors could resort to institutional work to achieve institutional changes. Here institutional work is the "purposive action of individuals and organizations aimed at creating, maintaining and disrupting institutions" (Lawrence & Suddaby, 2006, p.215); and the importance of *reflexivity*, which is defined as "an individual's general awareness of the constraints and opportunities created by the norms, values, beliefs and expectations of the social structure that surround them" (Suddaby et al., 2016, p.229), is highlighted (Lawrence & Suddaby, 2006, p.219; Ruebottom & Auster, 2018).

So, it seems that in the process of design for sociotechnical transition, we can adopt institutional theory as theoretical basis, and *reflexivity* as a concept to connect design interventions at micro-level to macro-level of sociotechnical systems change. In fact, similar topics have already been discussed in design topics. For instance *Transition Design* has emphasized that transition design education should teach designers "to examine their own value system" and "work with the interior, invisible dimension of human experience" (Irwin, 2015, p.235), which we conclude as *"designers' reflexivity"*; however, leveraging design intervention to cultivate reflexivity of actors who are inside the sociotechnical transition is still unclear. Although the concept of reflexivity has been mentioned in design research for a long time (Schön, 1984; Cross, 1999), there is a lack of research on how to use it in the practice of sociotechnical transition.

In the next section, the paper will review existing design studies that involve "cultivating reflexivity" as a core element, to value their contribution to this discussion.

REFLEXIVITY AND DESIGN

The term reflexivity has been discussed in various disciplines to describe the "capacity to turn or bend back upon itself, to become an object to itself, and to refer to itself", and it "links self and other, subject and object" (Babcock, 1980, p.2). At the moment, reflexivity seems to be used more associated with academic research and discussed with concepts of

epistemology and construction of knowledge, especially in qualitative research (Barry et al., 1999; Mauthner & Doucet, 2003; Etherington, 2007; Berger, 2015; Alvesson & Sköldberg, 2018). However, in line with our study, we adopt the interpretation of reflexivity given by institutional theory as proposed above in this paper.

In sociotechnical systems, actors and organizations are embedded in networks interdependently, in which the sociotechnical regimes and rules provide stability by guiding actors' perceptions and actions (Geels, 2004). So, reflexivity could allow actors to recognize and reflect on those invisible rules and regimes, which may trigger further changes. Given this specific meaning, it seems to be valuable to review and discuss some emerging design research fields, respectively *Critical Design* (Dunne & Raby, 2013), *Norm-creative Design* (Öhrling et al., 2018), and *Service Ecosystem Design* (Vink et al., 2020), for their application of "cultivating reflexivity". Other design fields that relate as well with critical society transformation, such as *Design for Behaviour Change* (DfBC), are more oriented to intentionally influence individuals' behaviour and "negative social and environment issues" (Niedderer et al., 2018, p.3). Instead of aiming at changing the actors' context or the overall socio-technical system, DfBC starts from the designers' "moral responsibility" to use design interventions to influence the users (Jelsma, 2006; Niedderer et al., 2014, p.14).

CRITICAL DESIGN

The term Critical Design was first used in Anthony Dunne's book *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design* (1999). For critical design, critical theory is taken as an intellectual resource (Bardzell et al., 2012), although the latter is applied "strategically and sporadically" (Malpass, 2017, p.10). And critical theory argues that "our everyday values, practices, perspectives, and sense of agency and self are strongly shaped by forces and agendas of which we are normally unaware, such as the politics of race, gender, and economics" (Sengers et al., 2005, p.50). In this context, Dunne and Raby refer to "*affirmative design"* to describe most design which conforms to cultural, social, technical and economic expectation of status quo (2001, p.58). Recognizing that society is passive and people "unable to see alternatives to their current conditions of life" (Jakobsone, 2017, p.S4260), as an opposition to affirmative design, *critical design* is "a form of social research" (2006, p.147), aimed at "leveraging designs to make consumers more critical about their everyday lives, and in particular how their lives are mediated by assumptions, values, ideologies, and behavioral norms inscribed in designs" (Bardzell & Bardzell, 2013, p.3297). Critical design suggests to facilitate "a way of knowing, exploring, projecting and understanding the relationship between users, objects and the systems that they exist in" (Malpass, 2016, p.486). As a result, the primary outcome is knowledge, not a design product (Bardzell & Bardzell, 2013). Based on the review above, we believe that critical design can provide implications for cultivating reflexivity in sociotechnical transitions. And in critical design, a concept that echoes reflexivity could be *critical sensibility*.

At its most basic, critical sensibility is "simply about not taking things for granted, to question and look beneath the surface" (Dunne & Raby, 2009). To achieve that and "overcome a conditioned familiarity with design and use" (Malpass, 2016, p.484), critical design works through *relational ambiguity* (Malpass, 2013). According to Gaver and his colleagues, "ambiguity is a property of the interpretative relationship between people and artefacts", which "is an attribute of our interpretation of them" (2003, p.235). Furthermore, they propose three types of ambiguity, respectively in information, context and relationship (Gaver et al., 2003). All of them can drive users to experience a dilemma and carry a burden of interpretation, which is vital to critical design (Malpass, 2013).

When it comes to design process, critical design essentially relies on the mechanisms of narrative storytelling and allegory to visualize alternatives and allow the user to understand and engage with the design and further its satiric forms (Malpass, 2013), and design objects often play as a medium and are used to "draw attention to the matter of embedded messages and ideologies" (Jakobsone, 2019, p.15). In this process, *design fiction* is the most representative tool of critical design (Dunne & Raby, 2013). Coined by science fiction author Bruce Sterling incidentally (2005), design fiction is further refined as "the deliberate use of diegetic prototypes to suspend disbelief about change" (Bosch, 2012). Practically, design fictions utilize software development kit, 3D computer model, and other media methods to build fictional alternative worlds, where the design artefacts created by designers are making sense (Coulton & Lindley, 2017).

NORM CREATIVE INNOVATION

Norm Creative Innovation is emerging as a new design theory with special emphasis on challenging current social norms (Öhrling et al., 2018). Norm creative innovation are not only concerned with the significance of the norms in guiding our everyday life, but also with the characteristics of the actors in these norms, including their gender, abilities, etc., and the social exclusion that these characteristics entail (Nilsson & Jahnke, 2018).

For norm creative innovation, it is defined as a two-step process: the first is norm-critical design and the second is to become norm-creative (Nilsson & Jahnke, 2018). The concept of norm-critical design is proposed by

Swedish researchers Sofia Lundmark, Maria Normark and Minna Räsänen "to investigate the norms and normative assumptions that a certain object generates" (2011, p.42). They introduce the focus of a "norm-critical perspective" to "make norms that affects and dominates our beliefs and values, more visible" (2011, p.42). The term "norm-critical" comes from the Swedish term "normkritisk" that used in "normkritisk pedagogik" (norm-critical pedagogy) (c.f. Bromseth & Darj, 2010), which is a development of "queer pedagogy" (Bryson & de Castell, 1993). The term norm-creative or norm-creativity is a more recent concept coming from Swedish term "normkreativ" (c.f. Vinthagen & Zavalia, 2014), "which explores different ways of responding to non-conscious human interactions" (Nilsson & Jahnke, 2018, p.379). In norm creative innovation, norm-critical design involves gaining awareness of social norms that contribute to inequalities and social exclusion and challenging them; and then norm-creativity develops design solutions that counteract such norms through design thinking of what might be (Nilsson & Jahnke, 2018).

Norm creative innovation can be described more as a design principle than as a design discipline. Due to the fact that related theory is not yet well established, the approaches to norm creative innovation are still lacking. One of the most important sets of methods is the Nova cards toolkit developed by Swedish research and innovation agency Vinnova (c.f. Silva et al., 2016). Like a deck of cards, NOVA contains 54 cards including four tool suits, respectively *norms, tactics, role models*, and *experiments*. And it is described that the toolkit is designed as a deck for a social and interactive process and also flexible usages (Silva et al., 2016).

SERVICE ECOSYSTEM DESIGN

Service ecosystem design is a new conceptualization of service design proposed by Vink et al., aiming to cope with the "reductionist view of service design that ignores the institutional arrangements and other interdependencies" (2020, p.1).

Service design has been integrating service-dominant (S-D) logic (Vargo & Lusch, 2004; Vargo & Lusch, 2008), which has resulted in the conceptualization of "Design for Service" (Kimbell, 2011; Meroni & Sangiorgi, 2011). In S-D logic, service is the underlying basis of exchange (Vargo et al., 2008; Vargo & Lusch, 2004), and value results from the beneficial application and integration of resources for other actors (Vargo & Lusch, 2008). To better understand value cocreation among actors, Chandler and Vargo (2011) propose oscillating foci of multi-level conceptualization of context with three levels aggregation (micro, meso, and macro). Built on above theoretical foundation, service ecosystems are proposed and defined as relatively self-contained, self-adjusting systems of actors connected by shared institutions and service exchanges (Akaka et al., 2012). Here, the institutions in service ecosystems theory are also from institutional theory but focusing on guiding value cocreating interactions among actors. Service researchers also introduce institutional work to refer to the actions of creating, maintaining and disrupting institutions (Lawrence & Suddaby, 2006; Vargo et al., 2015).

Based on above new development of S-D logic, Vink et al. propose service ecosystem design to facilitate the emergence of desired forms of value cocreation (2020). Taking institutional arrangements (i.e. sets of institutions) and related physical enactments as the design materials, the embedded *feedback loop* of reflexivity and reformation is suggested as the focal stance of design process (Vink et al., 2020). Here, the reflexivity refers to the same concept in institutional theory; and the reformation involves intentionally reshaping institutional arrangements and occurs through institutional work (Lawrence & Suddaby, 2006; Vargo & Akaka, 2012; Vink et al., 2020).

Given the newness of service ecosystem design, there is a few established design methods for the feedback loop of reflexivity and reformation.

As we can see from these different design studies, cultivating reflexivity has been interpreted in different ways, with different scope and perspectives. The following discussion will compare these research works to then suggest implications that could better help design to use reflexivity as a matter of scale.

DISCUSSION

In the following text, we try to discuss their understanding of reflexivity and norms, their design processes and actors' engagement to explore implications for cultivating reflexivity in large scale design involving sociotechnical transition. Buchanan's Four Orders of Design is also introduced to integrate and broaden found implications.

UNDERSTANDING OF REFLEXIVITY AND NORMS

Critical design in itself, as the aim of the design process, is developed to stimulate people's reflexivity; a related concept is critical sensibility (Dunne & Raby, 2009). Norm creative innovation instead refers more to the phenomenon of social exclusion (Nilsson & Jahnke, 2018): here reflexivity could be taken as a starting point: with reflexivity designers and engaged actors start their journey to uncover the hidden social norms and then trigger further design activities. Whereas in service ecosystem design, reflexivity is a process in feedback loops of reflexivity and reformation.

The social norms involved in critical design and norm-creative innovation seem to be interpreted in a general

way, which "are woven into the fabric of our societies and guide our everyday actions" (Nilsson & Jahnke, 2018, p.379). Service ecosystem design, on the other side, due to its cognate origin in the introduction of institutional theory (Geels, 2004), has a natural compatibility with large scale designs for sociotechnical systems. However, it is important to note that institutions and institutional arrangements in service ecosystem design are used to explain how value cocreation is realized in a service ecosystem (Vargo & Lusch, 2016), which take into account more of the properties of value cocreation, and may ignore the moral and ethical connotations of, for example, gender or social oppression.

As such, we argue that in exploring implications on how these three design concepts understand reflexivity, there is a need to clarify their advantageous areas, and due to the complexity of the sociotechnical system itself, we may need to combine different perspectives on reflexivity in order to address different characteristics of sociotechnical regimes aiming for sociotechnical transitions.

DESIGN PROCESS

For critical design, the aim of the design process is to stimulate reflexivity, or critical sensibility (Dunne & Raby, 2009). For norm creative innovation, after providing a reflexive norm-critical process, a norm-creative phase follows to provide feedback on the previous reflective process and to try to build new norms. The service ecosystem design approach includes the feedback loop of reflexivity and reformation, firstly through reflexivity to stimulate actors' understanding and awareness of institutional arrangements, and then reformation is used to alter "physical enactments" (Vink et al., 2020, p.8) by means of institutional work, which can build up aiming for a more permanent influence on sociotechnical systems.

Based on the above discussion, it seems that critical design can be more of a communication design tool that can be used to attract people's attention and activate a critical reflection. Besides, while cultivating audiences' reflexivity, critical design focuses on single events and encounters but does not offer a solution to overcome related design problems. Norm creative innovation instead focuses on stimulating reflexive design processes. In other words, the design process combination of norm-critical design and norm-creative process could be used to stimulate reflexive practice among designers and actors. So, we suggest that norm creative innovation can be *integrated* into large scale design processes as a tool to cultivate reflexivity. While the reflexivity-reformation feedback loop allows service ecosystem design to inform a systemic and collective cycle of reflexive practice. The continuous cycle, from cultivating reflexivity to changing the institutional arrangements and their dependence on the tangible infrastructure, of service ecosystem design is inherently iterative and systemic, and as a result, its output aims for a long-term impact.

ROLE OF ACTOR OR USER

While there is a lack of specific tools and approaches as mentioned in previous part, the core differences among these three design concepts concern the nature and level of actors' engagement. In critical design, as the purpose of the design is to facilitate "a way of knowing, exploring, projecting and understanding the relationship between users, objects and the systems that they exist in" (Malpass, 2016, p.486), actors engage mostly with the outputs, reacting to the provocations to potentially change their view; in norm creative design, actors are generally engaged in the design process to affect the output and generate better solutions, that might be freer of bias. Whereas service ecosystem design requires actor's engagement, as a collective endeavour to identify existing norms and rules (i.e., institutions and institutional arrangements) that might prevent for wider and deeper aimed for transformations of their practices and the wider ecosystem.

Below we create a table to summarize the three design topics discussed in this paper to provide implications for cultivating reflexivity in large scale design processes for sociotechnical transition.

Table 1: Implications of reflexivity

	Critical Design	**Norm Creative Innovation**	**Service Ecosystem Design**
Theoretical foundation or resource	Critical theory	Norm-critical pedagogy	S-D logic; Institutional theory
How to Understand Reflexivity	Reflexivity as the aim	Reflexivity as a starting point	Reflexivity as a process in feedback loops
How to Understand Institutions or Norms	Social norms	Social norms	Value cocreation institutions
Design Process	Focus on generating reflexive encounters	Focus on stimulating reflexive design processes	Focus on stimulating reflexivity and ongoing loops of reformation
Role of Actor or User	Reacting to change their perspective	Engaging to transform the design outcome	Engaging to change their own practices

INTEGRATING WITH BUCHANAN'S FOUR ORDERS OF DESIGN MODEL

Buchanan's Four Orders of Design model (1998; 2001) is here introduced to integrate previous discussions and broaden the field of observation, understanding and application of those implications to a wider range of design contexts. According to Buchanan's definition of *products* (2001), the three design concepts discussed before can be distributed in different places of the Four Orders model, although not very precisely.

From this perspective, these three design concepts can be seen as representatives of the different design concepts based on the four orders model. And the related implications or strategies seem to have the potential to be applied to a wider range of design contexts (Figure 1).

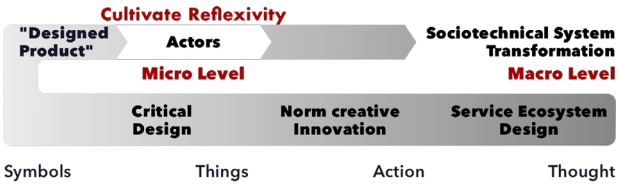

Figure 1: Integration based on Buchanan's Model.

CONCLUSION

Although large scale design such as DesignX (Norman & Stappers, 2015) and Transition Design (Irwin, 2015) recognize the value of actors, there is limited consideration on how to connect the actors to reflect on the sociotechnical transition. Given such a status quo, we have reviewed the development of sociotechnical theory with the introduction of institutional theory. Based on that, we have clarified how reflexivity can be regarded as a matter of scale in design of intervening sociotechnical transitions to connect the underlying actors at the micro level to macro level of system changes in terms of contributing to the regime shifts. Then, by reviewing the literature on critical design, norm creative innovation, and service ecosystem design, and comparing and discussing the basic findings, we discussed differences in their understanding of reflexivity and norms, their design process, and actor engagement. Furthermore, based on Buchanan's Four Orders of Design model, we suggest that those implications found in mentioned three design concepts could be useful in a wider range of design contexts.

As a first contribution, this paper has stressed the importance of reflexivity as a matter of scale. Although the concept of reflexivity has been mentioned in design theory for a long time, and Irwin has also called for designer's reflection on "invisible dimension of human experience" in transition design (Irwin, 2015, p.235), but this is still lacking when it comes to how to use design to cultivate the reflexivity of actors in large scale design interventions. To compensate this limitation, we have introduced reflexivity as defined by institutional theory, as a potential lever to connect the change at the micro level of individual actors with sociotechnical transition at the macro level.

This potential role, has been partly evidenced by reviewing how reflexivity has been used in design, moving from being a tool to stimulate individual reflexivity and critical attitude to become a collective approach that can change not only the design processes to become less biased, but also wider system change transitions, by stimulating interlinked exercises of reflexivity and reformation. We argue how the value of these three different approaches could be used in a more systematic and integrated manner in designing for sociotechnical transitions.

Although the discussion in this paper is preliminary, it points toward a valuable field of studies in Design, such as reflexivity as a matter of scale. As we intentionally selected only three recent design approaches that addressed reflexivity in an explicit manner, we would recommend future studies to conduct a more systematic review of the use of the concept of reflexive practice, critical thinking and reflexivity in design, to deepen the potential of this theoretical construct for large scale change. This future research should also support the development of practical design strategies to link micro level initiatives with wider sociotechnical systems transitions.

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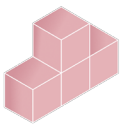

RETHINKING FOOD: CO-CREATING CITIZEN SCIENCE FOR SUSTAINABILITY TRANSITIONS

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ABSTRACT

Transforming human food practices to be more sustainable is not straightforward. The human food system and international sustainability advice are both global in scope. Whereas food practices are locally situated and personal. *ReThinking Food* grapples with this challenge, using co-creative citizen science and the Future 50 Foods Report. The research involves cooking with; sharing food, recipes and stories; surveys, interviews, online and in-person activities. Through these actions, participants exchange knowledges with the food, their families and each other; become agents of change in their social groups and workplaces. They enact agency, shifting scales from human to non-human; near to far; from one-to-few-to-many. Building on this insight, we propose a hybrid engagement strategy for fostering connections across scales, from the personal to the planetary. The strategy strengthens the effectiveness of bottom-up societal transformation efforts.

INTRODUCTION

The human food system is global in scope; a key driver of climate change, ecosystem collapse, species extinction and societal inequalities (Willet et al., 2019). Human food practices sit within the larger system, operating across scales—personal, political, cultural and, global. This interconnectedness makes the food system "the single strongest lever to optimize human health and environmental sustainability on Earth" (Willet et al., 2019, p.5). It also means that operationalising food system transformation is not straightforward. Food practices are situated; rooted in culture and identity. Sustainability advice is often global in scope, lacking attention to diversity of cultural norms (Bené et al., 2020). This complexity requires food system transformation to combine top-down, systemic action with bottom-up efforts and situated perspectives.

ReThinking Food investigates this challenge through bottom-up action. The project inquires how to mobilise individual and community efforts towards Environmental Citizenship: "the responsible pro-environmental behaviour of citizens who act and participate in society as agents of change..." (ENEC 2018). The objective is to transform citizen participation in the food system, and eventually the food system itself, to be more sustainable. The research uses the Future 50 Foods Report as its foundation, to focus attention on the challenge of scale. The report is developed by the World Wildlife Federation and Knorr, in consultation with world-leading food and sustainability experts (Shaver & Drewnowski, 2019). It

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represents the cutting edge of global sustainable diet advice, alongside parallel efforts (Willet et al., 2019b). All fifty foods recommended in the Future 50 Foods report are deemed healthy for people and planet. However, only a portion of the foods are available in any location, and not all are sustainable where they are found. The report, thus, troubles the shift to a sustainable diet, as much as it intends to guide changes in practice. Its use contributes to knowledge-building, yet unsettles people's understanding of what constitutes sustainability in a complex global food web. It thus serves as an effective prompt for people to share ideas about how sustainability advice might be (re)framed to be effective in supporting transformative change.

In this article, we carefully unpack the *ReThinking Food* Main Course. We then bring focus to questions of empowerment, and the ways that self-directed research activity across scales might embolden citizen-scientists to step out into the world as emergent environmental citizens. To conclude we offer a hybrid strategy for troubling, enlivening and strengthening approaches to what is commonly understood as Citizen Science.

METHODOLOGY

ReThinking Food, converges co-creative citizen science (CS) and participatory research through design (pRTD, Wilde, 2020) to learn how families in Denmark might transform how they eat to be more sustainable. Over three courses, using the WWF and Knorr's 'Future 50 Foods' report as the scientific object (Shaver & Drewnowski, 2019), the study seeks to activate three research questions: 1) *How can we empower ourselves to engage with sustainability agendas and make transformational change?* 2) *How do everyday food and eating practices relate to international sustainability agendas?* and 3) *How do citizens imagine change?* The 'we' in question one, points to the active engagement of the researchers in the research, leveraging first-person perspectives through participation both as researchers standing apart from the participants, and participating alongside them, conducting Participatory Action Research (through design). This stance draws on feminist reflexivity (Rose, 1997), and allows the researchers to explore self-critique through self-construction toward lasting change.

The study unfolds over three courses that activate the above research questions through a mix of online and in-person activities. The activities are designed to connect participants in different ways with the researchers, the food, their families, and other participating families. The design is dynamic and responsive – changes were made as the research unfolded. While not unusual in design research, we position the work as CS. We do this to disrupt our understanding of the potential of CS. As Sauermann et al. (2020) explain: "Citizen Science has raised great hopes among scientists, civil society groups, and policy makers" (p.2). However, "it is important to develop a systematic and balanced understanding of the opportunities and challenges of Citizen Science in the particular context of sustainability transitions" (p.2). We see similarities and differences in CS, with pRTD, and hypothesise that our insights as design researchers may contribute methodologically to CS in ways that advance both disciplinary agendas.

CS has as its aim to "include citizens in research to create a common language between the citizens and the scientists" (Haklay, 2013). At its foundation, CS is inclusive – it involves activities in which different publics can participate; it contributes to science and scientists, as well as to publics; and it involves reciprocity: dissemination of scientific information to publics, on the one hand, and a reciprocal listening to citizens' opinions and needs, on the other (Golumbic et al., 2017). In CS, the use of the word citizen is not linked to state. Rather, it is linked to science and society. We use it to denote citizenship: Environmental Citizenship, as defined above.

Haklay describes four approaches or levels to CS, ranging through: *Crowdsourcing*, where citizens act as sensors; *Distributed Intelligence*, where citizens interpret data; *Participatory Science*, where they participate in problem definition and data collection; and *Extreme Citizen Science*, where they additionally participate in analysis (Haklay, 2013). Our research troubles this model by moving away from a tradition of citizens as sensors, to engender a form of extreme, co-creative citizen science; extreme in the sense that it involves citizens in problem definition, data collection and analysis, community evaluation and peer-review (Liboiron, Zahara and Schoot, 2018), and is guided by the methods and philosophies of pRTD.

pRTD is a stance that foregrounds embodied, situated experience throughout research. *ReThinking Food* takes this stance to shift what is understood as CS to a more personal scale, to trouble assumptions and practices around CS and resituate it within politically more inclusive – co-creative – traditions. This impulse aligns with current moves in CS, to trouble the ways it is practiced (Sauermann, et al., 2020). It enables us to bring problems to the scale of the body, and embodied engagement with the world, to reflect on, in, and through action. Through these means, pRTD affords new perspectives on what might be required for people to feel empowered in the face of planetary scale challenges, and enact Environmental Citizenship (EC).

Positioning pRTD research as CS afforded a number of advantages: it helped to make the work seem impactful to our participants, due to an assumed commitment to reciprocity on their part. It offered differing frameworks for understanding the outcomes (Sauermann, 2020) that we may not have considered if we had remained strictly

Figure 1: Onboarding activities, a) receiving the Future 50 Foods kits, b) covid-safe Foods kit delivery, c) unboxing the foods

within the theoretical and methodological traditions of participatory design research. It afforded a partnership with Denmark's national broadcaster that brought in journalists to expand our understanding of how to frame our outreach efforts and enabled us to engage 500,000 people in the second part of the project – the Free-Range course. It also provided some challenges. As design researchers, we brought assumptions to the work about co-creation, not necessarily visible to the participants. The idea of co-creating the study they were involved in upset some participants' notions of hierarchy in science and led to expressions of frustration and anger. Nonetheless, we remained committed to engaging our citizen-scientists through participation and co-creation, and to shaping the study together.

RETHINKING FOOD

The Main Course of *ReThinking Food* ran Oct-Dec 2020 and involved 35 families with children, living in Kolding municipality. The Free-Range course ran Nov to December 2020, and involved ~500,000 people from across Denmark, with no demographic restriction. As detailed below, Main Course participants had food delivered to them; the Free-Range participants did not. If they were to eat the Future 50 Foods, Free-Range participants had to find and purchase them, thus make a conscious act. The third course, Dessert is planned for late 2021. It consists of community peer-review and analysis conducted through communal, online exchange. The purpose of Dessert is to discover the temporal impact and thus scalability of this research; whether and in what ways participants' short involvement in the study may have contributed towards long-term changes in their food practices. We focus here on the Main Course.

MAIN COURSE

Over 11 weeks, we conducted online and in-person activities to connect 35 families with the researchers, the food, their own families and other participants. This included: onboarding activities (week 1), community-building on a closed Facebook group (week 1-11), an online cooking session (week 3), a Sunday Market (week 4), and a series of Sustainability Breakfasts (week 7-11). In week 5, the Danish national broadcaster hosted a ten-day special theme on the future of food, featuring participants from the Main Course, who spoke about their experiences in the research to that point.

RECRUITMENT AND ON-BOARDING

We recruited participants through public and closed local Facebook groups, and distributed flyers in local cafes, at the university, a local design school, a business park, the city library, outside of supermarkets and at secondhand stores, where shoppers may be aware of sustainability issues. We sought households with children, living in Kolding municipality. This demographic allows us to study local responses to international sustainability advice, and the impact children may have on choices and actions when preparing food. Of the 35 families recruited, 90% were middle class, ethnic Danes; 10% came from other origins – the norm in Denmark in 2020. To initiate recruitment, we asked interested parties to fill out a brief online survey with demographic information, eating and cooking habits, and allergy information. Once we had recruited 35 families, we hand-delivered food boxes to their homes (Figures 1), including 39 locally-purchased foods from the Future 50 Foods list, characterized as being beneficial for both humans and the environment (Shaver, D., & Drewnowski, A., 2019), a research consent form, and a pictorial survey. The survey asked, for each food on the list, if the families had a) heard of it, b) tasted it, c) had it in their home. We requested families complete the survey before unpacking their boxes, and create an 'unboxing' video (Figure 1c), and upload them both to the project's closed Facebook group (described below). Participation in these activities was optional. All activities throughout the study were optional, though we stressed the importance of research

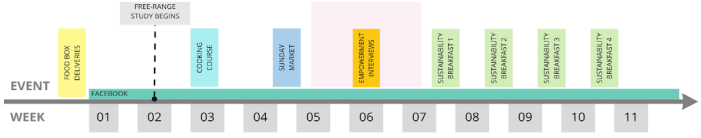

Figure 2: project timeline.

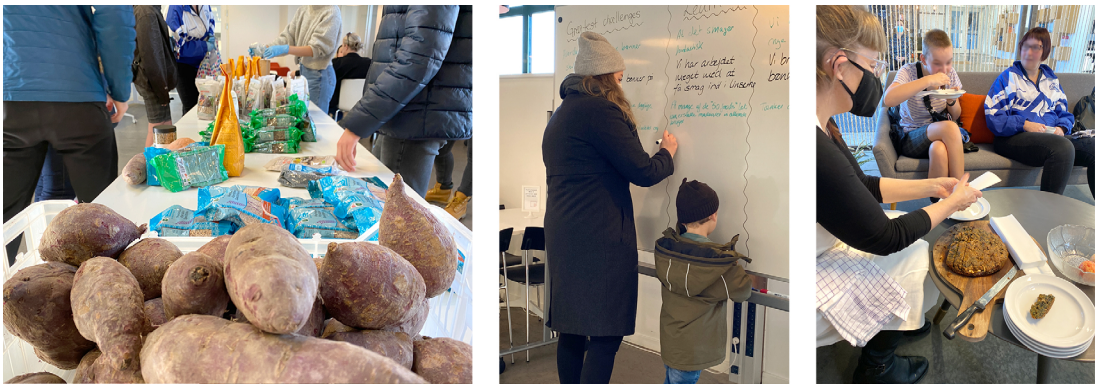

Figure 3: Sunday Market: *a)* foraging at the food stall, *b)* leaving feedback on the community whiteboard, *c)* fresh coffee and cake.

consent in enabling us to ethically conduct and report the research. The food delivery process served as a first point of in-person contact between the families and the researchers. It enabled participating families to ask questions and express their interest; some invited the researchers into their homes, others enjoyed a quick exchange on the doorstep, some requested drop-off without exchange as they were unable to be home on the delivery days (Figure 1). This process, and the literal food handover, allowed the researchers to perform their role as researchers and the families to assume their roles as research participants within the study. Once this task was complete, participating families were free to explore the Future 50 foods in any way they wished.

FACEBOOK

A closed Facebook group is the main communication platform for the study. It serves as a virtual research commons for the families, where they exchange knowledge, experiment, and share situated research findings with each other and the researchers. Active families post questions, share recipes, comment, offer advice, and share photos of their cooking practices. Others lurk (as evidenced by acknowledgements of researcher posts). The researchers play a number of roles in the Facebook group. They post formal notifications of activities (the cooking session, the Sunday Market and Sustainability Breakfasts). They respond to questions raised to them directly (leaving time for the families to find answers for themselves). They occasionally provide first-person perspectives through comments, and one researcher participated in the study with her family. This researcher declared their dual role when she introduced herself in the Facebook group. Otherwise, she participated in the same way as the other families. Her reflection is provided below.

COOKING *WITH*, FORAGING, COLLABORATIVE REFLECTING

Three activities were held outside of Facebook: an online cooking session (week 3), a Sunday market (week 4), and sustainability breakfasts (week 7-11). The online cooking session was hosted by an internationally acclaimed local chef, who prepared a three-course menu based on the Future 50 Foods. His remit was to guide participants in preparing great tasting, nutritious and sustainable food for the whole family, for minimal effort and cost, highlighting the Future 50 Foods. Ten families participated. Recipes were shared in advance to facilitate preparation. Over the course of an evening, from their kitchens, the families conversed, cooked, and ate together with the chef and the researchers. Overall, we noticed distinct forms of engagement. There were those who prepped everything in advance, drank wine and enjoyed themselves; those who cooked whatever they had time for and were relaxed and had fun; and there was one family who had nothing prepped, had not checked in their cupboards to see if they had suitable ingredients, and frantically tried to follow the chef and confirm suitable replacement ingredients as they scrambled to keep up. Throughout, everybody laughed, even the very stressed family. One family who did not come said they felt that cooking a three-course meal on a Tuesday evening was “too heavy” (F04). However, as the chef explains, the idea behind cooking three courses is to diversify taste exposure for children, use leftovers more creatively, and in the end save money and time.

The week 4 Sunday Market was modelled after a public food market and included a food stall, a whiteboard that served as a community noticeboard for suggestions and comments, and seating areas where families could sample freshly baked cake made with sustainable ingredients (Figure 3). The market gave participants an opportunity to talk to the researchers in-person, forage for foods and continue their research. Market attendees could give feedback to the researchers over coffee and cake, or by adding their reflections to the whiteboard. To conform to Covid-19 safety protocols, participants booked an appointment time for their visit to the Market. This restriction limited participant-participant interactions but provided space for enhanced researcher-participant interactions as the individual appointments allowed more time for one-on-one conversation. All families who attended said they appreciated the possibility to come out and meet us in person.

The final act of co-reflection was four Sustainability Breakfasts, held Saturday mornings, Nov 28-Dec 19 (week 7-11 of the study). Themes included: *ReThinking Food Research*; *Tips & Tricks*; *Sustainable Christmas*; and *Sustainable New Year*. Researchers and participants

gathered over Zoom, shared coffee, breakfast, and conversation from the comfort of their homes, reflected and shared ideas and impressions on that week's theme. The Breakfasts were open to Main Course and Free-Range participants. They enabled families to connect with the researchers, across courses, to discuss concerns, share advice and food practices across three distinct scales: i) familial: cooking within the family and exchanging experiences with other families; ii) national: exchanging experiences with participants from diverse locations across Denmark; and iii) global: sharing experiences of traveling and living abroad, and with family and friends abroad.

In addition to the weekly theme, participants brought up topics that surfaced within the closed Facebook group. Conversation often would lead back to best practices for including children in the cooking process at home, and sharing personal backgrounds and relationships with food, whether sustainable or not. They expressed a desire for more scaffolding in their adoption of the foods. For example, they liked being able to explore freely for the first couple of weeks, but then would have appreciated recipes. Those who joined the *Cooking with* session were longing for more recipes from the chef, which unfortunately never arrived. They all loved the food that he introduced them to and mung beans, in particular, became a new staple in their cupboards. "I never knew mung beans could be delicious!" exclaimed one of our participants, laughing. She now makes mung-bean risotto regularly, and always has them in her cupboard. Others in the breakfasts agreed. The Breakfasts were not well attended but were appreciated by those who came. They enjoyed the opportunity to connect with the researchers through casual means and explicitly connect us to their discussions on Facebook. This was the last formal activity for the Main Course, though it is not the end of the study. As we write this, we are preparing Dessert in the form of community peer-review and analysis of our findings.

UNDERSTANDING EMPOWERMENT THROUGH SCALING

Environmental Citizenship (EC) is defined as "responsible pro-environmental behaviour of citizens who act and participate in society as agents of change..." (ENEC 2018). For citizens to act as agents of change, they must be well informed and empowered to take action appropriate to the seriousness of the environmental problems affecting our world (Hodson, 2003, OECD, 2012; WEF 2021, in Reis, 2020). To gain a sense of whether, and if so, in what ways, participants might be feeling empowered towards EC, in week 6, we conducted 7 semi-structured, conversational interviews with participants who responded to an open email. By then, they had been experimenting with ingredients, engaging with other families via the Facebook group, and may have participated in the cooking course. Interviews were held online, one-on-one, to encourage participants to share personal impressions without influence from the opinions of others. The goals were to i) identify how they define empowerment, ii) how empowered they feel in the project, and iii) whether they believe it is possible to make societal scale changes from personal scale action.

Empowerment is discussed in the literature in different ways, depending on context (Bailey, 1992, p.74). The OECD (2018) and Kim and Roth (2016), describe being empowered as having a sense of agency: an innate sense of responsibility, a capacity to act, and a willingness to participate in the world. In the context of CS, Peterson, (2014) explains that empowerment is a "strengths-based, non-expert driven approach that emphasizes the ability of people [...] to actively engage in solutions to the problems confronting them." Page (1999, p.2) describes this process as "a multi-dimensional social process" that helps participants gain control over their lives at a range of scales that cross individual, group, and community dimensions (ibid.). At all of these scales, the objective of empowerment is to bring forward change through an interconnected process between the individual and the community (ibid.). As Dominitz et al. (2018:1) explain, empowerment involves "increasing independence, establishing a sense of fairness, and enabling conscious decision-making while creating benefits for other stakeholders".

To begin each interview, we asked the interviewee(s) to define empowerment. Their definitions diverged from the literature, in that they all considered that having a sense of freedom, or self-determination in the project was critical to their feeling empowered. This sense of freedom led to enhanced involvement, and a feeling that their actions "have some realness in it" (F04). Participation in project activities was voluntary. While this may be standard for ethically conducted research, our participants imagined that, by signing up, they would have to do everything. They reported that being able to determine for themselves the level, quality, and kinds of engagement they had in the project gave them a real sense of freedom. Whether this led to increased involvement is unclear. However, all interviewees suggested that from their perspective, it did.

Empowerment is commonly understood as the ability to effectuate changes that have societal impact. For the families in our study, small changes, such as decisions around what to cook that day, made them feel that they were making a difference to society. Moreover, the more important the area of action was to them, the higher the potential they felt for long-term change. Throughout the interviews, participants describe having a sense of agency – an innate sense of responsibility, a capacity to act, and a willingness to participate in the world (Kim & Roth, 2016; OECD, 2018), as a direct

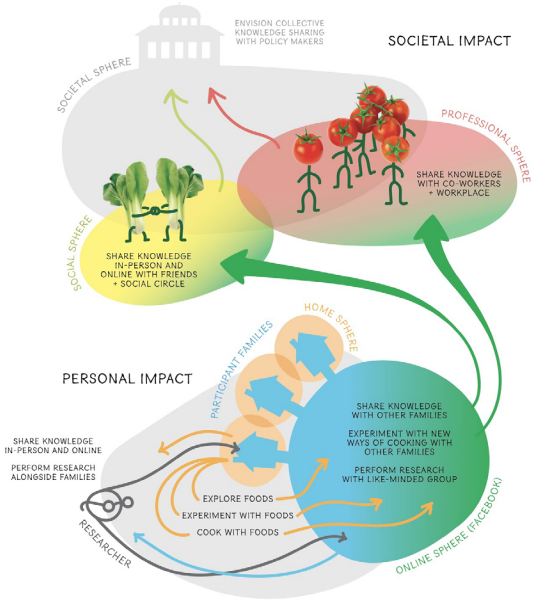

Figure 4: a hybrid strategy for bottom-up societal transition. By shifting scales between home and online, participants can try out emerging knowledge, and be emboldened to scale out to social, professional, and societal spheres of action.

result of the freedom they felt to move between scales of concern. They clearly valued the feeling of control the study gave them over their own lives and food choices, over society and the ways food is understood and consumed.

HYBRID STRATEGIES FOR ENGAGEMENT ACROSS SCALES

The *ReThinking Food* Main Course research was designed to encourage participants to shift their scales of engagement between a number of spheres: the intimate realm of home and family; and the less intimate in-person and online spheres, where they engaged one-to-one and one-to-some, with the researchers; and one-to-some and one-to-many, with the other participating families. They moved between these scales, freely, trying out emerging knowledge. The scale shifts seemed to embolden them to scale out further, to social, professional and societal spheres (Figure 4). One participant discussed seeing opportunities for their work canteen to become more sustainable, and making suggestions to the cafeteria managers about simple, yet effective changes they could make to offer more sustainable meals. They noted that they felt empowered to act in this way because of the strength they gained from their role in this research. We hypothesise that it is the underlying structure of nested, overlapping and interconnected spheres of action, each operating at different relational scales, that engenders this empowerment. Through different spheres (Figure 4), researchers and participants co-create activities. These actions enable them to move across scales. Throughout, families shape their engagement according to personal needs and preferences (Sauermann et. al, 2020), and in the process become empowered. We contend the blended, responsive design strategy affords this outcome. It gives participants a sense of agency and emboldens them to shift scales of action. It fosters Environmental Citizenship by beginning at the scale of the body and extending out into the world. We consider, next, other forms of scaling that undergird this model.

SCALING OUT FROM THE INDIVIDUAL

The Main Course begins with a food delivery and unfolds over a range of actions. Along the way, the researchers engage in research alongside the participating families, modelling the research process, engaging in embodied ways. We (the researchers) share knowledge ("*The Future 50 Foods report was intended to…*") and our own embodied, situated research ("*I find when I cook with sprouted kidney beans that…*"). Through each knowledge exchange, we (re-)frame the research as a co-creative process. From the very beginning – the delivery of the foods to their door – families responded with enthusiasm, took ownership, and proceeded to explore on their own. "Thanks for the box! It's almost like Christmas Eve – filled with exciting things" (F08).

After initiating the research at the scale of the individual, we offered families the option to connect at the scale of the group, to see if they would common their challenges and develop a sense of community. This group was the closed Facebook group. As they shared with the Facebook group, we notice their engagement with the research begin to shift, moving back and forth between the home sphere and the group sphere (Figure 4). This movement across scales enlivened families' personal, situated food practices and encouraged continued engagement within the online community. Their activities in one sphere informed and strengthened their activities in the other. In interviews, families explained the role that the Facebook group played in creating a feeling of community: "Facebook allows us to feel connection with the other participants" (F01) because in the group the families felt they could "have their meaning heard" (F07), an experience they define as empowering.

While the closed Facebook group enabled families to scale their research engagement, it was not a tool that all families chose to use. 33 of the 35 Main Course families joined the closed Facebook group and not all families who joined were active. Barriers to participation arose due to distrust of the Facebook platform and, in general, being "not very active on social media" (F02). Such families were unable to fully engage with the researchers and other participants because of discomfort with the platform. Their engagement with the research was thus challenged. We appreciate privacy concerns around social media, however, did not expect them to be

A first-person researcher-participant account:
• Motivated to make long-lasting changes to her family's diet for personal health and environmental health reasons • Enjoyed receiving the future 50 food box from other researchers and experimenting with new foods in her home kitchen • Liked the support and community of the Facebook group as a resource, but did not actively participate in the group due to data privacy concerns • Reported that lack of time, dietary issues and lack of local accessibility to future 50 foods were obstacles to change within her family food practices • De-motivated through encountering these obstacles but determined to keep trying to enact change on a personal, familial scale.

Table 1: First-person account of researcher-participant

a high barrier to participation in Denmark, which is noted for high social media participation (Tankovska, 2020). The use of a pre-existing social media platform to support group communication and exchange was attractive to us given the low-to-no setup costs and the built-in infrastructure that corporate social media platforms offer. However, participants' discomfort, biases related to social media, personal privacy, and other anxieties about online presence were obstacles to participation for some. These barriers to engagement attached require further consideration of net positive and negative effects on participation within the context of co-creative, CS and other methodologies. Table 1, above, provides a brief journey through the research, from the first-person perspective of the researcher who joined the study with her family. We see her move through motivation, enjoyment, then hesitation, as she encounters resistance to the Facebook group. We see her challenges, which translate into de-motivation and then determination to find a solution to low accessibility in the stores, and her acceptance that personal and societal changes come in different forms and tempo.

SHIFTING SCALES THROUGH ONLINE ENGAGEMENT TOWARDS AGENCY

During our research, Covid-19 restrictions were implemented in Denmark. The highly personal, situated nature of food practices and the reciprocal, participatory nature of the study's methodology necessitated interconnection and communication between families and researchers. The online group enabled us to connect families, researchers, and experts despite the restrictions. Shifting research activities online had a twofold effect. It created a shared community space that helped to support the co-creative research process; and engendered feelings of agency in families by affording connection across scales of intimacy.

The closed Facebook group afforded flexible avenues for engagement with research. It was always accessible, and thus allowed families to engage with research activities at their own pace. Group invitations to activities from researchers could be accepted, ignored or declined without judgement or repercussions. Families were free to RSVP to events in advance, join in at the last minute, or not at all if their schedules did not allow for it. On a day-to-day basis, families using the Facebook group were able to move between roles of active problem solver, researcher, and spectator (Reis, 2020) as they wished, while simultaneously conducting their individual research in the home. This flexibility and freedom to self-determine their level(s) of involvement across scales engendered feelings of agency in participants. Families expressed feeling "free to experiment" (F02) and "hav[ing] the power to choose" (F05). This sense of agency, in combination with feelings of empowerment, arose from belonging to a larger community with shared interests. It led families to begin sharing knowledge on a societal scale with friends, social circles, and co-workers (Figure 4). "We feel like we're doing something good together" (F06).

According to ENEC(2018) and Hadjichambis et al., (2020) Environmental Citizenship is:

> "the responsible pro-environmental behaviour of citizens who act and participate in society as agents of change in the private and public sphere, on a local, national and global scale, through individual and collective actions, in the direction of solving contemporary environmental problems, preventing the creation of new environmental problems, achieving sustainability as well as developing a healthy relationship with nature. "Environmental Citizenship" includes the exercise of environmental rights and duties, as well as the identification of the underlying structural causes of environmental degradation and environmental problems, the development of the willingness and the competences for critical and active engagement and civic participation to address those structural causes, acting individually and collectively within democratic means, and taking into account inter- and intra-generational justice (ENEC 2018).

Throughout this definition, we see the importance of scaling, as they "act and participate in society as agents of change in the private to the public sphere, on a local, national, and global scale, through individual and collective actions…" (ibid.). In *ReThinking Food*, we see these ways of being emerging as a direct result of what is afforded by the closed Facebook group, as this group performs the role of being a safe space to test out emerging knowledges and develop a sense of agency – an innate sense of responsibility, a capacity to act, and a willingness to participate in the world (OECD, 2018;

Kim & Roth, 2016). By volunteering to participate in the study at the outset, our participating families confirmed their sense of responsibility and willingness to act. By practicing their emerging knowledges in the Facebook group, as they enacted the dual role of citizen scientist researcher, they developed their capacity to act at other scales, and then they acted.

This finding is exciting for us as researchers, but we must also practice caution and note the flipsides of the strengths in our study design. For example, maximizing for participant self-direction and freedom of choice across scale had beneficial effects but also left some families who expected more structure feeling lost. F03 commented that they "don't know where to begin" and that it was "hard to keep up momentum, we need more guidance." This family simultaneously expressed a positive view of the structure, stating they could "get answers to questions in the Facebook group" (F03). Through being able to both seek and receive guidance within the group they experienced social empowerment. Nonetheless, they had a hard time recognising their co-creative exchanges with other participants as the performance of research. This conflicting experience highlights a tension point between participants' perceptions of CS and the enactment of extreme, co-creative CS through the lens of pRTD. Notions of hierarchy in science led some participants to view their role in the research process as existing within the bounds of Haklay's (2013) levels of CS, wherein participants play a relatively passive role as sensors in the research process. Coming from this point of view, expressions of frustration like the above example were understandable when families were confronted with expectations of performing research within active, co-creative frameworks.

ENVIRONMENTAL CITIZENSHIP: FROM THE BODY TO THE WORLD

The scaffolding of Environmental Citizenship in this research begins with an embodied exchange (from researcher to participant, handing over a box of food); then scales inward, to the ultimate particulars of peeling vegetables, sprouting legumes, and acts of handling the live materiality of the food. From this scale, participants then engage as a family with the question of what to eat. Children play an important role in the process, as F03 noted, sometimes they just wanted to make a simple family fall-back meal, but the children would not let them – they wanted some of the research food, and the parents, despite being tired, complied. Children will live with the futures we are making day by day. Their insistence can help us to make better (if not always easier) choices, as they help us to see beyond the timescales of our own bodies to imagine the lives of future bodies. Many of the discussions on Facebook came back to children. We have many photographs of children cooking and experimenting; the scale of their commitment was larger than we anticipated.

From the scale of the family, the research then scales out to the online sphere, to be enacted vigorously in the Facebook group, where participants find acceptance and form community. From here, they continue to scale outwards, acting within larger social, professional, and societal spheres. One family reported positively that they "accidentally posted on their own Facebook wall and got a lot of comments from friends there" (F06). Others proactively posted in their social networks, and we received a number of requests from friends of participating families who wanted to join the study.

In all, we found that performing research within the context of an online social network prompted "independent forms of communication/intervention" (Reis, 2020) both within the group and outside of it. Participating in the online group helped families build confidence in their own situated practices and acted as a conduit for enactment of EC between the private and the public spheres, the body, and the world. Curiously, despite there being no direct contact with policymakers, our participants expressed a belief that the small changes they were making could impact government, and that the bottom-up approach, scaling out from the personal to the societal, would ultimately incentivise policymakers to put the topic of a more sustainable diet on their agendas. For the families who were interviewed, the option of scaling up their contribution motivated them to change their behaviour on the individual level. They also appreciated the scaling out of the research that took place in the Free-Range study. They found themselves represented in national media. Some were interviewed over breakfast by the DR regional radio crew, others conducted online Q&As for a national audience, and had their stories shared in the newspaper and online. Whether or not they appeared personally in these media events, they felt they were at the forefront of a national discussion on societal transition; that their actions were helping society to understand how we can make change. They were emboldened by the combination of online and offline activities, and by the support provided in the online communities. These communities provided access to knowledge, and the courage to scale out experiments to social, professional, and societal spheres. Participants in the study became community catalysts; developed EC leadership capacities; and brought sustainable eating agendas to the table both in and beyond the home. They nurtured long lasting change around themselves as they experimented with transforming their personal practices.

CONCLUSION

ReThinking Food affords the development of Environmental Citizenship through engagement with international sustainability agendas across a range of

scales. It does this by working with a hybrid structure that affords scale-shifting from the home sphere through the online sphere, into social, professional, and societal spheres. At each of these scales, interaction and commoning emerge through the performance of one-to-one, one-to-some, and one-to-many interactions, infinitely nesting scales to empower citizens to enlarge the spheres within which they "act and participate in society as agents of change." (ENEC, 2018). The online sphere is critically important within this landscape of action. The closed Facebook group provides a safe space of community-building within which participants test and share emerging knowledge; rehearse change.

Over the course of our study, activities spanning multiple levels of engagement fostered connections across scale, expanding from the person through the personal to the societal. The research thereby, methodologically troubled the tendency to keep CS at what Haklay (2013) describes as level 1: Citizens as Sensors (Sauermann, et al., 2020). By exploring the concept of empowerment through embodied engagement with the research object – food and sustainability in the family and in society – becoming an agent of change in society could begin at home. This rescaling of planetary issues to the family home was important. It enabled our participants to make small moves and, after testing their emerging knowledge in the Facebook group, become emboldened to act. The Facebook group as safe space for rehearsing EC, was critical to this process.

In terms of motivation, the main reasons for joining the study were to eat more sustainably, eat less meat and have more energy. The main challenges were finding recipes, shifting practices in the kitchen to accommodate unfamiliar and time-consuming processes, such as soaking beans and legumes, and finding the ingredients at local supermarkets. The main reasons for reverting to habitual cooking and eating were time, motivation, and digestion issues, resulting from the increase in pulses in the diet. Critical to our hybrid strategy, we found that participants seemed to not only face similar challenges, but to find support, tips and advice through the Facebook group. They exchanged hopes, fears, questions, and concerns within this safe space. These exchanges helped in the collaborative formulation of knowledges as people considered how to move forward.

The participants in the Main Course were mostly middle-class Danish families who shared economic and lifestyle commonalities; they also all lived in the same municipality. The strategy presented here reflects the experiences of this specific group, and our methods would necessarily require change when applied in other, situated circumstances. Conducting this study with older or younger people, for example, may significantly impact the online component of the research. Working with people living on a lower income might require more active support from researchers in procuring foods over the course of the study. We do not consider these to be weaknesses, merely limitations to acknowledge.

In this article, we offer a live account from research, and a hybrid strategy of engagement that begins at the body and expands across scale. As our researcher-participant's bulleted account demonstrates (Table 1), the path through the research was not necessarily easy. She highlights her embodied engagement with the Future 50 Foods in the home sphere, and access to a community of like-minded individuals in the online sphere, as important points of engagement that enriched her situated practices, and helped her family engage with what it means to be sustainable in the home. Like some of our other participants, she expressed concerns about the privacy issues connected to companies such as Facebook. We take these concerns seriously. We can clearly see from our families that the perceived safe space provided by the closed group was critical to them developing their capacities in EC. This brings up a dilemma for us that will need further research. It seems clear from this study that hybrid strategies, combining online and scales of in-person engagement, are effective in accelerating the transition to Environmental Citizenship. This strategy is therefore a powerful strategy to support the radical societal changes we must make. However, we hope that we might find new platforms for conducting this work and will expand our search for alternatives moving forward.

ReThinking Food reinterpreted Citizen Science, through the lens of participatory research through design. The research foregrounds co-creation, and uses experimental, embodied and food design methods to enliven the inquiry. Through this process, we discovered that engaging citizen-scientists across scales strengthens the effectiveness of bottom-up societal transformation efforts, beginning with the personal and extending across familial, societal, and planetary scales.

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NORDES 2021

Paper Session 4

Shifting Scales

Session Chair | Tuuli Mattelmäki

Challenges of Downscaling and Upscaling in Human Centered Design
Simon Nestler, Sven Quadflieg and Klaus Neuburg (F)

Big Data and Small Beginnings – How People Engage with Data Physicalizations
Jacob Buur, Jessica Sorenson and Christina Melanie Cooper (F)

A Matter of Scales: Experiential Evaluation as a Caring Platform across Scales
Lieve Custers, Oswald Devisch, and Liesbeth Huybrechts (F)

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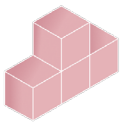

CHALLENGES OF DOWNSCALING AND UPSCALING IN HUMAN-CENTERED DESIGN

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ABSTRACT

Design has power – to improve lives, to empower people and to break down barriers. Successful design requires (besides many other tasks) a comprehensive analysis and deep understanding of the target audience. However, current design approaches, for instance established in the field of Human Centered Design, lead to multiple biases: Design neglects a multitude of needs when it uses downscaling to make complex target groups manageable. Downscaling must therefore disproportionately consider special needs within the design process – and upscaling must be able to compensate these biases again. The approach presented in this paper delivers three benefits: Conflicts between general and specific requirements are resolved, efficiency and equity are given equal consideration, and synergies become possible even at the resource level. By systematically analyzing and linking the issues of downscaling and upscaling in the context of design processes, the paper provides guardrails; these guardrails guide the design process and support a better focus to the general and specific needs of the target group.

INTRODUCTION

Design is a powerful tool: it can improve lives, empower people, and break down boundaries and barriers. At the same time design can also discriminate and exclude by simply not working for everyone or even manifesting or reinforcing existing sexism, racism or existing discrimination. A key to design that does not discriminate or exclude anyone is strongly linked to the idea of usability and accessibility. This concept is linked to the idea of usability and accessibility: Good usability and accessibility should guarantee that artifacts and processes can be used equally well by all users.

In Germany, the topic of UUX (Usability and User Experience) is currently receiving growing attention. One of the triggers is the BITV[1], which defines legal

[1] BITV is a German regulation on Barrier-free Information Technology; in German: "Barrierefreie-Informationstechnik-Verordnung" (https://www.gesetze-im-internet.de/bitv_2_0/BJNR184300011.html)

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standards for the accessibility software in public authorities (Algermissen et al. 2005). Especially the fact that accessible software is the result of a complex process leads to various challenges. When considering the related ISO standards[2] on Human Centered Design (HCD)[3], it becomes clear that usability is the result of a process. Combining this insight with the implications from BITV, accessibility is nothing more than usability for groups with specific needs. Thus, the HCD moves in a field of tension between specific needs (accessibility) and general needs (usability). As a consequence, design teams are faced with the challenge of balancing these needs on a day-to-day basis.

However, accessibility is only one example of such specific requirements. From the perspective of HCD, there are a large number of groups that are not given the necessary consideration by the existing processes and whose requirements are thus left out. This is not only due to a lack of sensitivity to such discrimination, but also to the fundamental systematics of the HCD process, which consists of an iterative interplay between downscaling and upscaling (e.g. Henze et al. 2011, Henze 2012). This downscaling can also affect (depending on the context of use), for example, women, BIPoC, left-handed people, blind people, short-sighted people, people who wear glasses, tall people, short people – and many others (Coleman & Lebbon 1999, Newell & Gregor 2000). We want to emphasize that discrimination in the context of HCD is not limited to the "traditional" categories of discrimination, but is even more multifaceted in individual contexts of use. Thus, the principle of multiple discrimination described by the term intersectionality (Crenshaw 1989, McCall 2005) can also applied to HCD (Schlesinger et al. 2017, Windsong 2018, Rankin & Thomas 2019).

However, the HCD according to ISO 9241-210 is also only one example of a human-centered design process characterized by upscaling and downscaling. Ultimately, other processes, such as design thinking and the *Double Diamond* are also characterized by a constant alternation between convergent (downscaling) and divergent (upscaling) methods (British Design Council 2005, Johansson-Sköldberg et al. 2013, Dorst 2015, Carlgren 2016, Park & McKilligan 2018). Therefore, this paper focuses on the basic systematics and the underlying problem: How can a (human-centered) design process focus while keeping users with specific needs in mind?

For this purpose, we will first deal with the rather static downscaling and upscaling during the life cycle of artifacts before we will then take a closer look at the interplay in the context of design processes.

"DESIGN FOR ALL"

Analyzing the target group is, according to our observation, still the most neglected aspect in industrial practice. When interdisciplinary teams are asked to create a particular artifact (e.g., an online store, an app or a gesture-based interface) as part of hands-on activities, they too often start with directly designing the artifact. Experienced teams differ from inexperienced teams not only in the solutions they design, but more importantly in the questions they (don't) ask.

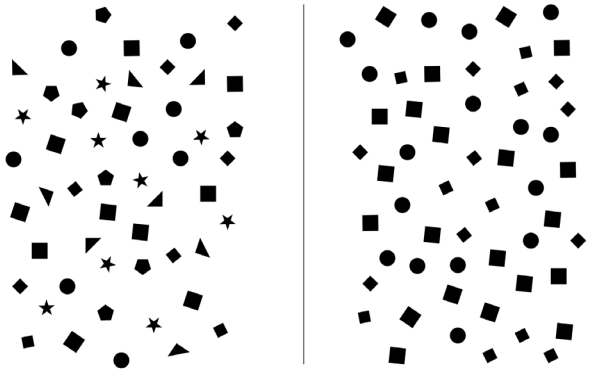

Figure 1: User research changes the target group: (a) Target group without user research vs. (b) with user research

The questions asked by the more experienced and reflective teams first gather information about the context of use (e.g.: Who are the users? What are their tasks? What are their tools? How does their environment look like? Or: In short, what exactly is the problem? Why do you need an online store at all?). One could counter that there are indeed processes in design that try to terminate exactly these questions – for example, the often-cited design thinking (Thoring & Müller 2011, Plattner 2013, McKilligan et al. 2017, Brown & Katz 2019). But even such processes, which even pose the question of the problem at an early stage

[2] Especially ISO 9241-210 (Thomas et al. 2017, DIN EN ISO 2010).

[3] It should be briefly pointed out that the concept of human-centered design is quite critically discussed: On the one hand, "human" is a term that sounds empathetic and empowering in principle, but is completely undefined for the specific context and requires a more precise process to ensure that all needs are covered as much as possible - this is, after all, discussed in this paper. Likewise, in theory, yes, the term provokes the question of design that includes non-human interests. Above all, however, the practice of HCD is repeatedly the focus of criticism, since in reality human-centered means rather profit-centered and people are regarded more as consuming beings.

and involve the user, are problematic if the scaling process described later is not carried out correctly.

Teams who skip these considerations, design with the implicit hypothesis in mind that the online store is "for everyone". In Figure 1, these two user groups are compared: When comparing the left side (without user research) with the right side (with user research) of Figure 1, one thing stands out: Some groups are missing on the right side. In this (and the following) figures, each geometric shape stands for individual users with certain characteristics. This insight helps to initiate a critical reflection of the hypothesis "the design is for everyone" by addressing, for example, the following questions:

- Is the store also for minors?
- Is the store also for welfare recipients?
- Is the store also for pensioners?
- Is the store also for illiterate people?
- Is the store also for people without a car?
- Is the store also for people in the countryside?

DOWNSCALING (ON TARGET)

These questions make a valuable contribution to the next step: The right focus. Only with the right focus design can solve problems and reach the target group – as shown in Figure 2. Focusing increases the total amount of users: When designing for an unspecified target group (left side), then only a low percentage of people will be addressed. If the target group is clearly defined (right side), the pie gets smaller, but the piece gets bigger (even in absolute terms); we refer to this strategy as *downscaling on target*.

In consequence, a differentiated examination of the target group leads to a comprehensive understanding of the context of use. Different methods of user research, for example interviews, focus groups and surveys help to develop a better understanding of the target group (Väänänen-Vainio-Mattila et al. 2008, Rohrer 2014, Robinson et al. 2018). The results are typically made usable within the design team through personas (Chang et al. 2008, Miaskiewicz & Kozar 2011, Schulz & Fuglerud 2012).

In the context of this paper, which is dedicated to the downscaling and upscaling that takes place in design processes, this approach has some weaknesses: The more realistic and closer to reality these personas are designed, the higher the risk that this representation of reality will be mistaken for reality in the further course (Junior & Filgueiras 2005). This leads to various challenges: As personas depict prototypical users, personas (despite their foundation in research) focus primarily on the greatest common denominator. This strong exaggeration of the commonalities leads to the danger that stereotypes develop, a pigeonhole thinking evolves, uniformity dominates in the further design process and individual facets are lost. Numerous existing artifacts from other contexts demonstrate this problem: Car interiors adapted to an average man's body (while increasing the risk of injury and death for those who deviate greatly from that body-especially for women, whose specific characteristics are not taken into account) can serve as one of countless examples (Criado-Perez 2020).

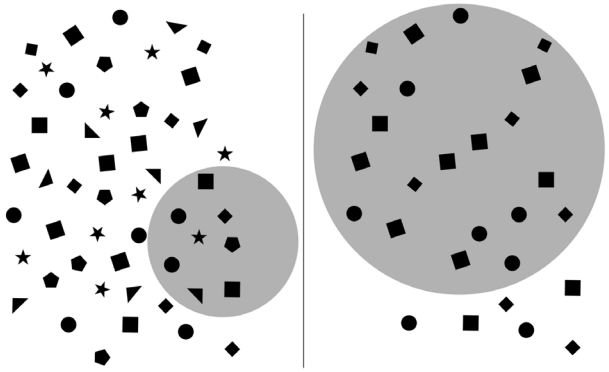

Figure 2: Focusing increases the total amount of users: (a) *Design for All* vs. (b) Downscaling on target

The tension between facets that are relevant for abstraction and those that are irrelevant is not resolved by the persona approach; therefore, we will present a possible resolution of this tension in the chapter on differentiated downscaling.

UPSCALING (OFF AND ON TARGET)

Downscaling is – as just described – the decisive process in order to be able to carry out the process of design in a focused manner. The opposite principle, upscaling, on the other hand, is not relevant until much later: For example, the four phases of ISO 9241-210 are iterated multiple times; this means that several iterations are necessary until a solution is available that can be used effectively, efficiently and satisfactorily in the specified context of use (i.e., in particular by a concrete user group) in practice. Only at this point – when the problem is sufficiently solved for a specific group – strategies for upscaling are relevant.

In practice, upscaling often starts earlier (for example, due to economic constraints); this is fundamentally extremely detrimental to the process going forward: design teams lose the necessary focus and, in the worst case, find themselves again faced with the challenge of having to design "for everyone." Furthermore, broadening the target group on the basis of a usable solution succeeds more easily - design processes can then concentrate on the additional requirements to be considered, and thus remain focused despite the upscaling. This upscaling can basically be done in two ways – as shown in Figure 3.

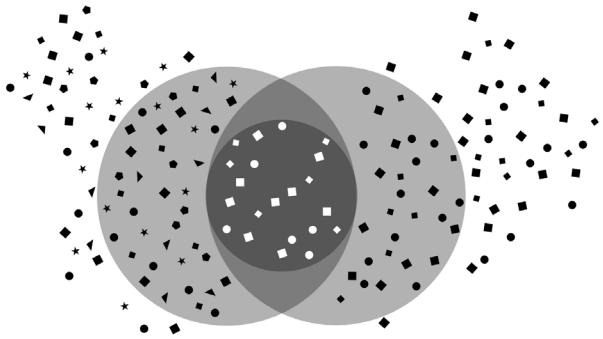

Figure 3: Different strategies for upscaling: (a) Off-target and (b) on-target

On the left side better coverage of the target group (upscaling on target) makes use of established methods. The second approach on the right side (upscaling off target) is broadening the target group: The context of use expands to include users with new needs not previously considered. Design provides the adequate methods to methodically support this broadening and to further develop the artifact accordingly. In the context of design, (bottom-up) approaches to broadening can emerge, but this broadening can also come from outside; broadening can also come (top-down) from changing the business model.

These downscaling and upscaling processes are characterized by their rather static nature: The processes comparatively rarely take place in the lifecycle of an artifact. Permanent downscaling is typically required once at the beginning of the design process, and upscaling also occurs with rather low frequency (sometimes not at all). However, the design process itself also makes intensive use of the mechanisms of *upscaling* and *downscaling*. Thus, in the next chapters we will focus on the mechanisms within the design process itself.

DOWNSCALING IN THE CONTEXT OF HCD

When downscaling in design aims to represent reality as accurately as possible, distortions arise. It is well known from research that ultimately there are always two categories of hurdles: On the one hand, there are errors that affect a large proportion of users - and on the other hand, there are errors that affect only a comparatively small group of users (or even only one user) (Kujala et al. 2001, Lindgaard et al. 2006, Wang et al. 2020). Against the background of limited resources, design will thus always inevitably focus on the first category.

Measures of optimization thus always refer to the achievement of the greatest possible effects for the largest possible group of users - the larger the group of people affected and the more serious the hurdle, the greater the attention paid to this hurdle in the course of the design process. This approach ensures both the best possible use of resources and the best possible overall effect. Ultimately, this is nothing more than an application of the pareto principle (Dunford et al. 2014), (Kiremire, 2011): With appropriate prioritization and focus, 20% of the budget required to eliminate all hurdles can already eliminate 80% of the hurdles – always in relation to the totality of all users.

So far, we have used the term *Design for All* in a shortened form as a synonym for “design for an insufficiently analyzed target group”. This contextualization may initially give the term a negative connotation, but this is relativized by the clarifications we have just made: Methodically correct Design for All goes into the breadth, and does not follow the Pareto principle. Design for All is not design for an unspecified general public, Design for All is the consideration of all requirements within the clearly specified target group. The inadequacy of the Pareto principle in the course of Design for All is thus not in contradiction to intimate downscaling, it is rather a strong argument for its necessity: The construct “all requirements of the target group” is only specific, measurable, accepted, realistic and scheduled if the target group has been sufficiently specified in advance in the course of downscaling.

The idea that design should work for everyone is, of course, ingrained in design discourse. Universal design in particular (Mace 1985; Center for Universal Design 1997) has attempted to formulate rules that attempt to create the basis of a design that works for all possible users. These focuses, among other things, on physical and cognitive limitations – but do not elaborate further, and especially not in detail, on how consideration of such factors should be reflected in the design process. The idea that marginalized persons should also be taken into account is thus formulated – whereas the concrete implementation recommendation is missing. For a design that tries to exclude any form of group-focused enmity and – see intersectionality – the combination of several characteristics, the approach is also not suitable because the focus is on inclusion and not on avoiding discrimination.

UNDIFFERENTIATED DOWNSCALING

Design neglects a multitude of requirements when it makes complex target groups manageable with the help of downscaling. When Nielsen in 2000 postulated that “Five users are enough”, his statement was critically and intensively discussed within the HCD community (see Faulkner 2003, Woolrych & Cockton 2001, Spool & Schroeder 2001). Even if seven, ten, fifteen or twenty users have to be tested in practice, downscaling is still crucial in order to make design processes manageable: The prototypical users (personas) serve as a template for the selection of suitable subjects. Just like the design process itself, the selection that takes place in the course of downscaling also focuses on “the 80 percent”. Only those hurdles that occur in at least two of the usability

tests have a realistic chance of being eliminated in the further course.

We refer to this process of downscaling in the further course of this publication as *undifferentiated downscaling*, since the consideration of specific needs is neither intended nor desired. Figure 4 illustrates how specific needs play no role in the selection of subjects. To this end, we have extended our visual representation and additionally use unfilled geometric shapes. These shapes represent users within the respective user group with individual barriers. During undifferentiated downscaling, these individual barriers are ignored.

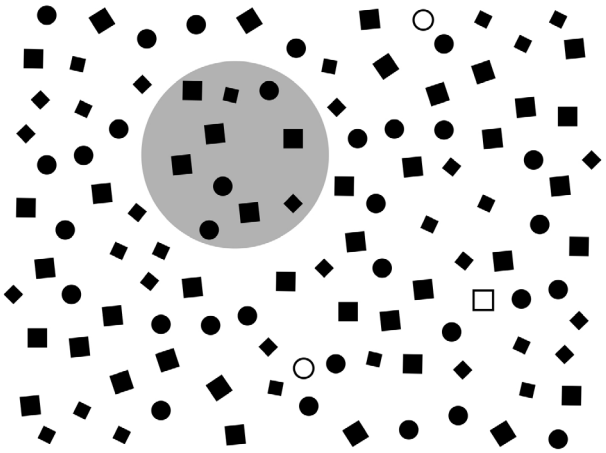

Figure 4: Individual barriers are ignored during undifferentiated downscaling

This observation has a central and obvious limitation: People in real life are not as uniform as the persona identified in the design process. The persona is an abstraction; therefore, against the background of the previous findings, the question inevitably arises whether the right aspects are now part of this abstraction – and whether the aspects not taken into account have been neglected for the right reasons. If one has doubts about the basic validity of the persona approach, there is an alternative interpretation: When the shapes are the known aspects of the target group and the fillings are the unknown aspects, the bottom line remains the same - the unknown aspects are not considered during downscaling.

Depending on the specific requirements considered in each case, the percentages vary greatly. For some of the groups considered at the beginning (e.g., women), the percentage is significantly higher than shown, while for other groups (e.g., blind people) it is lower. Figure 4 therefore initially only makes clear that specific needs occur with different frequency depending on the context of use considered and are initially left out of the downscaling required for the design process.

This practiced process of downscaling is the enemy of any specific requirements. But in practice, this effect can even be exacerbated: If in the further course after downscaling (of the sample) a generalization of the findings (upscaling) takes place, this process acts like a target group filter, as shown in Figure 5: When using the dark gray circular area (the result from the downscaling, see Figure 4) for the upscaling attempts (all light gray circular areas), individual barriers do not reappear during the process of upscaling. Under this focal lens, only the requirements lying in the overlap point remain – and the originally finely differentiated target group becomes narrower. In theory, user research does not change the target group - but in practice, strategic and operational decisions are often based on these findings. Implicitly, at many points in the process, the “stamped reality” from Figure 5 might be used instead of the “real reality” from Figure 4.

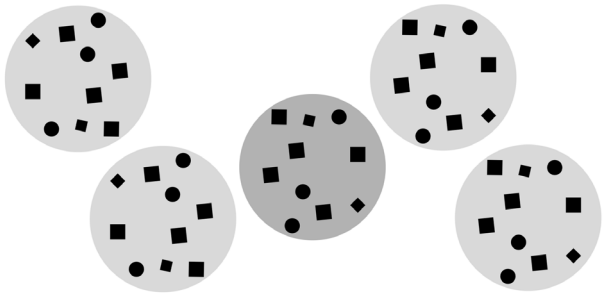

Figure 5: Subsequent downscaling and upscaling distorts the reality

In particular, qualitative findings from the research shape the further orientation of designers and developers in a decisive way. The effect shown in Figure 5 is not a defect in the system, but ultimately a desired effect of design: the focus should shift from the world of thought of the designers to the world of thought of the users. Therefore, regarding the undifferentiated downscaling we must conclude: It is methodically correct and leads to a representative user study. At the same time, however, it is also the reason why we experience a multitude of systems in practice that do not work for users with individual barriers.

DIFFERENTIATED DOWNSCALING

As explained in detail in the previous chapter, downscaling is not a priori non-discriminatory. On the contrary: Downscaling currently practiced in the context of design processes (which is also mandatory in the course of manageability) is always discriminatory. By focusing on the highest common denominator, design processes ignore the specific needs – especially of smaller marginalized groups. For the sake of clarity and precision: In our further considerations, a small marginal group is a group with individual requirements that affect less than five percent of the total. Thus, on the one hand, these requirements are well below the threshold of 20 percent (of the Pareto principle) and, on the other hand, it is unlikely that subjects from this

group are already accidentally recruited during undifferentiated downscaling.

Thus, obvious candidates for such groups are motor and cognitive impairments of any kind. However, some of the aspects mentioned at the beginning (e.g. left-handed people, BIPoC, women) would generally not be covered. However, since the relevant basis is the context of use, the specific requirements of women, for example, can also be covered by the five-percent hurdle; think, for example, of specialist applications for occupational groups still dominated by men. Men, however, can as well be affected by the five-percent rule, for example when specialized applications for educators are designed[4]. From these findings, a better downscaling strategy can be derived; we refer to this as *differentiated downscaling* because of the great importance of a differentiated approach.

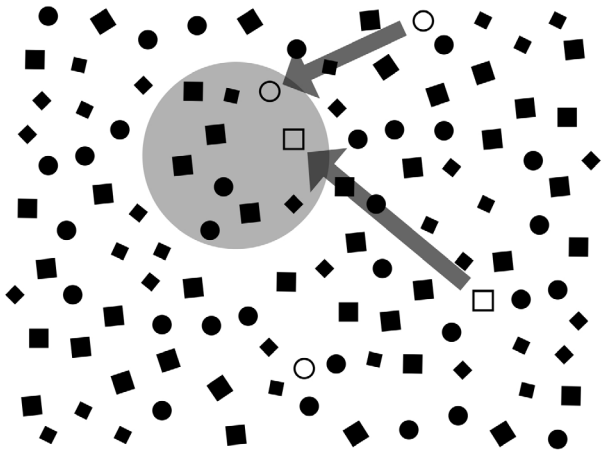

Figure 6: Downscaling with a stronger focus on marginalized groups

As shown in Figure 6, marginalized groups with specific needs must be overrepresented in the design process in order to be adequately addressed: The filled square (general needs) is replaced by an unfilled one (specific needs). The same is done for the specific needs represented by the unfilled circle (note, however, that only one circle is replaced). All of these specific needs that are overrepresented in differentiated downscaling, would fall by the wayside in undifferentiated downscaling. Or to put it another way: If specific needs are quantitatively so serious that they are already taken into account in undifferentiated downscaling, they do not have to be overrepresented in differentiated downscaling. All other specific needs, however, only gain access to the sample through their intentional overrepresentation.

Two different cases can be observed among these specific needs: On the one hand, quantitative minorities (e.g., cognitive and physical barriers) are permanent beneficiaries of differential downscaling. On the other hand, temporary minorities (e.g., BIPoC and women) also benefit from differential downscaling. This also results in two slightly different effects: In the first case, differentiated downscaling serves a better representation of reality with all its facets – since successful design is decided precisely by these facets. In the second case, differentiated downscaling serves to reduce discrimination and inequalities that lead to current underrepresentation. In this way, differentiated downscaling also makes a substantial contribution to breaking through the chicken-egg problem: As long as groups are underrepresented, they are given special consideration by the five-percent rule.

The five-percent rule makes itself partially superfluous through its consistent application. Therefore, the differential analysis of the downscaling process is not a one-time activity; rather, the design process must regularly validate the validity of the five-percent rule – and, if necessary, include new groups. In practice, this has very concrete implications, for example: A government agency has 1,000 employees, one of whom is blind. If a new application for booking business trips is to be introduced, then he must be included in the design process. Or if this authority introduces a tool for internal project management for its 50 managers (48 male, 2 female), then the differentiated downscaling ensures that at least one female manager is included in the design process. Or if there are three BIPoC working in a logistics center with 500 employees, then at least one should be included in the design process here as well.

UPSCALING IN THE CONTEXT OF HCD

As we have just explained, there are a number of pitfalls in downscaling. But upscaling can equally lead to a distortion of reality. The right strategy is also crucial here to avoid falling off the horse on the other side: Differentiated downscaling should not lead to a situation where consensual requirements (“the 80 percent”) are no longer appropriately prioritized and focused.

[4] In Germany, the proportion of male kindergarten teachers exceeded the five percent hurdle (5.2 percent) for the first time in 2015 (2014: 4.8 percent) (see https://de.statista.com/infografik/14678/maennliche-paedagogische-fachkraefte-in-kitas/).

This fear is not taken out of the air, but several aspects lead to the fact that the basic problem with upscaling in design processes is less serious: First, even after the consideration of the marginalized groups, subjects without specific requirements still remain in the target group – and are the focus of the design process. Their consolidated requirements are therefore still taken into account (on the basis of the Pareto principle). Second, the marginalized groups do not only contribute specific requirements, so these subjects also play a crucial role during further consolidation. And third, general and specific requirements are often mutually dependent. For example, BITV requires accessibility and usability.

UNBALANCED UPSCALING

The broad masses thus benefit from the requirements of special groups. From the practice of accessibility assessment, for example: Accessibility analysis and improvement makes interfaces better for everyone. This philosophy is for instance proposed by the design and consulting company IDEO; they recommend to pay special attention to the extremes in design processes[5]. In concrete terms, this means that the sample created by differentiated downscaling is unbalanced – it disproportionately represents the marginalized groups. If this distribution is adopted in the course of upscaling, then the marginalized groups are also disproportionately represented in the target group focused on in the further process. We refer to this effect as *unbalanced upscaling* and illustrate it in Figure 7 (left): The resulting specific needs are overrepresented during this kind of upscaling process.

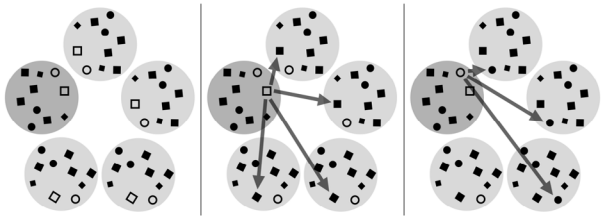

Figure 7: Different strategies for upscaling: (a) Unbalanced upscaling vs. (b) Balanced upscaling vs. (c) Balanced upscaling with inverted downscaling

The danger of unbalanced upscaling is that different intentions are mixed together – and contradictions can arise in the further design process. The objective of downscaling and classical design processes is the most effective and efficient use of resources (achieving as much as possible for as many as possible). The objective of differentiated downscaling was the best possible addressing of individual barriers. If these two aspects are now placed next to each other in the context of unbalanced upscaling, they inevitably compete with each other. This means that both directions of objectives thus also become the subject of prioritization and focusing. It sounds paradoxical at first: Although the marginalized groups are given additional weight by unbalanced upscaling, this weight is usually not sufficient to achieve a sufficiently high priority for these concerns.

BALANCED UPSCALING

The greatest weakness of unbalanced upscaling thus does not lie in the overrepresentation of the concerns of the special target groups – on the contrary, the weakness arises from the systematics of the process of prioritization and focusing. This systematics is necessary due to the limitation of resources. As our proposed strategy should be capable of maintaining the two different intentions of the design process, these specific needs may not get lost during upscaling. This requires first of all a removal of overrepresentations in the course of upscaling. With the maxim “as much as possible for as many as possible” the specific needs have to be put in relation to the population; this leads us to balanced upscaling, as shown in Figure 7: By replacing individual needs by general needs (Figure 7, middle) and additionally taking into account the insights from differentiated downscaling (Figure 7, right), upscaling is capable of inverting the downscaling process.

This strategy results in two advantages: When prioritizing hurdles, existing systematics can be retained. Based on the recognition that the broad masses benefit from the needs of special groups, general improvements can be achieved with the resources originally available for design processes; in practice designers regularly observe the following effect: What is unusable for special needs groups is often usable by the general public only with great difficulty (Astbrink et al. 2003, Keates & Clarkson 2003, Borys et al. 2013). When design processes increase effectiveness for special groups, they increase efficiency and satisfaction for the general public at the same time. Secondly, balanced upscaling makes use of the separation of concerns: Balanced upscaling explicitly rejects the hypothesis of resource neutrality. If available resources are to be distributed between two diametrically opposed intentions, then two good intentions enter into competition and conflicts are pre-programmed. Instead of moderating these conflicts in the context of design

[5] see: https://designthinking.ideo.com/resources/extremes-and-mainstreams-design-toolkit-by-ideo-org

processes on the concrete case such conflicts have to be resolved in advance. Additional resources must therefore be allocated to the additional activities up front. While the interleaving in downscaling leads to the resource-saving integration of the additional activities, these different interests have to be balanced in upscaling.

In consequence, balanced upscaling follows the previous process of prioritizing and focusing the requirements on the basis of the Pareto principle with the resources available for design. Since it is based on the differentiated downscaling, specific requirements that are "majority-driven" are also taken into account. At the same time, an additional budget is provided to address the specific needs in the process. During this process synergies are considered, but all specific needs are equally significant. We would like to emphasize that this requirement leads to a fundamentally different systematic for prioritizing needs: Inclusive design decisions are based on the lowest common multiple rather than the highest common denominator. Thus, the second budget does not follow the didactic of efficiency and effectiveness, but rather the principle of equal opportunity.

These marginal adaptations of the previous processes are fundamental; and marginal adaptations lead to central effects. This is clearly illustrated by the (already discussed) example of *accessibility vs. usability*: First, part of the budget for usability no longer has to be diverted for better accessibility; instead, the budgets are planned separately and backed up with concrete goals and metrics. Second, usability measures no longer have to be covered by the accessibility budget; instead, the budget can also be used for specific requirements that are eligible for majority support. Third, individual barriers do not compete with general requirements; the principle of equal opportunity is separated from increasing effectiveness and efficiency.

DISCUSSION

In the end, what can this publication achieve in this field of tension? Many of the topics have already been analyzed and discussed in the field of UUX from different angles and under consideration of different facets. However, the systematics of downscaling and upscaling presented and explained in this paper and its application to design processes has not been done in this form before. Thus, the paper makes a valuable contribution to resolving the tension between general needs and individual barriers. This can be achieved on the one hand by separating downscaling from upscaling and on the other hand by using different approaches for integrating specific needs.

This publication is intended to help practitioners in the field of UUX, for example, to differentiate between usability and accessibility on the one hand and to exploit synergies on the other. At the same time, these findings and methodologies can be transferred to other design disciplines and be used for supporting specific goals and concrete strategies (advancement of women, accessibility, etc.).

Of course, self-critical reflection also includes the fact that the mandatory prerequisite postulated in the context of balanced upscaling (additional budget) is not part of the solution but part of the problem in many practical issues. We are aware of this problem, although this publication at least provides a substantive argumentation basis for claiming additional budgets. Nevertheless, the design teams should never be forced to make difficult trade-offs that cannot be handled with design, regardless of the concrete framework conditions – even if resources are strictly limited. If economic reasons really do make trade-offs unavoidable, then they must be made at the management level. A competition between the two goals can only be resolved – even with limited overall resources – through separate budgets; even if, in the worst case, this means that something has to be diverted from the existing budget.

A second hurdle may arise in practice from the presence of a large number of marginalized groups with specific needs. In the extreme case, the sample is filled exclusively with representatives of marginalized groups – and is not even quantitatively sufficient for all marginalized groups to be represented. While the aforementioned intersectionality can sometimes lead to additional challenges, it is a valuable phenomenon here that can significantly reduce the effects: For example, female BIPoC provide a particularly large number of specific needs in design processes, or large left-handed people help identify edge cases in a particularly targeted way. If this strategy also does not lead to a resolution of the conflicting goals, the overall sample can alternatively be enlarged in differentiated downscaling instead of replacing individual subjects. This enlargement is not the ideal solution, since it increases the effort for the design process, but it is a compromise that can be achieved (especially if this concept is not used in an excessive form) – a compromise that can help prevent discrimination, sexism, and racism in and through design solutions.

CONCLUSION

On the one hand, the strategy we propose allows HCD processes to focus and narrow down the issues (in the course of differentiated downscaling), while remaining open to prioritized generalization of findings (in the course of balanced upscaling). Downscaling itself – despite its discriminatory effects – is not negative; downscaling is necessary to maintain focus in the design process. Downscaling makes complex realities manageable; personas (properly done) are as important

in practice as maps – they simplify a complex, multidimensional and differentiated world. This simplification is a necessary condition for orientation and practical usability of these tools. However, our persona map ultimately only draws our attention to the aspects and facets that are particularly relevant.

With the systematic linking of downscaling and upscaling, this paper helps us to fulfil this purpose – to maintain the structuring and focus-supporting guard rails in the further course of design processes. Instead of an arbitrary section on reality, the differentiated downscaling directs the view to the special "sights". At the same time, reflection on the processes of downscaling will also help to ensure that this issue receives greater attention in future discourses on design methods.

Legal foundations support the process of finding bottom-up synergies in the area of tension (general requirements vs. individual requirements). Although template-like and standardized requirements have a particularly strong resonance in practice due to their ease of application, they are not entirely harmless: They can be mistaken as a top-down approach. Thus, on the basis of our considerations of downscaling and upscaling, these regulations should even more clearly point out that no useful shortcuts or top-down solutions make a differentiated examination of the context of use dispensable. In order to effectively avoid playing off groups that are discriminated against in different ways, bottom-up strategies such as differentiated downscaling in combination with balanced upscaling have to be implemented.

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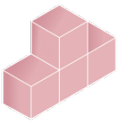

BIG DATA AND SMALL BEGINNINGS – HOW PEOPLE ENGAGE WITH DATA PHYSICALIZATIONS

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ABSTRACT

Data physicalization has emerged on the design scene as a way of making sense of big (quantitative) data. This study explores how big-data physicalizations are designed, how people engage with them, and how that spurs innovation. Graduate student designers created 15 data physicalizations to engage bus planners and bus passengers at multi-stakeholder workshops in discussing bus services and bus designs. The physicalizations were based on passenger data from 9 city bus routes. We used dimensional analysis to scrutinize the data physicalizations as constructs and multimodal interaction analysis to understand how workshop participant interact with the physicalizations. Using the theories of Flow State and Play Moods as analytic perspectives we identified patterns of engagement that were stimulated by both material aspects of the data physicalizations and the designers' role in facilitating interaction. We contribute with a framework of how data physicalizations can scale big data insights to meaningful engagements, which in turn lead to Small Beginnings of innovation.

INTRODUCTION

With the collection of big data becoming ubiquitous practice in organizations, designers have been struggling to make sense of large amounts of quantitative data (Lu 2020). In a recent study of UX design practices in industry we heard from designers that they have difficulties *'making big data my own'*, but also that they need to take on a new role of engaging people in the organization in making sense of big data. According to De Mauro, Greco, and Grimaldi (2016), this struggle is inherent to the definition of *Big Data: "Big Data is the Information asset characterized by such a High Volume, Velocity and Variety to require specific Technology and Analytical Methods for its transformation into Value."* Data physicalizations have emerged as one such method for transforming big data into meaningful representations. While there are already many examples of data physicalizations (Dragicevic et al, 2019), it is yet unclear what people can actually *do* with them, and what role they may play in involving diverse stakeholders in innovative processes. In this study we examine a set of data physicalizations of bus service data, to find out how big-data physicalizations are designed, how people engage with them, and how that spurs innovation. The goal is to identify patterns towards innovation in interactions with data physicalizations and thereby suggest which design considerations may be important when creating data physicalizations for engagement.

The term *Data Physicalization* was coined by Jansen et al. (2015) to describe constructs designed to represent (big) data and help people explore, understand, and communicate data – as we humans explore the world around us with all of our senses. Data physicalizations may be static or interactive but have in common that they afford physical manipulation. They may convey (digital) data from systems or allow people to add or

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construct data about their own experiences. In this study, we asked designers to produce data physicalizations that instigate conversation and discussion around the bus traffic data.

Physicalization is a way to invite individuals into reflective processes. Huron et al.'s (2014) 'Constructive Visualizations' similarly enable individuals to express themselves through adding or removing data tokens. Houben et al.'s (2016) human-data design approach links data physicalization to learning: when individuals *"create, share and use data through tangible and physical visualizations"* they learn more about themselves and their environment. Knowledge is continuously constructed and deconstructed through the interactions we have with the world around us (Ackermann 1996; Kafai, 2006). This resonates with the way designers and architects work. They employ material practices, like model making and prototyping, to gain insights about how people experience the world. Hull and Willett (2017) suggest how data visualization take inspiration from architects. Buur et al. (2018) show how data physicalizations enrich conversations, shift perspectives, and help imagine "What could be" through the physical touch, juxtaposition and co-construction of data. For this study it was therefore a core criterion that in addition to eliciting conversation, the data physicalizations should invite physical interaction.

Within data visualization, research has been made on the aesthetics of "beautiful data" (Steele and Iliinsky 2010; Wattenberg and Viégas 2010), but McCosker & Wilken (2014) criticize that focusing on the end result of data visualization misses the opportunity of knowledge creation in the process. They argue that it is the creation of such diagrams, including all of the steps of planning, mapping, drawing and illustrating that generates understanding. This is relevant for data physicalization, as materiality affords manipulation and expression for active engagement.

Within ethnography, Anderson et al. (2009) show how data visualizations can be designed to involve participants in making sense of their own data, and thus diminish some of the authority that participants tend to give to the 'objectivity' of data. They claim that this makes participants more comfortable at providing explanations of the data, as they can see how some of the collected data can be misinterpreted. One quality to look out for in designing data physicalization is thus how they challenge the 'objective' look of numbers and graphs. We challenged our graduate student designers to create big-data physicalizations that go beyond representation to involve participants in making meaning from the data.

In human-centred design research it has become popular to utilize materialization to ease the conversation between designers and 'users'. The generative tools of Sanders and Stappers (2014) and the tangible business models of Buur and Mitchell (2011) both use design materials to surface memories and stories that otherwise can be tacit and difficult to put into words. In the same way data physicalizations can be understood as *boundary objects* (Star 1989) that enable people to work together and make sense of the data, even if they have different ways of understanding it.

The question we ask ourselves in this study is: What makes some data physicalizations more inviting for engagement than others? And does engagement lead to innovation?

BUS SERVICE DATA PHYSICALIZATIONS

In order to explore the potential of data physicalizations to engage people toward innovation, we tasked graduate student designers with creating big-data physicalizations based on quantitative data supplied by a regional traffic authority. We collaborated with the traffic authority's data analysis section to explore 'what one can do with the data'. Rather than ask the designers to come up with 'ideas' themselves for how to improve bus operations, we challenged them to prepare the data as physicalizations that trigger discussions about innovation. We ran the project three times with different cohorts of designers and developed our design criteria from rather open in the first round to more specific later on (e.g., targeting particular stakeholders: traffic planners, politicians, bus-interior designers, bus-stop designers, bus non-riders). We explicitly asked them to design for *interaction* to engage participants (as opposed to physicalized pie charts and bar graphs as mere static representations).

The traffic authority supplied us with fare data spanning one week for 9 local city bus routes. The main source of data was the national transit cards that are checked in and out of busses and trains. The High-Volume dataset included more than 50.000 data points, which the traffic authority collects at a Velocity of 10,000 points per day. Designers were given access to a select dataset via the traffic authority's Business Intelligence (BI) platform. The BI platform allowed designers to organize or filter data, e.g., by specific bus lines, trips, or stops. The data could also be exported as comma-separated values for analysis in spreadsheets. Alongside the quantitative data, the designers had free passage to do their own ethnographic studies on the busses for a 2-week period, including observing, counting, and interviewing. These qualitative datasets were used to bring Variety and context to the designers' understanding of the quantitative data. For instance, the quantitative data would tell how many passengers are on the bus, but not where they are seated. Or they would tell how far passengers travel, but not for which purpose.

The designers produced a total of 15 data physicalizations, four of which we include in this paper as illustrative examples, Figure 1.

Figure 1. Four data physicalizations: Bus Route Map (top left), Travel Worms (top right), Bus Stop Crowd (bottom left), Corona Touch (bottom right).

Bus Route Map aims to support politicians in making decisions about the levels of bus service they want to offer based on traffic data. It is a map of the municipality with needles for each bus stop and colour codes for each city district. The needles hold coloured beads representing 5 (small beads) or 50 (large beads) passengers waiting at the bus stop, who want to travel to the district indicated by the colour. The challenge for the 'politicians' (participants) is to buy enough bus routes (with monopoly money) to connect bus stops (with pieces of string) in the most efficient ways, collecting passengers (beads) along the way.

Travel Worms triggers discussions of the variety in passengers' travel patterns, from home to destination. For 100 bus passengers the designers made strings of coloured beads with each bead representing 1 minute of travel, and colours depicting walking, train, or one of the bus routes. The participants pick a number of 'worms' to compare travel patterns and then place them in a physical model of the bus to discuss seating.

Bus Stop Crowd supports bus stop designers in finding ways of preventing crowding when passengers enter the bus. The designers projected their mapping of dynamic passenger behaviour onto the pavement in front of a scale model bus. Participants were given diverse materials and figurines to invent ways of nudging passengers to keep a distance while entering the bus (during the corona pandemic).

Corona Touch directs attention to passenger behaviour on the bus: How many times passengers touch the handrails, grab-handles, arm rests, their face mask, their cell phone, and stop buttons. Participants are asked to estimate their own behaviour, compare it to the data (in the form of colourful vira tokens), and suggest ways of reducing the risk of viral contamination on the bus.

At the end of each of the three design projects, we invited a mixed audience of professionals to attend a 90-minute multi-stakeholder workshop. Participants included traffic authority employees, municipality bus planners, and bus passengers (university faculty and students). Small mixed teams of 3-5 participants rotated between five stations with a data physicalization at each. The designers had prepared an activity to engage participants with their physicalization for 15-20 min. Presentations were not allowed, only facilitation. Each station was video-recorded from two angles. We gathered documentation of at least three teams of participants interacting with each data physicalization.

There was quite a variety in how the activities and tangible physicalizations captured the attention and active engagement of the participants. We used two methods of analysis. Dimensional analysis was used to achieve an overall understanding of the qualities of the data physicalizations and to characterize participants' interactions. Multimodal interaction analysis was used to identify patterns of engagement with the data physicalizations and their innovative potential.

DIMENSIONAL ANALYSIS

Dimensional Analysis (Kools et al. 1996) builds on a grounded-theory epistemology for organising empirical data along different 'dimensions' to come to a deeper

understanding of the phenomenon studied, Figure 2. As empirical data points we first used images of the data physicalizations, then condensed 2-min video edits highlighting how workshop participants interacted with each of the 15 physicalizations. Our collaborative analysis sessions included both researchers who had been part of the design projects and colleagues who saw the material for the first time. We reviewed the material and ordered images and videos along alternating scales in a comparative exercise. After discussing 15 different dimensions, our analysis had reached a level of nuance sufficient for describing the data physicalizations' qualities and interactions.

The *primary perspective* that emerged from the analysis was the ability of the data physicalizations to **facilitate innovation.** This would also be the primary measure of success of these tools with the traffic authority. The other dimensions elicited from the analysis were then organized as indicative of the *context, conditions, process* and *consequences* of the activity, Table 1, as recommended by Kools et al. (1996). Our dimensional analysis led us to identify 'engagement' as a most salient precondition for the data physicalizations to 'work' as innovation facilitators.

MULTIMODAL INTERACTION ANALYSIS

We performed a second and more detailed analysis of the video recordings to identify patterns indicative of engagement, asking: How can we characterize what happens in participants' activity with the data physicalizations? We analysed the participants' interactions with the data physicalizations, with the facilitators, and with each other.

We observed patterns of engagement that might be explained by two theories in particular: **Flow State** (Csikszentmihalyi 1975) and **Play Moods** (Karoff 2013). Both theories describe an aroused feeling of euphoria in activities, but they are also distinctly different: Flow State originates in individual thinking, whereas Play Moods are inherently social. Flow State appears in (loosely) goal-directed activity, where Play Moods describe play as valuable in itself. Flow State is generalised to many activities in life (including work and play), whereas Play Moods relate to play as activity.

While reviewing the videos for patterns of engagement, we also began to see patterns of emerging innovation. We noticed 'a-ha!' and 'what-if…' moments when participants were engaged with the physicalizations, and we recorded these in the same way we had done for engagement. We found these patterns mirrored in Shaw's (2000) concept of **Small Beginnings**, so we used this as a theory for understanding these moments where something unexpected is about to happen.

We reviewed each video looking for patterns of engagement in participants actions, according to the principles of multimodal interaction analysis:

- "the participants' language and embodied actions (with all senses) in relation with the material surroundings
- the actions of the participants as meaningful in relation to surroundings and fellow participants
- participants' actions as situated, comprehensible and accountable." (Paasch & Raudaskoski, 2018:158)

We paid attention to how participants moved around and interacted with the materials, how they made sense of the data in relation to their own personal experiences and professional expertise, and how they responded to designers' facilitation of the activity. We recorded a list of our findings describing the (inter)actions we observed, and the qualities that characterized these actions (e.g., how participants puzzled to solve a collective task, as characterized by their contemplative silence). We organized our findings in the framework shown in Table 2 with the interactions in the left column and the videos in the top row. In the following three sections, we discuss the results of our analysis when employing Flow State, Play Moods, and Small Beginnings as analytical perspectives.

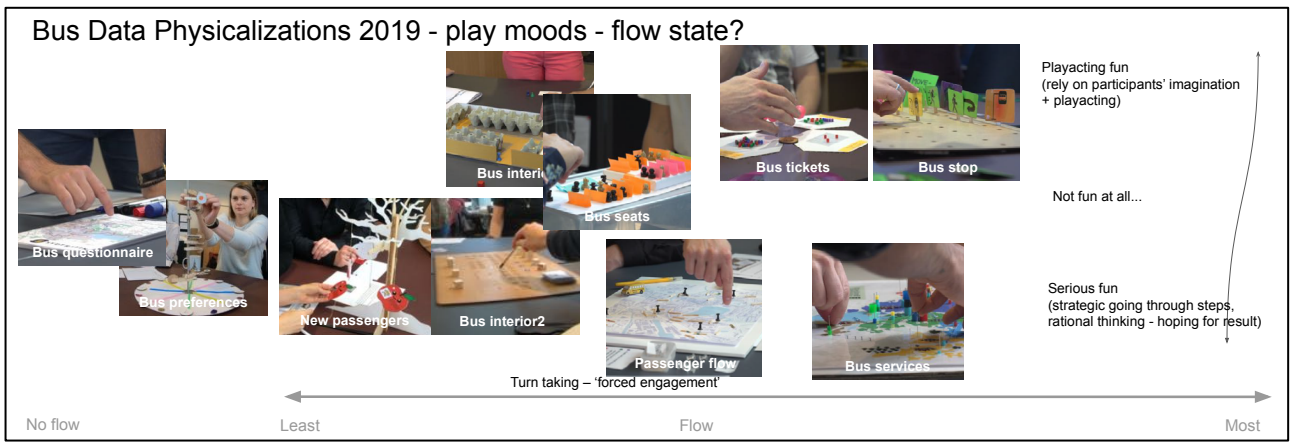

Figure 2. Example of one of the scaled dimensions scrutinized with Dimensional Analysis. Data physicalizations shown as photos.

ENGAGEMENT AS FLOW STATE

Csikszentmihalyi (1975) defines Flow State as a state of mind in which competence and concentration converge, and the subjective sense of time is altered. The experience of a heightened level of awareness of the activity in which one is engaged, and a lack of critical self-reflection or "internal mental chatter" in the moment. The essence of flow is the removal of the interference of the thinking mind. Flow arises from engagement with activities that are precisely mentally or physically challenging enough to require concentration, but not so challenging that they exceed competence. And: *"The second you realize that you are in a state of flow - you cease to be in a state of flow."*

"Most enjoyable activities are not natural; they demand an effort that initially one is reluctant to make. But once the interaction starts to provide feedback to the person's skills, it usually begins to be intrinsically rewarding." (Csikszentmihaly 1975:68)

Flow States can be experienced through both solitary and collaborative activities, and usually through engagement with an activity in which the goal or "meaning" with the activity is clear.

When observing participant interactions from a Flow State perspective, several patterns in the video documentation indicate that the participants may indeed approach flow:

Primary	**Facilitating innovation.** To which extent do the physicalization help facilitate innovative ideas? This is ultimately the meassure of success of these tools with the traffic authority. The data physicalizations were categorized on a scale from *no innovation* to *much innovation*.
Context	**Type of data.** How is data included? Scaled from *qualitative* to *quantitative*, with sub-categorizations (e.g., as stories, as background data). **Data processing**: How interesting is this data to the Traffic Authority: "How much have you done with our data?" From *unchanged* to *transformed*. **Contextual representation**. How do the designs represent the bus context? Each design was scaled from *abstractly* to *concretely* for how the data context was materialized (e.g., passengers as beads or sticks, routes as yarn, model of bus interior).
Conditions > Material expression	**Data affordance**. What does data encourage? The physicalizations were scaled from *observable* (a visualization) to *manipulable* (encouraging hands-on engagement). This dimension centered on the role of the data (as presented) in eliciting particular types of engagement. **Aesthetics**. How visually appealing does the data physicalization appear? From *very* to *not so much*. **Scale of prototype**. What is the scale of the data physicalization? From *big* to *small*. **Completion**. How 'finished' is the design as a prototype? From *hi fidelity* to *low fidelity*. **Complexity**. How complex does the physicalization look? How many 'parts'? From *complex* to *simple*. **Experiential complexity**. How easy to use is the design? The physicalizations were scaled from *self-explanatory* to *facilitated*. This dimension took into account how much explanation was needed to make a physicalization work.
Process > Participant interaction	**Engaging with data**. How effectively is data used to engage participants? This dimension was scaled from *least* to *most* engaging, focused on the primacy of the data in the tangible tool, and how it shaped the participants' experiences. **Experience flow**. What kind of Play Moods or Flow States are instigated? This dimension measured the level of participant engagement from *least* to *most*, and cross-characterized from *playful* to *serious*, with playacting on the playful end, and problem-solving or decision-making on the serious end. **Gamification.** How is a game experience used to encourage engagement? From *game* to *lecture*. On the one hand, the characterization *game* included participatory elements, like roles, turn-taking, and objective/problem-solving; on the other hand, *lecture* included explanations and static data. **Participant roles**. Which role do participants need to take to engage with the tool? The dimension explored a scale where participant roles ranged from maintaining their own perspectives, being *oneself* (in a decision-making process, e.g.) to embodying a *character* (in a role-playing scenario, e.g.).
Conse-quences	**Role as a tool**. Which role does the tool play in innovation? Scaled from *research tool* to *practical tool*, this dimension investigated the tools' utility in data collection and in decision-making, respectively.

Table 1. Framework for designing data physicalizations: 15 scaled dimensions developed in the dimensional analysis.

	Data physicalization	Bus Route Map		Travel Worms			Bus Stop Crowd			Corona Touch	
	Participant team	S-team	H-team	A-team	B-team	D-team	A-team	B-team	C-team	A-team	B-team
FLOW STATE	1. Ask questions about data		III	I	I	I					
	2. Solve a challenging problem	I	I				I	I	I		
	3. Take initiative	I								I	
PLAY MOODS	4. Make data personal			I		I					
	5. Share stories	I			I	I	IIIII	I			
	6. Play roles	III	II							II	I
SMALL BEGIN-NINGS	7. Use professional expertise	III									
	8. Compare to 'what I do'									II	
	9. Suggest design ideas	I	II			I	I	I	I		
	10. Initiate the unexpected	I									

Table 2. Framework for developing facilitation of co-analysis with data physicalization: 10 observed interaction patterns and in which videos they appear

1. ASK QUESTIONS ABOUT DATA

In many instances, the physical shape of data triggers participants to pose questions. With the Travel Worms, for instance, the facilitator asks the participants to pick four 'worms' (strings of coloured beads representing a passenger's travel time and modes of transport) and explain why they find them interesting. Two particular 'worms' trigger repeated questions about the passenger data:
A very short 'worm' with a few minutes of walking at each end of a 1-min bus ride: *"I picked a very short one, because I wondered why anybody would bother to take the bus that short?"*
"Why take a bus – walk, take a bus for 1 minute and then get off? It's a waste of resources!"
"I was wondering: Why did you want to take a bus if you are not disabled for just 5 minutes?"

And a 'worm' that combines walking, bus-ride and biking, Figure 3: *"I think this one is interesting: Biking in the end. It's a nice phenomenon if it is these commuter bikes?"*

Also, some of the very long 'worms' elicit questions: *"Why do they remain on public transport, when it takes so long?* Handling the data physically seems to stir curiosity.

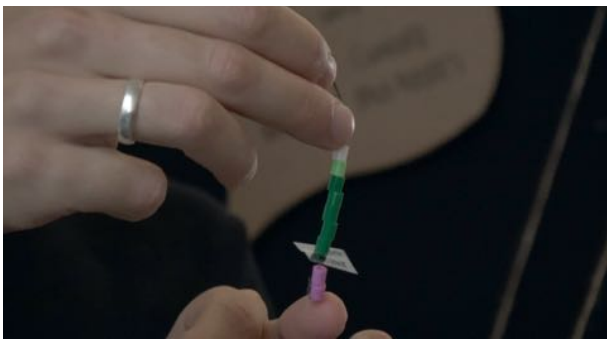

Figure 3.A short 'Travel Worm' triggers a participant to ask questions about the bike ride (pink beads) at the end of the travel.

2. SOLVE A CHALLENGING PROBLEM

The Flow State perspective helps identify situations when the participants get deeply absorbed in solving a challenging problem – rather than just look at the physicalization, or perform tasks as asked by the facilitators. In the Bus Route Map, the participants are challenged to buy the minimum of bus routes required to move a given number of passengers (coloured beads) to their respective neighbourhoods (coloured areas) in the map. This triggers intense discussion and experimentation with different bus route configurations. When the facilitators make suggestions, it seems to interfere with the flow rather than scaffold it.

Similarly, in the Bus Stop Crowd physicalization, participants are encouraged to find a physical arrangement at busy bus stops that prevents passengers from flocking to the door, when the bus arrives. With all participant teams we observe inspired shifting around of the materials at their disposal.

We observe that hectic activity sometimes is interspersed with moments of silence. From context it is quite easy to sense, even in the video recordings, if such moments are awkward silence, waiting for facilitators to push on, or rather quiet contemplation, where facilitation will appear interruptive.

Figure 4.Participants solve the challenging problem of nudging passenger to keep a distance with the Bus Stop Crowd data physicalization.

3. TAKE INITIATIVE

Once participants emerge into an activity, they may be inspired to take their own initiatives, to take control of the process. In the Bus Stop Crowd activity, the designers have prepared situation cards, which participants can draw at any time to challenge their bus stop designs, e.g. 'THE BUS NEEDS TO LEAVE IN 60 SECONDS'. While at the beginning the facilitators challenges participants to pick a card, later participants pick cards themselves to move the activity on. They even challenge themselves with 'red' (the most difficult) cards rather than 'green' ones. We see that as an indication that the activity 'flows', facilitation is no longer required.

In our analysis, we recognise Csikszentmihalyi's eight components of "The phenomenology of enjoyment":

"working with a clear goal in an activity, a balance between challenges and skills, receiving immediate feedback from the activity, the merging of action and awareness, intense concentration on a task, a sense of heightened control, forgetting one's self, forgetting time, and an activity that becomes autotelic or an end in and of itself." (Mainemelis and Dionysiou 2015, 131)

These dimensions seem useful not only as analytic lens but also as a guiding star for designers aiming to design inspiring data physicalizations.

ENGAGEMENT AS PLAY MOODS

Karoff (2013) suggests a framework and vocabulary for understanding play as practice (doing) and sensing (being). She draws on Bateson, Schmidt and Heidegger to conceptualise *Play Moods* as a way of describing the aim of the playing activity, the commonness of play as practice. Play Moods is a theory of engagement with the present moment, in contrast to theories of human play that suggest play as a vehicle for learning. Play Moods recognise play as a phenomenon and experience that is valuable in and of itself.

Karoff suggests that several Play Moods appear simultaneously and describes four in detail (Karoff, 2013:10):

DEVOTION - letting go of "doing" and seeing where being leads
INTENSITY - the unpredictable feeling of something exciting is going to happen
TENSION - readiness to "show oneself"
EUPHORIA - intense expectation of silliness

"In play, the production of meaning takes place through our activities together." (Skovbjerg & Bekker, 2018:8). Through the Play Moods perspective on engagement, we observe several patterns of playful interactions:

4. MAKE DATA PERSONAL

There are instances, when participants relate their personal experiences to the data. Quite clearly in the Travel Worms case: When asked to explain which 'worms' they picked, several participants talk about personal experiences: "*I chose this very long one, because that reminds me of me in public transport. I live far out in the countryside."* and *"They look like my travel. When I do I do short distances."*

In Play Mood terms, personalising data seems to align well with 'Tension', the readiness to show oneself to other participants.

5. SHARE STORIES

Some participants find opportunities to relate stories from their own life. For instance, when pondering about the short, 1-min bus Travel Worm, a participant tells this narrative: "*The short trip is really interesting, because it reminds me of back in the days, when I lived in Lithuania. There were these one-way streets and trolley busses always going the same way. If I was really late and I could see the trolley bus coming, I would jump in and ride for 2 minutes, just to save 5 minutes!"*

We feel the excitement of participants being engaged also on a personal level. More generally, the data physicalizations tend to trigger associations to things the participants have heard or seen, for instance, when discussing the Travel Worms: *"There is a lot of walking [before and after the bus ride]. Some years ago, there were commercials that you should leave the bus one stop before you normally would to get more exercise."*

Similarly, in the Bus Stop Crowd activity, participants make several associations to other places with similar crowding challenges:

"Like at concerts, the barriers"
"Like in the airport, you make a channel"
"In the supermarket it works with drawings on the floor"
"In theme parks they have winding barriers. Like a maze."
"Like Orange Stage on Roskilde Festival"

While associations like these are less personal, participants in a sense work hard to make the data real for themselves.

6. PLAY ROLES

The most playful moments in the activities happen when participants start playacting roles – what Karoff would term Euphoria, an intense expectation of silliness. In the Corona Touch activity, participants draw situation cards, describing a situation in direct language, e.g.

YOU ENTER THE BUS AND START TO LOOK FOR A SEAT. SUDDENLY THE BUS STARTS DRIVING AWAY FROM THE STATION. YOU FEEL OUT OF BALANCE AND MIGHT FALL OVER. HOW MANY BARS WILL YOU TOUCH ON THE WAY TO YOUR SEAT?

In response one participant acts the movements of a monkey to show how she might tackle the situation – to the amusement of her teammates, Figure 5: *"And probably on my way to the seat, I would at least touch the vertical bar once, but probably twice, usually just kind of going monkey-bars, like…[miming monkey bars]."*

In the Bus Route Map activity, facilitators prompt the participants to imagine they are politicians discussing bus service levels vs. cost for citizens in the city. This leads to spontaneous acting: *"There are lots of voters here, how do we move them? Good voters, they are rich in this area!" "Because they are rich, they are complaining a lot! – That's how they get their own bus route."* Upon completing the map: *"I'm not sure we'll be elected next time!"*

In some of the data physicalizations not shown here, the roleplay elements are even more pronounced: In one activity, participants act out how they will react to a ticket controller, if they have no ticket. In another, they roleplay how they will catch a bus if the routes have been temporally shifted. These physicalizations, however, are richer on qualitative data (passenger stories), but make less use of the quantitative data.

"Play moods are essential to play, and they are always in plural, depending on how players engage with the world and the people they are with. (…) When highlighting mood in play it becomes possible to go beyond a functional approach to play, and instead to focus on play as a common way of living" (Karoff, 2013:10)

Play Moods is a convincing perspective for characterising playful activities when observed, and there is likely potential for drawing on the theory proactively in design.

Figure 5.A participant demonstrate how she migh go 'monkey-bars' through a shaking bus to to keep balance.

INNOVATION – SMALL BEGINNINGS?

Our overall perspective on the data physicalizations was to investigate, if they are able to facilitate innovation. In the video analysis, we looked for indications of 'innovation'. We particularly observed the reactions of the traffic authority and municipality participants – if there were any indications of 'innovation' emerging in the trial sessions. If, according to Buur & Larsen (2010), the emergence of novelty comes about in local interactions between people with different intentions, a vocabulary around the phenomena of "emerging novelty in local interactions" is useful. The traditional business definition of innovation – *"any new policy that an entrepreneur undertakes to reduce the overall cost of production or increase the demand for his products"* (Schumpeter 1943) – is not useful for this kind of micro-analysis. Instead, we look for *Small Beginnings*, a term introduced by Shaw (2000) to denote "low key" but meaningful practices. Shaw suggests conversational inquiry as an approach to organizational development. Larsen (2005) uses the related term "openings" similarly as minor differences that might be amplified.

The present moment becomes extremely important here, as does the understanding of time. Based on Mead (1934), Stacey (2001) understands time as a circular relation between the past, the present and the future, always perceived as present. As interaction takes place in the present as continuous iteration, the past is reproduced, but not necessarily in the same way; thus, it is "transformed as the process of its expression" (Larsen, 2005:41). Small differences might be amplified, resulting in the ideas of the future being changed along with the forming nature of the past. Following an ethnomethodological understanding of human interaction, we can only know the significance of a particular Small Beginning when viewed in sequence, but it is possible to notice that something is taking place that is slightly different from the usual. We observe four patterns that indicate Small Beginnings:

7. USE PROFESSIONAL EXPERTISE

The traffic authority and municipality participants often find opportunities to air their professional expertise on busses, bus traffic, bus planning. For instance, in the Bus Route Map case, the designers' activity only allows the 'politicians' to buy passenger services in one direction, Figure 6. A traffic authority member challenges the designers: *"But going the one way there are 50 and going the other way we have 50. That's how we plan routes."* The designers compromise.

While not necessarily showing the emergence of Small Beginnings, it does show that the participants work to make the data physicalizations relevant to their practice. In some cases, this may lead to rethinking of terms or perspectives.

8. COMPARE TO 'WHAT I DO'

Several participants find ways of relating the data they experience to 'what I do'. They compare what data tells about other peoples' actions to their own. In the Corona Touch physicalization, participants are challenged to guess how many times bus passengers touch the bars, handles, stop button, their face mask, their cell phone in these times of pandemic restrictions. (While the designers had the totals of bus passengers in any bus from the quantitative data, the number of touch contacts they had to register themselves in field observations). The participants make their guesses by counting out small laser cut "virus tokens": *"I always touch the chair for some reason when I enter... I'm not that tall, I don't think I'd touch [the horizontal bars]." "I'm hanging on for dear life."* Confronted with what other people do, such an activity may lead to Small Beginnings of what you yourself might do differently in your daily commute – but they would likely only show in retrospect.

9. SUGGEST DESIGN IDEAS

The data physicalizations that were presented along with a problem-solving scenario (e.g. planning new bus routes on the Bus Route Map and designing a bus stop configuration in the Bus Stop Crowd), elicit lots of suggestive questions, and when participants themselves come up with design solutions there is a potential for Small Beginnings of innovation. In our events, participants for instance together develop the ideas of:

- A projector on the bus that illuminates distance markings on the pavement in front of the doors (to remind passengers to keep safe distance when boarding)

- An indication in each bus seat telling how many have sat here recently (to reduce contamination risk)

While we do not know if such ideas develop into innovations, the traffic authority may actually have opportunities to bring the ideas forward, whereas regular bus passengers seldom have such an option. Larsen (2005:40) argues for attention to *"a heightened awareness"* of a sense of opportunity that might have emerged in the actual moment. It is fragmentary and might change again very quickly as the spontaneous action continues. It may turn out to be insignificant, or it might lead on to something important.

Figure 6. Traffic planners engage their professional expertise to develop a plan in the Bus Route Map data physicalization.

10. INITIATE THE UNEXPECTED

Something that tends to really push an activity forward, is when participants take unexpected initiatives. For instance, when participants 'break the rules' set by the facilitators, or start using the data physicalizations in unexpected ways. For instance, one participant in the Bus Route Map activity tries to stretch the otherwise fixed-length threads that represent a bus line at a fixed cost. Larsen refers to a kind of difference in the conversation *"perhaps something surprising, or a kind of 'presence' and engagement that emerges between the people talking"* (Larsen, 2005:40). It may be a change in a participant's tonality, gestures and responses, a lingering pause or a rapid/overlapping exchange of turns in the conversation between participants.

CONCLUSIONS

We have explored how particular qualities in the design of data physicalizations invite interaction. When balanced with facilitation to support engagement around these big-data physicalizations, participants begin to make Small Beginnings toward innovation. The dimensional analysis of 15 data physicalizations open a space of material aspects that influence the engagement that may be achieved with well-designed data physicalizations, and ultimately the innovative potential that they open with participants. As analytical perspectives, the theories of Flow State, Play Moods and Small Beginnings further allowed us to identify ten patterns in the video documentations of how people employ the data physicalizations as data analysis method for scaling big data to something meaningful, of value to them.

We observed, for example, that fixed constructs invite observation, while loose parts invite manipulation. The passenger Travel Worms, hanging from hooks, invited users to hang them from the bus frame below. Facilitators asked participants to reflect on travel worms, which led them to make the data personal and share stories. The fixed vira-token display, on the other hand, which was presented after participants had placed their own vira-tokens in an interactive activity, invited participants to compare the data to their own imagined experiences ('what I do'). We observed also that facilitation can scaffold participants in asking questions to the data, personify with them, and engage their professional expertise. In some instances, we observed how (interruptive) facilitation served to break rather than support flow. We believe that the dimensions and scales presented in Table 1 as a framework can inspire the design of data physicalizations. The set of interaction patterns summarized in Table 2, grounded in Flow State, Play Moods and Small Beginnings theories, may serve as a framework for developing facilitation of analysis with data physicalization.

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NORDES 2021

A MATTER OF SCALES: EXPERIENTIAL EVALUATION AS A CARING PLATFORM ACROSS SCALES

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ABSTRACT

Densification, as a sustainable spatial development strategy, is a matter of care that takes place on multiple scales and is related to liveability in a paradoxical way. In this paper we approach this paradox related to densification as a "matter of scales" and work consciously with the tensions which arise when multiple actors act on multiple scales, such as a lack of communication and mistrust. We analyse and discuss how the participatory design approach of "experiential evaluation" supports this conscious approach by giving form to it as a caring platform around a "matter of scale" by connecting the multiple actors across multiple scales and making the tensions between scales constructive. In the discussion, we present the learnings of the design process and the challenges that we encountered.

1. INTRODUCTION

The research that is the subject of this paper deals with the sustainable spatial development approach of densification, an approach that raises questions and resulting debates across the multiple scales in which policy-making, public discourse and everyday life take place. Densification can be seen as a policy strategy to counter suburbanization of a region and more specifically to reduce the societal costs related to suburbanization. Already since the sixties, there is a public debate in Flanders that discusses the societal costs of low-density suburbanization, in particular the (negative) impact of increasing spatial dispersion (Anselin, 1967; Braem, 1967; Strauven, 1980). Recently this debate is experiencing renewed attention by the clear ambition of the regional government to increase the spatial efficiency and declare a net-development stop by 2040 (Ruimte Vlaanderen, 2016). From that moment onwards, the net-amount of built surface can no longer increase. This means that there can only be a new development if an equally big one is being removed or that existing developments are densified. Densification is thus an actual, ongoing process driven by (economic) forces that go beyond the scope of a neighbourhood, city or region. At the same time, this supra-local debate has impact on a local level, because this "autonomous" densification process (Antrop, 1998) gradually transforms the neighbourhood on the ground. Most small transformations remain unnoticed while some transformations have a more profound impact on the spatial system of the neighbourhood (Antrop, 1998) and can trigger negative reactions by the inhabitants.

Densification is thus a matter of care that takes place on multiple scales and is related to liveability in a paradoxical way: when a neighbourhood is densifying, there are more people, there is more activity, more traffic, more nuisance and thus, potentially, a decrease of the liveability in the neighbourhood. At the same time, the densification might by 2040 lead to the

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opportunity to create more (green) open (public) space beyond the scale of the neighbourhood. This paradox between densification and liveability can be approached as a "matter of scales" (based on the concept "matters of care" by Puig de la Bellacasa (2017)), a concept that together with its implementation in practice will form the centre of discussion in this paper. In this matter of scales, there are multiple actors that act on multiple scales which can lead to tensions based on lack of communication and mistrust. This makes it a difficult and sensitive task for designers and policymakers to initiate a debate with citizens about the "strategic densification" of their neighbourhood: "why do we have to suffer for the benefit of the others?".

In this paper we discuss this "matter of scales" via a case of participatory design in urban planning in the Heilig-Hart neighbourhood in Hasselt, Flanders (Belgium). We worked on this matter of scales from the perspective of densification and more specifically the ambition of the city to densify the neighbourhood, the inhabitants who nearly get out of the neighbourhood, the shop owners who serve a larger part of the city, families who live in other neighbourhoods but their children go to school here, schools with students from the entire province or the ambition to expand the mosque into a religious, educational and multicultural centre. In order to approach this matter of scales as "a generative event" (Whatmore, 2009), we used the methodology of experiential evaluation to co-design a caring platform (Light & Seravalli, 2019). We considered experiential evaluation as a strategy to try to connect all these scales and thus make these tensions related to the matter of scales and the debates around it constructive.

The focus of this participatory design process is not on the participatory development of a new technology, in this case the evaluation tools, but on the exploration of a strategy (experiential evaluation) to foster critical engagement and creative expression (DiSalvo et al., 2013, p. 193). This has the goal to collaboratively imagine the future of the neighbourhood by including the local knowledge and values (DiSalvo et al., 2013, p. 196).

In this paper, we will first define experiential evaluation as a caring platform and the analytical framework. Then we will describe the participatory design process of the case in the Heilig-Hart neighbourhood. Further, we will analyse the case based on four concepts that contextualise a caring platform and specifically how the experiential evaluation helped to make the tensions related the matter of scales constructive. Finally, we discuss to what extent the experiential evaluation could play its role as a caring platform that enables turning the matter of scales into a constructive process generating care for the liveability in the neighbourhood.

2. EXPERIENTIAL EVALUATION AS A CARING PLATFORM

Experiential evaluation can be defined as a methodology for participatory action research that combines formal evaluation methods with everyday practices (Custers et al., 2020). Like in participatory evaluation, in experiential evaluation researchers, experts and inhabitants together decide what the evaluation criteria will be and how the data is collected, analysed and evaluated. Throughout this process the participants make norms and values explicit, develop future scenarios and decide together about further action (Brunner & Guzman, 1989). In participatory evaluation, the people involved in the project, process or program evaluate the project, process or program together with an outsider in order to see if the initial goals are met and/or adjustments need to made. The emphasis is on the evaluation and it is accomplished through a collaboration of the researcher and local practitioners (Fawcett et al., 2003).
In experiential evaluation is also a participatory process organised to co-create a future scenario for a liveable neighbourhood. However, it adds an experiential aspect in order to make the evaluation process more tangible in everyday life based on the assumption that if the people can experience a test set-up in their everyday life it can lead to a more engaged evaluation.
The experience of a new possible future enables the participants to make value trade-offs and change their perspective on the issue or position in the process. The evaluation moments triggers reflection about what they value and prioritise. The evaluation and the experience are thus intensely intertwined in the process of experiential evaluation and can enable collective learning in a participatory planning process (Albrechts et al., 2020).

The research that we describe in this paper will particularly explore how we can use experiential evaluation to co-design a caring platform to make a "matter of scales" constructive. A caring platform is defined as socio-technical structures that support the welfare of citizens and can enhance "relations of reciprocal accountability and mutual commitment and which encourages reflexive engagement among citizens (caring) (Light & Seravalli, 2019)". The definition of a caring platform is related to the articulation of the relationship between co-design, co-learning and care. This is a complex relationship and a mutual caring relationship is not an automatic outcome of co-design process. The co-design process can be instrumental to the co-learning as this co-learning can be seen as a product that emerges alongside a design activity (Light & Seravalli, 2019)
The co-design of a caring platform is foremost contextual as it is affected by the people, values, tools and action in that specific context (Light & Seravalli, 2019). Therefore, we will use these four aspects to analyse the process of the experiential evaluation and to

define the relationship between co-design, co-learning and care that is constructed (or not) in this specific case. What we precisely want to learn is how the experiential evaluation not only enables value trade-offs and initiates co-learning but also can change the relations between the different actors in the neighbourhood. Can this change in relations turn a participatory design process into a caring platform in which a sensitive "matter of scales" can be dealt with in a constructive way?

3. THE CASE

We developed the methodology of experiential evaluation within a participatory design project that we facilitated in the Heilig-Hart neighbourhood; a neighbourhood located close to the city centre of Hasselt, the capital of the province of Limburg in Flanders. The participatory process started in August 2018 and ran until the end of January 2020 (see Figure 1). The Heilig-Hart neighbourhood is surrounded by a railway station in the south, a larger ring road in the west and north and a former industrial site (in transformation to a residential area) and a smaller ring road in the east. The morphology of the neighbourhood is diverse: detached-houses, row houses, apartment blocks and services with a clientele beyond the scope of the neighbourhood.

The process is part of a bigger participatory project "Werke naan Wijken" (Dutch for "Working on Neighbourhoods") and is formalized in a contract between UHasselt and the city of Hasselt. The assignment is to organize collective learning processes in three neighbourhoods during which the city policy, the city departments, designers, citizens and stakeholders collaboratively learn how to cope with the tensions between spatial planning processes, such as densification, and participatory processes. For the Heilig-Hart neighbourhood we had to address the tension between an ongoing and planned densification process and the concern among inhabitants on the impact of this process on liveability. More specifically, the question of the city's policy was to approach this tension from the perspective of mobility.

3.1 MOBILITY

The Heilig-Hart neighbourhood is a neighbourhood in transformation: there is a large urban development that will double the population in the neighbourhood; there might be a new high-speed light rail implemented in the next few years; there are the ambitions to expand the mosque to a religious, educational and multicultural centre; the church needs a new future and the city is planning to redevelop the area around the train station. All these projects have an impact on the mobility and thus the liveability of the neighbourhood, but there is uncertainty about which projects will be realized, how they will be realized and what the actual impact will be on the mobility? This uncertainty became so big that inhabitants started to speculate: "there will be traffic jams from morning till evening"; "we will not find a parking space anymore"; "why would the city allow such a project if the situation is already so bad". These speculations triggered the idea that the city was no longer in control of all the densification processes and the inhabitants started to question them ("they have no overall vision"; "they just allow projects in one neighbourhood without thinking of the impact in other neighbourhoods") leading to misunderstandings and mistrust between the city policy and the inhabitants.

The mobility situation in the Heilig-Hart neighbourhood is indeed complex: there are quite some functions that generate traffic, such as schools; the neighbourhood is situated between important traffic lines and it is located close to the train station. There is thus a large diversity of mobility users with each their own rhythm, intensity and needs. In addition, there is a problem of traffic that uses the neighbourhood as a shortcut to travel to the city centre.

Mobility was already an issue before the participatory process started. Early 2018, the mobility department gave an assignment to an engineering office to analyse the mobility situation in the neighbourhood and formulate scenarios to improve this situation. The inhabitants and representatives of two schools were consulted in four focus groups. Around that same period, the parent committees of three primary schools in the neighbourhood organized a questionnaire to gain insight in the safety perception in the school environment. The questionnaire was initiated by a few parents, not only out of a concern about the mobility situation at the school environment but also in the entire neighbourhood. The results indicated that there is not only a safety issue in the school environment but also that there is a large support among the inhabitants for structurally changing the mobility situation. To make this public, the parent committees of two schools together with the NGO "Fietsfront Hasselt" decided to organize an annual "kidical mass". This is a collective bike ride to strive for more safety, space and attention for young cyclists and pedestrians.

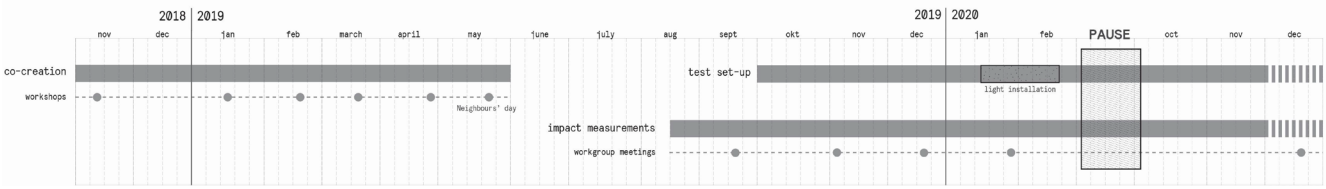

Figure 1: overview process

In parallel, a group of concerned inhabitants started an action committee and asked the city to be involved in the planning process of their neighbourhood in order to change the mobility situation and increase liveability. The complexity of the mobility situation and the ongoing initiatives made it clear to us that we could not limit our participatory process to developing a mobility plan on the scale of the neighbourhood. We noticed the tensions between different narratives of multiple actors and ambitions on different scales: the ambition of the region to densify, the ambition of the city to work on mobility, the ambition of the mosque to increase accessibility, the ambition of different parent committees in schools to give form to a city that is "cyclist friendly", the ambition of neighbourhood committees to contribute to a liveable place to live… These ambitions and some tensions between them coincided with the belief of certain actors that these ambitions stand in each other's way and that this belief was based on a historical mistrust. This required an approach which combined different tools in order to connect the multiple scales and actors in the neighbourhood to make the tensions of a "matter of scales" constructive. The experiential evaluation started with the co-creation of an alternative scenario for the neighbourhood mobility plan, we then implemented one part of this alternative scenario in the neighbourhood via a test set-up and we collaboratively measured and evaluated the impact of the test set-up on mobility.

3.2 THE CO-CREATION OF A MOBILITY SCENARIO

We started the participatory design process with the co-creation of an alternative scenario for the neighbourhood mobility plan, in support of addressing the paradoxical effects of a densification process, during five workshops with inhabitants and representatives of the mobility department from November 2018 until May 2019 (see Figure 2). It is this alternative mobility plan that we used in the experiential evaluation.
In the first workshop we mapped what we valued in the neighbourhood: what is a liveable neighbourhood? In what kind of neighbourhood do I want to wake up in the future? We also made a map of all the projects (in realisation and planned) and bottlenecks in the neighbourhood. In the second workshop, we evaluated the neighbourhood mobility plan made by the engineering office by mapping the impact of this plan on the everyday routes (car and bicycle) that the inhabitants take to go in and out of the neighbourhood. This resulted in three alternative mobility scenarios. We assessed these scenarios with the alderman and experts from the mobility and urban planning department of the city. We presented this expert judgement on the third workshop as a series of posters on which inhabitants could vote pro and against and comment on the different scenarios and assessments via sticky notes. The two preferred scenarios were presented at the fourth workshop. This time we asked the participants to evaluate the scenarios on the basis of accessibility (car, bicycle), safety (pedestrian, cyclists and car drivers) and livelihood (green space, air quality and noise nuisance). We divided them in four groups and each group had to further detail the scenarios for one particular location. After the fourth session we discussed the preferred scenario in depth with each collective separately (the action committee, the parent committees and the shop owners). These discussions resulted in three variants of the preferred scenario. In the last workshop we asked the participants to prototype and evaluate these three variants. We decided to end our co-creation process by presenting the final scenario on the "Neighbours' day" (see Figure 3). This is a yearly event that takes place at different locations in the neighbourhood. Together with the neighbourhood committees, we agreed to organize it as one big collective event on the square that played a crucial role in the alternative mobility scenario. This

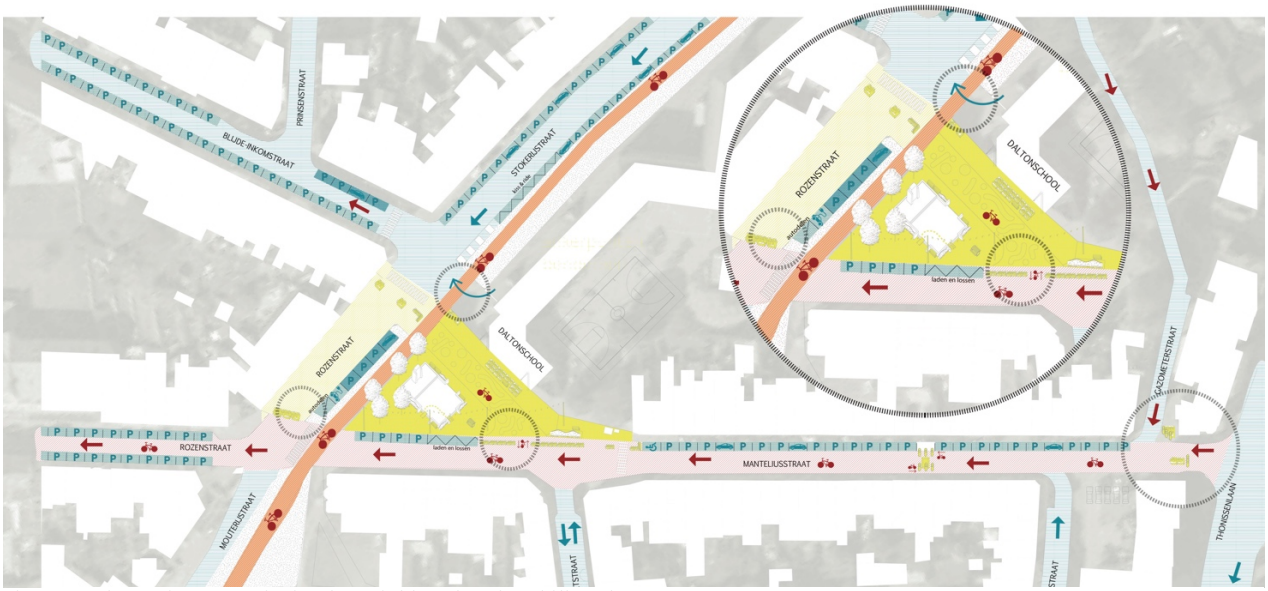

Figure 2: alternative scenario for the neighbourhood mobility plan

allowed the inhabitants to see the plan in the actual space and resulted in a final round of comments.

Figure 3: Neighbours' Day at the central square

4. EXPERIENTIAL EVALUATION OF THE ALTERNATIVE NEIGHBOURHOOD MOBILITY PLAN

The co-creation phase resulted in an alternative neighbourhood mobility plan. It was part of our original agreement with the city that we would gradually test this plan on different locations in the neighbourhood: implement a first test set-up, evaluate it, make adaptations if necessary and then proceed to the next phase.

Figure 4: test set-up at the central square

4.1 TEST SET-UP

The first test set-up was installed by the city at the beginning of October 2019 and is still in place until today. In this test set-up we blocked two segments of streets around a central square where one school was situated, to enlarge it (see Figure 4). We changed the directions of one-way streets and turned two-way streets into one-way streets (see Figure 2). In January 2020, we added a "schoolstreet" to another school in the neighbourhood, which implies that traffic around the main entrance of the school is blocked during the start and end of the school day and we made a necessary change in the circulation based on an intermediate evaluation.

4.2 IMPACT MEASUREMENTS

During the fifth workshop of the co-creation phase we developed a "measurement plan" together with the mobility department and the participants. We decided collaboratively what we wanted to measure, how we would measure it, what the strategic locations are to measure and when the measurements would take place. We decided upon a range of data-collection tools: traffic counts (1), Telraam (Dutch for "counting window") (2), online questionnaire (3) and permanent feedback (4). The traffic counts (1) were measurements that the city organized at around twenty locations across the neighbourhood (see Figure 6). Over a period of two weeks, they registered the amount and the speed of traffic (cyclists and motorized traffic). The traffic counts were conducted in September 2019 before the test set-up was in place as a reference measurement, and November 2019 to measure the impact. Telraam (2) is a citizen science project that was used and actively promoted by the neighbourhood during this evaluation process. It is a small device that has to be installed at a window on the first floor of a house (see Figure 7). The device measures the amount of the traffic (pedestrians, cyclists, cars and larger vehicles) and the speed of the cars during daytime. The data is visualized on a website where everyone can access it. There was a network of 24 Telramen active in the neighbourhood a month before the test set-up started and provided a continuous measurement of the situation. The city also organized an online questionnaire (3) a month after the test set-up was in place to give everybody enough time to adapt to the new situation. With this questionnaire it was possible for inhabitants and visitors of the neighbourhood to evaluate the test set-up based upon their personal and direct experience. At any time, it was possible for everybody to give personal feedback (4) via email to the mobility department.

4.3 WORKGROUP

We organized together with the city an open call for inhabitants and shop owners to apply to become a representative in the workgroup in August 2019. The selection of the representatives was based on the network of the candidate as well as the location of the network in the neighbourhood in order to constitute a group of representatives that more or less covers the entire neighbourhood. The aim of the workgroup is to evaluate the test set-up and advise the city policy based upon this evaluation. It is on the basis of the advice of this group that the city policy will finally decide whether the test set-up will stay in place (and evolve to a permanent situation), that there will be adjustments made or that we will return to the original situation.

The first meeting of the workgroup took place mid-September 2019 to discuss the implementation of the

test set-up and the measurements. Early November 2019 was the second meeting of the workgroup to discuss the first results of the measurements, the experiences of the inhabitants, schools and shops presented by the representatives and the draft of the online questionnaire. In the third meeting, one month later, evaluated the workgroup the test set-up based on the results of the measurements and decided to keep it in place but to make some necessary adjustments and to add a "schoolstreet". The fourth meeting was organized at the end of January 2020 to discuss the impact of the adjustments. In this meeting the workgroup decided to pause the process because there were a lot of road and construction works going on in the neighbourhood and the first phase of the large development would soon be realized which all had an impact on the mobility. If there would be extra adjustments implemented, this would mean that there would be even more uncertainty and thus less support for the process. The last meeting of the workgroup was in December 2020. The city again conducted traffic counts in October 2020 to measure the impact of the test set-up after this uncertain period and take into account a new uncertainty, the COVID-19 pandemic. The workgroup discussed new adjustments, the possibility to transform the central square in a qualitative meeting place with space for more green. They also decided to keep on meeting once a year to keep on evaluating the situation in the neighbourhood.

5. EXPERIENTIAL EVALUATION AS A CARING PLATFORM

As we discussed in the theoretical section, the co-design of a caring platform in a specific context is affected by four aspects: action, tools, values and people in that context (Light & Seravalli, 2019). Therefore, we will use these four aspects to analyse the case of the Heilig-Hart neighbourhood in order to discuss to what extent the experiential evaluation as a caring platform helped to turn a "matter of scales" constructive.

5.1 ACTION

The test set-up is an invasive action in the public space which has an effect on a complete mobility system, not only including the everyday life of the inhabitants living and working around the set-up, but also of those far beyond (visitors, clientele of the shops, the ones that take the shortcut to the city centre, parents that bring their kids to school). We move around every day and we can choose how we move (by foot, cycle, car, public transport…). When we are forced to change this individual behaviour, it will make us question this behaviour and maybe leads to more sustainable choices (Marres, 2015). This individual behaviour that happens in the public space defines the use of this space to a large extent. This means that when the mobility in a certain space changes, it can also change the use of the space. This change is most visible at the central square in the neighbourhood. After the installation of the test set-up, the square is used as a meeting place and a playground for children after school hours. The rediscovery of the square was celebrated with a light installation that we placed on the square during a month mid-January 2020 and was accompanied with a "winter walk" for children organized by the parent committees of two schools together with the action committee with the support of the shop owners and the city (see Figure 5). This action emphasises the change in the positions of the different actors and the shift in the process from mere car accessibility to liveability. It shows that the square is not an abstract space but a co-constructed and political space (Light & Miskelly, 2019).

Figure 5: light installation during the winter walk

The implementation of the test set-up not only created the possibility to experience the alternative scenario on a 1:1 scale but more importantly it also made the impact on the multiple scales tangible. It shows the importance of caring for multiple scales (and the actors associated with them) at the same time: changing the mobility on the scale of the neighbourhood, but also the future redevelopment of a square and the adaptation of a school environment.

5.2 TOOLS

In order to evaluate the test set-up, we had to measure the impact on the mobility in the neighbourhood. These impact measurements were a crucial part of the experiential evaluation because by the end of the co-creation phase, it was clear that the prototyping and the qualitative approach to discuss the alternative scenario was not working for all the groups and even further increased tensions instead of making them productive. We used this moment to support the different groups in using the tools they wanted to use to generate data for the impact measurements. The traffic counts as a common tool of the mobility department were opened up as the approach for the inhabitants and the results were discussed with the representatives of the inhabitants and stakeholders (see Figure 6). The action committee used Telramen as a way to collect their data (see Figure 7). Therefore, the committee added fifteen Telramen to the network, in addition to the nine that were made available by the city, to create a denser

network. They contacted the organisation behind Telramen to ask for the unprocessed data, made suggestions to optimise the data collection process and did tests to install the device outside the house. The online questionnaire was initiated by the mobility department but developed in collaboration with the workgroup.

This collaborative data collection as a way of "joint fact-finding" gave the different scales not only the possibility to use their own tools to collect their data but also made it possible to exchange and explain their data and thus create common knowledge and understanding of the complexity and uncertainty of mobility (Ehrmann & Stinson, 1999). Also, a test set-up showed how a certain mobility plan can improve the liveability at multiple scales. The tools also helped the multiple actors to get familiar with each other's knowledge production processes and to reason on scales that they are not used to (Whatmore, 2009): an action committee measures traffic in a way the a city normally does and the city involves citizens in the evaluation of this data and had to adapt their modus operandus to make this feasible. It was an important step in our attempt to create a caring platform that can cross scales and engage them in the collaborative decision-making process (Matsuura & Schenk, 2017).The joint fact-finding provided a common language between the different actors in the participatory process. This does not mean that they will agree upon every aspect. However, they will speak a technical and/or scientific language understood and developed by multiple actors which helps them to start to rebuild trust (Matsuura & Schenk, 2017).

Figure 6: traffic counts

Figure 7: Telraam set-up

5.3 VALUES

In the first workshop of the co-creation phase, we defined with the participants what they value in the neighbourhood, in what kind of neighbourhood they want to wake up in the future and what is important for the mobility in the neighbourhood. The values were defined as livelihood (public space, air quality, noise nuisance, green), safety (car, pedestrian, cyclists) and accessibility (car, cyclists and public transport). We used these values as evaluation criteria in the process for the expert judgement in workshop three, to evaluate the scenarios in workshop four and as a basis for the online questionnaire. The values were defined in a very general way but throughout the process it became clear how different (groups of) inhabitants interpreted the values in different ways. For example, in a discussion about the online questionnaire between two representatives of different inhabitant groups: one representative defined a liveable neighbourhood strictly as a place to live and all the other uses were subordinate to that, while another representative had a broader view and stated that also the shops and the schools are necessary for the liveability of the neighbourhood and need to be supported.

The experience of the test set-up made the inhabitants not only question their own mobility behaviour but also triggered them to make value trade-offs between their individual values and the liveability of the neighbourhood. For example, an inhabitant stated in an email directed to the mobility department that he shifted from a severe opponent of the test set-up because made his house less accessible for the car toward an advocate because the square in front of his house is now a quieter public space. We tried at different moments in the co-creation phase to let the participants make these trade-offs but it was only when they could actually experience an alternative reality that they made these direct trade-offs. The test set-up has ensured that the central square became a quieter place that is used as a meeting place and playground after school hours. This added value was not defined by the participants in the co-creation phase. The collective experience of the new situation leads to a more engaged and constructive evaluation of the situation and helps the participants to take other values and thus scales into account.

5.4 PEOPLE

The workgroup, which was installed after the co-creation phase and before the test set-up was implemented, consisted of representatives of the inhabitants, the shop owners and the two schools in the neighbourhood together with the alderman, the experts of the city's mobility department and neighbourhood management department and the researchers. At the start of the first meeting, the alderman defined the workgroup as "an arena of dialogue". The workgroup meetings created the opportunity for people active at all scales to communicate directly with each other and

exchange knowledge. This dialogue was crucial to gain trust and mutual understanding at all sides of the table. They became partners in the same process and in that way, it was a successful experiment in the politicisation of the decision-making process.
Nevertheless, we know that one representative had a separate meeting with the alderman to discuss the concern about a more thorough test set-up as a next phase in the process which the mobility department was currently developing based on the alternative scenario. The alderman shared the concern of this representative and therefore this proposal for a more thorough test set-up was not discussed during the next meeting of the workgroup.

Although everybody could apply to be a representative in the workgroup and we contacted stakeholders directly, there were still actors who were not represented. First, there is the clientele of "Café Anoniem" (Dutch for "Café Anonymous"), NGO that provides services for homeless people. Their clientele was already using the central square as a meeting place because it is located close to the Café. Another actor is the mosque. The representative of the mosque attended several workshops, but they decided not to be directly involved in the test set-up, although it changed the accessibility of the mosque. We could have kept these actors more involved in the process by for example providing them with tools that fit their needs or engage in their practices and thus did not connect them with the other actors across scales.

6. DISCUSSION

In this paper we discussed the experiential evaluation of an alternative mobility scenario in the context of the Heilig-Hart neighbourhood. What did we learn as design researchers during the process about how experiential evaluation can be such a caring platform that enables us to negotiate in constructive ways on a "matter of scale"? What did we learn from the action, tools, values and people and the relation between co-design, co-learning and care? Did we design for care and co-designed a caring platform? Did the experiential evaluation enables value trade-offs and initiated co-learning? Was there a change in the relation between the different actors in the neighbourhood?
We will share some reflections, in order to answer the above questions.

6.1 A CARING PLATFORM FOR A "MATTER OF SCALES" PROVIDES ROOM FOR EXPERIMENTATION AND ADAPTATION

The experiential evaluation process as a caring platform was made of experimentation and adaptation. We started the participatory design process from the perspective of mobility, because this was already taken care of by actors individually. We brought these actors together in the experiential evaluation which led to a shared accountability and co-ownership as they cared to work together (Light & Seravalli, 2019) which meant that we as design researchers had to start working across different scales and diversify our approach. For example, we had to moderate the strong voice of the action committee throughout the process. To facilitate that, we had to organise parallel meetings with the different actors in order to give them the possibility to equally contribute to the final scenario. This experience shows that there needs to be room for experimentation and adaptation of the process. Indeed, the bridging across scales sometimes required to slow down the process and create opportunities for a different awareness or approach of the issue (Whatmore, 2009).

6.2 A CARING PLATFORM PROVIDES ROOM FOR A PLURALITY OF ACTORS, BOTH INSIDE AND BETWEEN GROUPS

The process as a caring platform provided space for a plurality of actors and groups and was flexible enough for changes in group constellations. An example is the action committee that was persistent in their belief that there was only one solution for the mobility issue even after they had the possibility to discuss it with the alderman at the workgroup and it was clear that it was not feasible in the short term. It kept them from making value trade-offs and acknowledging other positive impacts on liveability beyond their proposed solution. This persistence of mainly representatives of the group not only led to a change of representative in the workgroup after the second meeting, but also in the board and position of the action committee. Today the group presents itself as a citizen initiative with a focus on liveability and no longer as an action committee related to mobility. This indicates that there is not only a plurality of different groups of actors, but also within one group (DiSalvo et al., 2013).

6.3 A CARING PLATFORM PROVIDES ROOM FOR A PLURALITY OF KNOWLEDGE AND TOOLS FOR KNOWLEDGE EXCHANGE

The experiential evaluation as a caring platform brought different forms of knowledge together: knowledge foregrounded as being objective and subjective, knowledge from inhabitants and experts, from outsiders and inhabitants. Within the process we provided the multiple actors with different tools to make their own knowledge visible and created a place (the workgroup) to exchange and discuss their knowledge with others. This co-learning process allowed them to bridge scales by building a common language and trust. The collaborative evaluation of the test set-up based on the experience provided a means of reflection in the co-design process. It was only when the different actors could actually experience an alternative future via the test set-up that they made trade-offs between values and changed their positions. This made the process a co-designed learning project (Light & Seravalli, 2019) across scales and actors. Indeed, the test set-up at the central square is now a new meeting place. Multiple

actors start to care about it: organizing a Winter Walk but also asking the city to redesign the square to enhance this new use and maybe other future uses. The city starts to take care of it via small adaptations over time. Also, the shop owners experience the added value of having a new meeting place in front of their shops.

6.4 A CARING PLATFORM PROVIDES ROOM FOR EXCHANGE BETWEEN ACTORS ACROSS SCALES CO-DEFINING THE PUBLIC REALM

The co-design of the caring platform enhanced the exchanges of knowledge, experiences and practices across scales providing the possibility to re-engage with each other and define new relations within the complexity of the contemporary public realm and can be defined as a form of "institutioning" (Huybrechts et al., 2017). The experiential evaluation lead to a shared accountability and a sense of co-ownership, which in itself is a form of caring to create the opportunity to work together. The workgroup that was created to evaluate the measurements changed the relation between the inhabitants and the local authority: from mistrust to a politicisation of the decision-making process. What does not mean that all the actors agreed upon every decision, in fact the representative of the action committee left the work group because he disagreed with the decisions that were made.
It indeed bridged the different scales between inhabitants, public and private institutions by enhancing the communication, providing means of reflection and opportunities to share practices (exchanging knowledge and tools) makes the process of the experiential evaluation a co-designed learning project (Light & Seravalli, 2019).

6.5 A CARING PLATFORM OFFERS SPACE FOR ACTORS TO EXIT THE PROCESS

In the fourth meeting of the workgroup (January 2020) we, as being part of the university, announced that our assignment ended at that time and that the mobility department would be in charge of the process. It was in the same meeting that the workgroup decided to pause the process providing a real risk that the process would end. Nevertheless, the caring platform proved to keep on doing its work across scales, because the workgroup did meet again in December 2020, to discuss the follow-up on data measurements conducted by the mobility department, new changes in the mobility situation and a specific request to redesign the central square with more space for green. They also decide that they would keep on meeting at least once a year and thus "infrastructuring" this caring platform (Karasti, 2014)

6.6 A CARING PLATFORM FOR WHO?

The caring platform connects multiple scales between multiple actors, but we did not succeed to keep all the actors on board during the process. The clientele of "Café Anoniem" and the mosque are not represented in the workgroup and we were not able to connect them with the test set-up although this action also intervened in their everyday practices. We did not manage to provide them with tools that fit their needs or engage in their practices in order to keep them engaged in the process. Ideally, we would create room in the design process for the workgroup to reflect on their aim and principles during the process: Do we need to map other issues? Collect other data? Do we need to involve other actors? The flexibility of the current process has proved to have many advantages: it provides room for adaptation and experimentation. At the same time, it also leaves room to discuss individual concerns with the alderman instead of making them explicit during a meeting of the workgroup. It is a trade-off between flexibility and openness versus transparency with a real risk that it threatens the democratic character of the workgroup.

7. CONCLUSION

We presented densification as an issue that plays at multiple scales with a challenge to bring together multiple actors that act and think on multiple scales. With experiential evaluation we created a caring platform to cope with a "matter of scales" in the Heilig-Hart neighbourhood. Thinking of the experiential evaluation model as a caring platform supported not to see it as a linear process that starts with a question and ends with a set of answers, but rather as a flexible and pluriversal process. It became a process in which multiple actors were in charge, defining the values important to them, mastering the tools closest to their interests to re-negotiate these values with others, inhabiting a space in which conversations could take place asynchronously between scales, and finally taking a space temporarily, with the possibility to leave whenever the actors felt the need. Nevertheless, we should also recognise the possible weaknesses in this process. Not all the actors are always represented equally in the process, since the flexibility and asynchronicity of the process also offers possibilities to prioritise values of particular actors over others. This forces us to always consider the question related to the democratic aspect of the process: whose caring platform is it or does it need to be?

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Paper Session 4

Working Scales

Session Chair | Namkyu Chun

Distributed Thinking Through Making: Towards a Relational Ontology in Practice-Led Design Research
Luis Vega (F)

Tangled Becomings in Materialities of Felt Practice(s)
Bilge Aktaş and Julia Valle Noronha (E)

The Extension of the Craftsman's Hand by Robotics
Flemming Tvede Hansen (E)

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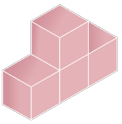

DISTRIBUTED THINKING THROUGH MAKING: TOWARDS A RELATIONAL ONTOLOGY IN PRACTICE-LED DESIGN RESEARCH

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ABSTRACT

Practice-led design research is a celebrated but debated field of inquiry. Although it offers appropriate tools to advance design knowledge through and within making, its scope remains limited to the scale of individual practice. Such a limitation hinders the possibility to account for particular design instances in relation to more general contexts. To address this issue, the paper at hand presents an exploratory literature review discussing why practice-led design research may benefit from adopting a relational ontology—i.e., a stance wherein to be is to relate. The review identifies two streams of relational thinking that exhibit potential overlaps with practice-led design research: sociomateriality and distributed cognition theory. In revealing these overlaps, I introduce the term "distributed thinking through making" to formulate a novel framework from which to reconsider the ontological dimension of practice in practice-led design research. The term illuminates a research gap that appears especially relevant to empirical studies in which making constitutes both the platform and the focus of inquiry.

INTRODUCTION

With the increasing involvement of professional designers in academia, the last three decades have witnessed an explosion of research approaches in design. The need to advance knowledge from within practice has propelled the emergence of a research stream wherein design is no longer an object of study but has become a platform of inquiry. The origins of this stream can be traced back to the 1970s (Chow, 2010, p. 145), yet the idea of designing to produce knowledge did not gain momentum until twenty years later, when the notion of *research through design* was first sketched in an academic publication (see Frayling, 1993). Since then, this notion has been iterated by different people in different contexts (see e.g., Archer, 1995; Gaver, 2012; Koskinen et al., 2011; Stappers & Giaccardi, 2017), accommodating divergent approaches that share a common orientation towards the use of design practice as a vehicle of research. Without entering into detailed discussion, this paper elaborates further on one of these approaches, namely *practice-led design research*.

In particular, practice-led design research highlights the instrumentality of making in the generation of knowledge. Making, in this sense, is understood as a competence-based creative activity that fundamentally partakes in the thought processes of designers. Because designers are professionally trained to think generatively, they possess the ability to accomplish tasks by simultaneously ideating the ways of accomplishing them (cf. Gherardi & Perrotta, 2013). This means that designers are capable of producing not only creative outcomes but also knowledge about their creative processes. Typically referred to as *thinking through making* (see e.g., Carter, 2005; Mäkelä, 2007; Nimkulrat, 2012; Olsen & Heaton, 2010; Pasman &

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Boess, 2010; Rajmakers & Arets, 2015), this feature of design activity constitutes the operational principle of practice-led design research: it offers designers a mode of inquiry that is familiar to them, thus asserting the epistemic role of making in the context of design practice.

Although this mode of inquiry has proven efficient in advancing design knowledge, it remains considerably limited to particular design instances. Because practice-led design research allows for the use of one's own acts of making as a platform of investigation, knowledge production in this field exhibits a tendency to be overly self-referential. Against this backdrop, the paper at hand asks: *how can practice-led design research account for the epistemic role of making beyond the scale of individual practice?* To answer this question, I review relevant literature across different domains by conducting an exploratory study (see Arksey & O'Malley, 2005). The review discusses various approaches to practice grounded in relational perspectives. This means that all approaches discussed herein contend that the relationships established between the actors of a given practice are more significant than the actors themselves. Based on a detailed analysis of these approaches, I propose the term *distributed thinking through making* to mobilize practice-led design research beyond the boundaries of the first-person singular.

To contextualize, the term distributed thinking through making accounts for a synergistic process of knowledge creation in which *thinking* exhibits two main characteristics: (a) it is socially and materially constituted, and (b) it is operationalized by bringing things forth into being. The former is met when thought processes extend beyond a single individual to include other individuals, artifacts, and the environment. The latter is met when these thought processes occur via open-ended, inventive, and affective tasks. Typical examples of thought processes with both characteristics can be found in activities such as collective art making, co-designing, group cooking, community gardening, writing music for an ensemble, or choreographing a dance. Central to these activities are the conditions of non-linearity and collectivity: none of these activities follow a fully articulate logic, yet all of them rely on the intersubjective articulation of knowledge.

One of the main endeavors of practice-led design research consists in articulating the type of ineffable knowledge that unfolds during design practice. It has been well documented that since designing is a largely tacit activity, utilizing it as a mode of inquiry situates the research endeavor within an ambiguous epistemological space (Gaver, 2014, p. 153). Assuming the double role of designer and researcher comes with the challenge of assessing how the tacit nature of design practice can contribute to the articulation of explicit knowledge (Koskinen & Krogh, 2015, p. 124; Mäkelä & Nimkulrat, 2018, p. 1; Pedgley, 2007, p. 463). Although this issue has sparked a vivid debate in design research at large, the use of design practice as a mode of inquiry has been celebrated in studies that necessitate the living knowledge of practicing designers. This living knowledge becomes an invaluable asset in a field like practice-led design research (see e.g., Evans, 2010; Groth et al., 2015), especially because it offers the kind of insider's perspective that other research approaches are far from reaching.

Following these lines of thought, the term distributed thinking through making reconsiders practice-led design research not epistemologically but ontologically. Put simply, it *maintains* the locus of knowledge production within design practice but *expands* the nature of such practice beyond individual modes of practicing. In reviewing the literature to lay out the foundations of this ontological shift, I reveal a research gap that appears especially relevant to empirical studies in which making constitutes both the platform and the focus of inquiry. The next section describes the methods employed in the review and outlines the overarching structure of the analysis.

MATERIALS AND METHODS

Relevant literature was selected based on a three-step procedure. The first step consisted of selecting a starting set of publications from the main sources used in practice-led design research. These sources were identified between 2019 and 2020 via access to research seminars, reading circles, and leading journals in the field. The selection was limited to publications that offered theoretical or empirical insights about the role of making in the production of knowledge. The second step consisted of expanding the scope of the review by including relational perspectives from other fields. To that end, a list of keywords was extracted from the starting set of publications and supplemented with terms expressing aspects of relationality. All keywords and variations thereof were combined with boolean operators (e.g., "making" or "materiality" and "network") and searched for in scholarly databases such as ScienceDirect, Scopus, and Google Scholar. The resulting publications were included for review insofar as they examined acts of making or offered approaches to practice that were compatible with practice-led design research. Lastly, the third step consisted of performing backward snowballing (Levy & Ellis, 2006; Webster & Watson, 2002) to identify relevant citations in the selected literature. This step yielded new publications and showed a few connections among the previously included ones.

The method described above allowed for the collection of a total of 61 research publications found in scientific journals, conference proceedings, books, book chapters,

and doctoral dissertations. Relational approaches compatible with practice-led design research were found in areas of cognitive anthropology, science and technology studies (STS), social theories of practice, material culture, and ecological psychology. Combined with the exploratory nature of the research question, the breadth of the selected literature did not allow for a systematic review but rather lent itself to a scoping study (see Arksey & O'Malley, 2005, p. 21). This strategy permitted me to identify the extent of available knowledge related to the research question regardless of disciplinary allegiances. To ensure depth in the analysis, nonetheless, I focused on five aspects of practice-led design research that emerged among all areas of the selected literature: (a) the epistemic dimension of practice, (b) the importance of materiality, (c) the limits of individuality, (d) the non-linearity of thought processes, and (e) the double role of the practitioner-researcher. The analysis was conducted at the intersection of these five aspects, revealing two streams of relational thinking that exhibited potential overlaps with practice-led design research: sociomateriality and distributed cognition theory.

To further articulate such overlaps, the review is organized into three sections. Section 1, *Practice beyond the individual*, draws on an area of the literature that conceives of practices as unitary systems of activity wherein people and things are inextricably bound. In this section, I employ sociomateriality as a theoretical lens to address matters of scale, relationality, and the inclusion of social and material actors in practice-led design research, thus anchoring the act of making not only in human-material interaction but also in social practice. Section 2, *Literacies of Making*, encloses the review of various publications coming from, and referred to in, practice-led design research. In this section, I discuss how practitioners and scholars champion the idea that making is not only a way of knowing but also a means to produce knowledge. Section 3, *Distributed thinking and reflective practice*, focuses on how design practitioners utilize multiple cognitive resources that are spread across space and accumulated over time. In this section, I review the theory of distributed cognition and lay out a way of triangulating it with practice-led design research. The remainder of this paper comprises an additional section where I summarize the findings and discuss their appropriateness in filling the research gap.

PRACTICE BEYOND THE INDIVIDUAL

This section concentrates on the idea of treating practices as relations. The review takes as its point of departure the work of cognitive anthropologist Edwin Hutchins (1995), which offers a revolutionary view of the mind by examining cognitive activity not at the level of individuals but at the level of practices. Upon acknowledging that a more nuanced comprehension of human accomplishment lies in the study of phenomena beyond the individual, I review how various theories of practice place emphasis not only on the social but also on the material. This idea sets the stage to review sociomaterial approaches grounded in relational perspectives to epistemology and ontology, which I discuss in relation to practice-led design research. Before closing this section, I underline one key aspect that has been ignored in this area of the literature, which, in contrast, has been the focus of attention in practice-led design research. This aspect concerns the idea of employing the act of making as a means of knowledge production.

In his influential book *Cognition in the Wild*, Hutchins (1995) proposes a framework for the study of mind that cuts across anthropology and cognitive science. Based on the observation of a group of navigation practitioners operating aboard a naval ship, he examines cognitive activity in a real-life setting instead of limiting its study to laboratory conditions. Informed by social anthropologist Jean Lave's work on knowing-in-practice (1988), STS scholar Lucy Suchman's work on situated action (1987), and psychologist Lev Vygotsky's work on activity theory (1978), Hutchins's studies constitute one of the cornerstones of a growing research approach called *situated cognition*. This approach has been acclaimed in a wide variety of fields because it puts human thinking back in context. Further, it is considered pioneering because it *situates* thought processes in social and material interaction rather than confining them to the individual's head. In what follows, I discuss two implications of adopting this approach in practice-led design research. First, I focus on the social aspect of practice; then, I concentrate on its material dimension.

The first implication of adopting a situated cognition approach in practice-led design research lies in the need to reaffirm the locus of the individual within a larger system of activity. Hutchins (1995, xiv) does so by expanding the unit of analysis from individuals to practices. This procedure allows him to examine the coordinated operations of the entire navigation team. With examples describing how the team manages to keep the ship under control and bring it safely into port, he empirically demonstrates that human accomplishment does not depend on the skills of individuals but on the often-implicit structures that enable the exercise of such skills in the first place. This means that even when carried out at the individual level, cognitive activity is driven by tacit understandings of practice that are socially and culturally situated (Lave, 1998, p. 171; Schatzki, 2001, p. 16). In this context, Hutchins (1995, pp. 27, 176) maintains that it is "shipboard navigation culture" that prescribes the navigators' way of thinking and thus the cognitive properties of the entire navigation team.

Acknowledging the relation between practice and culture places this idea of *situatedness* in high resonance with practice-led design research. In the quest of employing their practice as a platform of inquiry, designer-researchers who ascribe to this field need to situate their knowledge within the disciplinary culture in which this knowledge operates (Evans, 2010; Groth, 2017). In this sense, Hutchins's work resonates well with practice-led design research because it exhibits a process of in-depth data collection facilitated by the adoption of an insider's perspective. His extensive experience as both a cognitive anthropologist and an open sea sailor enables him to describe, with the utmost precision, the peculiarities of shipboard navigation culture and the social conventions, behaviors, and attitudes performed therein. This ability to understand such aspects from an insider's perspective is crucial in explicating the practice in question and its implicit structure. Moreover, it typifies the double role that practitioner-researchers have to adopt, as researchers and informants (Mäkelä & Nimkulrat, 2018; Pedgley, 2007), when they confront the task of articulating how their tacit understandings and situated experiences play a formative role in the generation of knowledge.

The second implication of adopting a situated cognition approach in practice-led design research is concerned with matters of scale, relationality, and the inclusion of material objects, flows, and forces as active participants in the shaping of practices. Whereas matters of scale and relationality are largely overlooked in practice-led design research, issues about the inclusion of material and environmental actors play a central role in this field (see e.g., Aktaş, 2020; Latva-Somppi & Mäkelä, 2020; Nimkulrat, 2009; Scott, 2010). Nevertheless, this latter aspect needs to be considered from a broader analytical perspective and not only from a practitioner-centered one. An insightful take on this issue can be found in the research stream of *sociomateriality* (see e.g., Carlile et al., 2013; Hultin, 2019; Orlikowski, 2007), which holds that the social and the material are equally malleable and actively shape each other. Sociomateriality is grounded in a relational ontology that assumes no a priori division between people and things (Jones, 2013, p. 221; Orlikowski, 2007, p. 1437), thus accounting for the primacy of relationships over entities in the study of practices. Below, I draw on this ontology to discuss how adopting a sociomaterial lens could be beneficial for practice-led design research. In doing so, I reassert the reasons why the idea of expanding the unit of analysis may assist this field in overcoming matters of scale and relationality.

As mentioned above, practice-led design research engages in knowledge production by highlighting the subjective input of the designer from a singular, first-person stance. Addressing research problems at the scale of disciplinary practices, however, demands the use of analytical tools that cannot be deployed by individual metrics alone. Therefore, matters of scale need urgent attention in a field like this. Practitioner-researchers Maarit Mäkelä and Nithikul Nimkulrat (2018, p. 1) remind us that "practice-led [design] research has been under debate for three decades". One of the most salient aspects of this debate concerns the question of whether analyzing one's own design activity constitutes a proper means to yield unbiased and generalizable knowledge claims (Pedgley, 2007). This question embodies what design philosopher Johan Redström (2017, p. 7) identifies as "the tension between the universal and the particular". In a similar way to what the situated cognition approach proposes, the literature on sociomateriality suggests that this tension can be softened by shifting the unit of analysis from individuals to practices. Such a shift is of great relevance to practice-led design research because it posits knowledge as a relational process rather than a localized property. Changing the scale from individuals to practices thereby allows practitioner-researchers to tackle issues of relationality. In other words, this change of scale assists in "clarifying the relationship between the practitioners as individual sources of knowledge and the practice itself as the unit of knowing" (Vega et al., 2021, p. 11).

Treating practices as a unit of analysis is a common procedure used in theoretical studies seeking to address research problems at the scale of social structures. Commonly referred to as *practice theory* (see e.g., Reckwitz, 2002; Schatzki, 2001; Shove, 2003), this approach offers yet another way to investigate human activity in context (Gherardi, 2017). Although rarely made explicit, practice theory and situated cognition are closely related. Both approaches are grounded in a relational epistemology that rejects the dualistic separation of knowing and doing. In the same vein, sociomateriality draws on practice theory but takes it even further by assuming this relational perspective not at the epistemological but at the ontological level (see e.g., Carlile et al., 2013). In line with shifting the unit of analysis from individuals to practices, sociomateriality shifts the status of materiality from passive to active by granting equal ontological treatment to the social and the material. In this view, practices are not constituted by social structures acting upon inert material worlds. Instead, as STS scholar Wanda Orlikowski (2007, p. 1437) pronounces, practices are "entanglements" of social and material structures that actively co-constitute the world.

Comparably, practice-led design research tends to emphasize the active role of materiality in the generation of knowledge. It is also common to observe that designer-researchers reject dualistic assumptions in the same way as sociomateriality scholars do. In this regard, practice-led design research and sociomateriality operate under similar tenets. They, however, differ in two fundamental aspects. The first aspect is

epistemological, thus concerning the locus of knowing within the practice under scrutiny. The second aspect is ontological, thus concerning the question of what constitutes a practice in the first place.

Epistemologically, practice-led design research differs from sociomateriality because its locus of knowledge production lies in the individual instead of the social. This aspect could be tackled by anchoring the epistemic dimension of the practice in question in a system of activity that is larger than the practitioner—for example, by *creating* knowledge with other actors rather than *sourcing* knowledge from them. It is worth noting that this strategy does not conflict with the intention of highlighting the subjective input of the practitioner-researcher. In fact, a strategy like this could enhance such subjective input because it would inherently afford an intersubjective means of knowledge validation. Ontologically, the gap between both fields is much larger. Because practice-led design research has not yet anchored its epistemological stance in the social, it cannot yet afford the ontological shift that sociomateriality proposes, which is the entanglement of the social and the material. However, since both fields "share a concern for the material and insist that the material cannot be understood outside of the social practices in which [it] become[s] enacted" (Østerlund et al., 2015, p. 127), their ontological dissimilarities seem reconcilable.

All in all, the idea of examining practice beyond the individual poses an important challenge for practice-led design research. At the heart of this challenge lies the question of how the act of making can be employed as a relational research practice. Although some studies have started to touch upon this question (see e.g., Nimkulrat et al., 2020; Shercliff & Twigger Holroyd, 2016; Vega et al., 2021), the epistemic role of more-than-individual acts of making remains largely unarticulated in practice-led design research. Conversely, some studies in the field of sociomateriality have inquired *into* more-than-individual acts of making from a relational perspective (see e.g., Durrani, 2018; Endrissat & Noppeney; 2013; Gherardi & Perrotta, 2013), but no studies in this field have yet engaged in knowledge production *through* such acts. To maintain the locus of knowledge production within the act of making and simultaneously expand it beyond the individual, the very act of making must remain known from the inside rather than observed from the outside. For this reason, the insider's knowledge of the practitioner continues to be much needed. In the next section, I review some of the literature that explicates how scholars and practitioners in the field of making articulate these ways of knowing from the inside.

LITERACIES OF MAKING

This section elaborates on the premise that making, in addition to being a knowledge competence, is a knowledge-producing practice in its own right. The review builds upon three main approaches to the act of bringing things forth into being: a material culture approach proposed by social anthropologist Tim Ingold (2013), a design theory approach proposed by design philosopher Johan Redström (2017), and a practice-led design research approach proposed by ceramicist and designer Camilla Groth (2017). All three approaches hold that making is a way of knowing from the inside. In focus is how this way of knowing does not exist in isolation but rather emerges in relationships.

In *Making*, Ingold (2013) argues that material culture studies ought not to be only preoccupied with understanding how the world is made. Drawing on the work of philosophers Gilles Deleuze and Félix Guattari (2004), he states that these types of studies should be as well preoccupied with participating in the making of the world. With this statement, Ingold reminds us that the essence of making lies in a process of correspondence between the maker and the world rather than in an imposition of the maker upon the world. On par with Orlikowski's (2007) sociomaterial conception of practice, Ingold's work posits that the act of making entails the entanglement of beings and things that co-participate in the world's *becoming* (see Deleuze & Guattari, 2004). In explicating the notion of becoming, he expresses his discomfort with Aristotle's *hylomorphic* account of making, which is the view that making implies the imposition of form upon matter based on a preconceived idea that exists in the mind of the maker (Ingold, 2013, p. 21). Ingold's rejection of Aristotelian hylomorphism promotes the adoption of a *morphogenic* approach, which, as he notes, stresses that "form is ever emergent rather than given in advance" (ibid., p. 25). In this view, makers do not impose form upon matter but rather couple with material objects, flows, and forces in a relational act of knowing.

Adopting a morphogenic approach allows for the formulation of three points from which to interrogate the role of making in design practice. The first point is that morphogenic thinking dismantles the role of the designer as the absolute agent in the process of giving form to things. In other words, it contends that it is the *relationship* between the designer and those things that renders designing possible in the first place (cf. Hutchins, 1995; Orlikowski, 2007). The second point is that it evidences how problematic it is to think of this relationship as a condition that is subordinated to either designers or things. Although practice-led design research is well attuned to morphogenic points of view, it continues to ontologically prioritize entities over relationships. By doing the opposite, practice-led design research would be fully equipped to employ design practice, in the strictest

sociomaterial sense of the word, as a means of inquiry that can transcend the designer's first-person stance. Finally, the third point concerns the very conception of design as a form-giving activity, especially because the question of what form means has become an increasingly contested territory in design research at large.

In *Making Design Theory*, Redström (2017) tackles this question and takes the morphogenic approach even further. He begins by mapping the meaning of form in the Scandinavian tradition of design research, which conceives of designing as an act of "form giving" (ibid., p. 25). He argues, however, that contemporary design research has erred by perpetuating the idea that form is a static and discrete feature that designers assign to the things they make. Although Redström does not refer to Ingold, he criticizes, as Ingold does, the Aristotelian view that form is "the way matter builds things" (ibid., p. 70). He explains that form does not reside in the expressive structures that matter can shape but in the relations between these expressive structures and the acts associated to their perception. In other words, he advocates a relational rather than an entity-based definition of form (ibid., p. 68):

> If I talk about a "circular form," I am talking not only about circles per se but also about a certain act of perceiving, of seeing, circles. So because of the typical acts involved in watching a movie, if I say that the form of this movie is based on a circle, then you would probably think of a temporally circular or repetitive structure with no obvious beginning and end, rather than something literally showing a circle all the time.

The idea cited above bears two important implications. The first one is that Redström's definition of form sits across a spectrum that ranges from what *a thing* is to what *making a thing* is (cf. Deleuze & Guattari, 2004; Ingold, 2013). To put it in another way, form cannot be defined by stable and static criteria because that would not support the development of design as an ever-evolving discipline. As he notes in his example, design practice has evolved to a point where designers not only transform matter into circular shapes but also configure circular processes, systems, and frameworks that only become circular in the making. Consequently, the second implication is that such a definition of form can only be brought about through acts of making. Beyond coupling with material flows to bring new things forth into being (see Ingold, 2013), designers, according to Redström, are capable of coupling with other kinds of flows by perceiving where these flows are coming from and where they are going (Spuybroek, 2011). In line with Ingold's morphogenic approach, this definition of form is also emergent rather than given in advance. In such a way, definitions also fall into the category of things that can be designed or, rather, *made*. By scaling up this idea from single definitions to entire theoretical framings, Redström envisions a theory of design that is in itself a *thing* (cf. Ingold, 2013) in the making.

The ideas proposed by Ingold and Resdtröm may seem hard to grasp because they describe acts of making that are based on fluid concepts rather than stable criteria. What is more, making entails the deployment of non-linear, inventive, and affective modes of working, which, unless experienced first-hand, are unlikely to be fully understood. This kind of first-hand experience is precisely what practice-led design research has championed as an asset, in fact calling it *experiential knowledge* (see e.g., Aktaş & Mäkelä, 2019; Groth, 2017; Nimkulrat et al., 2015). The notion of experiential knowledge typifies what Ingold refers to as *knowing from the inside*, which in turn echoes what polymath Michael Polanyi (1958) termed *personal knowledge*. Because making is imbued with a series of tacit understandings embodied by the maker (cf. Lave, 1998, p. 171), the personal and experiential knowledge involved in acts of making is known to be very difficult to articulate (Polanyi, 1966, p. 4). However, this way of knowing from the inside affords an appropriate tool to explore the kinds of empirical phenomena that typically fall into the scope of practice-led design research.

In *Making Sense through Hands*, Groth (2017) deals with the challenge of rendering her experiential knowledge as a maker "researchable and explicable in an academic context" (ibid., p. 7). Through a series of case studies aimed at answering the question of how designers think with their hands, she investigates the role of the body in design practice and notes that making allows designers to think in a variety of modalities. One of her cases shows how she managed to establish "tactile communication" (ibid., p. 52) with a deafblind maker by means of throwing clay together with him. This case highlights one of the key features of making, which is the production of meaning in non-representational form. Because throwing clay occurs in a material modality, representational means such as language are not sufficient to communicate its experiential aspects. Another of her cases illustrates the same idea, this time referring not to the limits of language but to the limits of drawing. As she (ibid., p. 60) expresses it, "[d]rawing is fundamentally different from the information to be had through real-life material manipulation. The more experienced designer has the benefit of owning a larger asset of embodied knowledge of materials and may thus create more realistic mental images of intended designs". Both cases demonstrate that experiential knowledge emerges in action (cf. Hutchins, 1995; Orlikowski, 2007) and cannot be articulated by representational means alone.

In a similar way to Redström, Groth describes acts of making based on a spectrum of concepts rather than stable criteria. In this case, the discrete definitions located at the opposite poles of this spectrum are the *representational* and the *performative* (cf. Groth, 2017, p. 63). Because making entails the ability to move back and forth between these two modes of working, Groth

claims that thought processes about making can only be fully deployed through acts of making (cf. Redström, 2017, p. 6). Her approach bears strong ties to that of Ingold and Redström in that it explicates the concept of knowing from the inside at different levels. On a conceptual level, she turns to the theory of embodied cognition to explicate how the experiential knowledge of a designer is always situated and implicit. On a methodological level, she sharply asserts that "[a] methodology that grows out of [a given] practice may reflect that practice more accurately" (Groth, 2017, p. 81; cf. Redström, 2017). Finally, on an epistemological level, she legitimizes the act of making as a way of knowing by placing the locus of knowledge production in her hands.

As seen above, Ingold, Redström, and Groth boldly recognize the act of making as an epistemic practice. Their work may differ in scope, conceptual depth, and degree of theoretical or empirical evidence. However, all three authors share the ability to articulate their insider's knowledge through the handling of materials, whether these be clay or theory. They all delineate a way of *thinking through making* that allows them to position themselves in correspondence with the world. While this way of thinking is comprehensibly relational, it comes with the downside of being largely tacit: makers know how they relate to their materials, but this relationship often remains invisible. The point of adopting a relational ontology in practice-led design research is to render relationships like this visible and thereby researchable. In line with the idea of examining practice beyond the individual presented in the previous section, the next section explains how to expand the notion of thinking through making beyond the maker.

DISTRIBUTED THINKING AND REFLECTIVE PRACTICE

This section revisits Hutchins's (1995) ideas and incorporates philosopher Donald Schön's (1993) work. Here, I review how cognition extends beyond the individual and how this process is normally accounted for in practice-led design research. In focus are two constitutive aspects of practice: materiality and time. First, I introduce Hutchins's theory of *distributed cognition* and a few similar approaches that emphasize the importance of materiality in the formation of thought processes. Then, I discuss the theory of distributed cognition in the light of Schön's notion of *reflective practice*, concentrating on how practitioners develop reflective tools to accumulate cognitive resources over time. The reason for including Schön's work in this part of the review is twofold: it is influential in practice-led design research, and it bears important similarities to Hutchins's theory.

In addition to contributing empirical evidence to the situated approach initiated by Suchman (1987) and Lave (1988), Hutchins's work paved the way to the development of *distributed cognition theory* (Rogers & Ellis, 1994). His extensive research on team performance allowed him to demonstrate that cognition is not only a situated activity but also a distributed process (Hutchins, 1995, p. 203). Essentially, distributed cognition theory accounts for the coordination of individuals, artifacts, and the environment in the accomplishment of tasks. Psychologists Yvonne Rogers and Judi Ellis (1994, pp. 121–2) note that it offers a suitable framework for studying how cognition is both socially transmitted and materially mediated.

Distributed cognition theory has strong ties with a developing research program called *4E cognition*. The program is an interdisciplinary effort to provide alternative approaches to classical cognitivism, which holds that thought processes occur exclusively inside the head. In arguing that thought processes are dynamically entangled with a multitude of external factors, the 4E research program offers (1) embedded, (2) embodied, (3) enactive, and (4) extended approaches to cognition (Rowlands, 2010), hence the "4E". Although these four approaches are different and strive to demarcate themselves from one another, all of them purport to explain that cognition occurs in practice and unfolds at the interface of mind, body, and world.

The first approach, *embedded cognition*, contends that thought processes are always context dependent. In line with the idea of situatedness explained earlier in this review, this approach recognizes that the mind is ontologically inseparable from its surrounding environment. The second approach, *embodied cognition*, states that thinking can only be the outcome of having a physical body experiencing a physical world. This approach draws on philosopher Maurice Merleau-Ponty's *Phenomenology of Perception* (1962/1945), wherein the notion of *embodied knowledge* was introduced to contest the cartesian problem of separating the mind from the body. As discussed in the previous section, Groth's (2017) research adopts this epistemological stance by placing the locus of knowledge production not inside her head but in her knowing hands. The third approach, *enactive cognition*, insists that thinking emerges in action, thus being always relational, dynamic, and performative. This approach is credited to philosopher Francisco Varela and colleagues (1992), who assert that "cognition is not the *representation* of a pre-given world by a pre-given mind but is rather the enactment of a world and a mind on the basis of [the] actions that a being in the world *performs*" (ibid., p. 9, emphasis added). This idea bears a direct link to the notion of performativity highlighted in the previous section, and it is specifically related to what Groth (2017, p. 63) describes as the "non-representational" dimension of making. The performative character of enactive

cognition also echoes Ingold's (2013) morphogenic stance, in which form is emergent, or *enacted*, rather than given in advance. Further, it resonates with Orlikowski's (2007) sociomaterial account of practice, in which the social and the material are not pre-formed entities but performed relationships (ibid., p. 1438). Lastly, the *extended cognition* approach posits that the cognitive capacity of individuals is constantly augmented by the use of artifacts, tools, and instruments. This approach is largely based on the studies of philosopher Andy Clark and cognitive scientist David Chalmers (1998), who took Hutchins's ideas to develop a model of the extended mind by stating that material objects, flows, and forces operate as cognitive resources that enhance the mental and bodily abilities of individuals.

While all four approaches are compatible with distributed cognition theory, the last two (i.e., the *enactive* and the *extended*) have a much stronger connection to it. They both hold that thought processes extend beyond the physical boundaries of the individual to include material interactions with the environment (Clark & Chalmers, 1998, p. 10; Hutchins, 2010, p. 706). Worth reminding, distributed cognition theory states that cognition is not only socially transmitted but also materially mediated. An example of the latter aspect would be any process that implies offloading one's thoughts onto a material artifact—for instance, when taking notes. Whether for personal use or to share with others, note-taking entails the use of analog or digital tools that populate a larger network of social and material resources. Taking cues from the work of anthropologist Gregory Bateson (1972) and psychologist James Gibson (1986), Hutchins (2010, p. 706) refers to this network as a *cognitive ecosystem*. Distributed cognition theory is thus concerned with material artifacts to the same extent as it is concerned with social dynamics. Further, it contends that materiality is inextricable from the cognitive ecosystems in which social practices occur.

Although the importance of material artifacts is well documented in studies of distributed cognition, little attention has been paid to studying the act of making artifacts as a distributed cognitive process. Some researchers have begun to address this topic. However, they treat artifacts as *external representations*, the only role of which is to mediate cognitive tasks or facilitate communication between individuals (see, however, Mehto et al., 2020). Because this treatment of artifacts is grounded in a representational perspective, further work is needed to comprehend their role in distributed cognition from a performative research stance. The notion of thinking through making is ideally suited to meet this need, but little is known about the inclusion of practice-led design research approaches in studies of distributed cognition. In short, while there is ample evidence of the role of material artifacts in studies of *distributed thinking*, there is no evidence of their role in studies of *distributed thinking* conducted *through making*. For this reason, the notion of *distributed thinking through making* constitutes in itself a research area that has remained unexplored.

The gap between practice-led design research and distributed cognition theory may seem wide, but Schön's (1983) notion of *reflective practice* reveals a potential intersection between both fields. Here, I further illuminate this intersection by discussing the temporal dimension of practice. In *Cognition in the Wild*, Hutchins (1995) stresses that thought processes are distributed not only among practitioners and artifacts but also across time. He notes that practitioners undertake long-term tasks by attaining partial achievements and simultaneously acquiring the competencies needed to attain subsequent achievements (ibid., 1995, pp. 165–9). This observation shows that the accomplishment of tasks entails the diachronic accumulation of cognitive resources. Further, it indicates that beyond acquiring technical skills, practitioners develop reflective tools to improve their performance. Schön's notion of reflective practice sheds light on the temporal scope of such tools, specifying that reflection can occur concurrently (reflection-in-action) or retrospectively (reflection-on-action).

Reflection is paramount in practice-led design research. Not only does it allow practitioner-researchers to accumulate experiential knowledge (see Nimkulrat et al., 2015, pp. 5–8), but it also helps them investigate their own design practice (see Scrivener, 2002, p. 25). In this context, Mäkelä and Nimkulrat (2018) draw on Schön to propose a reflective tool termed *documentation*. As they note, documentation assists in capturing and recording the experiential aspects of design practice, rendering them accessible and explicable at later stages of the research process (ibid., p. 14). Typical forms of documentation in practice-led design research include notes, studio diaries, photographs, sketches, and prototypes. Similar to what Hutchins (1995) and Clark and Chalmers (1998) explain in their models of distributed and extended cognition, documentation is the means by which practitioner-researchers offload their thoughts onto material artifacts. It is through this means that they "reflect on [their ongoing] experiences during the process (*reflection-in-action*) and on [their] documented experiences after the entire process (*reflection-on-action*)" (Mäkelä & Nimkulrat, 2018, p. 14, emphasis in the original). In addition to illustrating the potential of material artifacts as recording devices in practice-led design research, documentation constitutes a way of *performing* design practice. Further, it is an appropriate method to reveal how the cognitive repertoire of practitioner-researchers distributes across time and gives form to itself (cf. Ingold, 2013; Redström, 2017) through the accumulation of experiential knowledge.

To sum up, distributed cognition theory and practice-led design research are not as far apart as they may seem. In this section, I have laid out a possible intersection between both fields by focusing on their shared concerns with materiality and time. First, I have compared the role that materiality plays as a representational medium in studies of distributed cognition with the role that it plays as a documentation tool in practice-led design research. Then, I have articulated the relationship between reflective practice and distributed thinking by revealing how practitioners rely on materiality to extend their cognitive repertoires and accumulate experiential knowledge over time. I have, however, remarked that the treatment of materiality in studies of distributed cognition remains limited to representational modes of inquiry. Further research is needed to comprehend the significance of handling materials in distributed cognition from the performative perspective of making.

DISCUSSION

The paper at hand set out to elucidate how practice-led design research can account for the epistemic role of making beyond the scale of individual practice. A scoping study was conducted to comprehensively review the extent of available knowledge related to this question, concentrating on relational perspectives to epistemology and ontology across various fields. By discussing these perspectives in relation to the most salient issues of practice-led design research, I identified two fields of inquiry offering important contributions to the research question. These fields were sociomateriality and distributed cognition theory.

With a focus on the notion of practice, the study identified potential overlaps between practice-led design research, sociomateriality, and distributed cognition theory. Throughout this paper, I highlighted the similarities and differences between these fields and proposed a framework to integrate them. First, I argued for the study of *practice beyond the individual*, turning to sociomateriality to reconsider the ontological dimension of practice in practice-led design research. Second, I explained how the literature used in, and coming from, practice-led design research comprises a body of *literacies of making* that reassert the locus of knowledge production in the act of making. Finally, I reviewed the theory of distributed cognition to lay out a connection between the notions of *distributed thinking* and *reflective practice*.

The differences and similarities between practice-led design research, distributed cognition theory, and sociomateriality are synthesized in Table 1. To sum up, practice-led design research has thoroughly investigated the relationship between individuals and materials by focusing on acts of making. This focus on individual-material interactions, nevertheless, has come with a tendency to downplay the importance of the social as a site of knowledge production. Distributed cognition theory and sociomateriality, in contrast, have accounted for the relationship between the social and the material, but they have not yet placed the locus of knowledge production in acts of making. Because making entails the enactment of experiential knowledge, the study thereof necessitates more than representational means of scrutiny. Therefore, the insider's perspective of the maker is crucial in studying acts of making from a performative research stance.

Overall, the study strengthens the idea that adopting a relational ontology can benefit practice-led design research. This finding is discussed throughout the paper in the light of a change of scale, specifically in the unit of analysis. By taking the notion of *thinking through making* to account for the epistemic role of design practice in practice-led design research, I have introduced the term *distributed thinking through making*

Table 1. Review synthesis

Research field / stream	**Locus of knowledge production**	**Relational perspective**	**Epistemic dimension of practice**
Practice-led design research	The individual: Knowledge emerges from the practitioner in action	Epistemological: Accounts for the interaction between the individual and the material	Thinking through making: The practitioner moves between *representational* and *performative* modalities
Distributed cognition theory	The social: Knowledge emerges from the relationship between practitioners in action	Epistemological: Accounts for the interaction between the social and the material	Distributed thinking: Thought processes between practitioners are mediated by external *representations*
Sociomateriality	The sociomaterial: Knowledge emerges from the enactment of a practice	Ontological: Accounts for the constitutive entanglement of the social and the material	Distributed making: The social and the material *perform* the practice relationally

to emphasize this change of scale. The term simultaneously articulates an unexplored research area and a framework to explore a variety of research topics related to that area. Although the present review is limited to the application of the term in practice-led design research, it signals the need to reconsider the ontological dimension of practice in other fields of inquiry dealing with the study of practices from an insider's perspective. In any case, the benefit of adopting a relational ontology in practice-led design research is that it illuminates the primacy of relationships over entities in the study of design practice. In addition to offering a means to articulate the relationship between representational and performative modes of investigation, a relational ontology in practice-led design research can reassert the locus of knowledge production in acts of making that emerge from the entanglement of the social and the material.

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TANGLED BECOMINGS IN MATERIALITIES OF FELT PRACTICE(S)

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ABSTRACT

In this exploratory paper, we discuss how different scales of production can affect relationships between humans and nonhumans. This discussion is carried out through the exploration of three scales of felting: hand-felting with manual tools, felting with semi-industrial tools at small-scale studios, and felting with industrial automated machines. Despite the large spectrum from hand production to industrial production and the dramatic change in the actual practices involved, the fundamentals of felting remain similar, creating a compound surface by pressing and unifying fibres. By examining these changes, this paper explores the fluidity and changing meanings of practices and their impact on building new relationships among humans and nonhumans. The examination reveals that as the scale grows the distance between the maker and the material also grows, affecting the maker-material relationship significantly. By studying different relationships through the lens of scale, we further understand the becoming of human-nonhuman relationships in craft practices.

INTRODUCTION

Felting is an ancient craft often practised with sheep wool to create nonwoven textile surfaces. Wool has a tendency to entangle: even when there is no human contact wool fibres can be felted via the forces of air, sheep oil, sheep sweat, and pressure. Thus, when collected, wool is usually already tangled. Although the tangled wool can still be felted, often, to increase the efficiency of the process, makers un-tangle the fibres and put them in an orderly line before entangling the fibres once more, this time in the preferred size, firmness, and shape. At this stage, warmth, pressure, and soap can also be used as catalysers.

In recent years, following technological developments, felting procedures have been changing through the introduction of new machines and tools. The exploration of wool's ability to insulate sound and heat have led to a growth in the use of wool as a fundamental insulation material, both as part of construction (Raja, et.al., 2013) and as part of interior decoration (Kibbermann 2020). With these new tools, the scale of production has grown, and currently a felted artefact can be produced by hand at a small-scale craft studio as well as on an industrial mass production belt.

In this paper, we present three scales of felting, namely hand felting, semi-industrial felting, and automated felting. By discussing the similarities and differences between these scales, we present the vibrant materialities of felting that set the practice and its practitioners in a constant state of becoming. Materiality is often discussed through the haptic experiences of interacting with an artefact (Anusas and Ingold 2013), and in this paper we apply similar thinking to discuss the haptic experiences of the maker during the process of making as the practice's materiality. The material experiences of the maker during the process significantly shape the emergence of the practice and lead to it having various *becomings*. By looking into the materialities at different scales of felting, we reveal the becoming of the practice itself and how it affects different relationships.

The notion of *becoming* refers to a body's ability to affect and be affected (Deleuze and Guattari 1987), or to a state of constant flux as a body interacts (or intra-acts) with other bodies. Anthropologist Tim Ingold (2013, p. 28) proposes that materials are in constant becoming with their affective ability: they always change and make a change in their surroundings. Their becoming can be followed by observing the growth and transformations that they go through (ibid.). Here, becoming refers to constantly *becoming something else*

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rather than *being something* static and fixed. Thus, becoming is being in an ongoing unplanned action with other elements in that particular situation (Barad, 2003, p. 803).

The notion of becoming is closely entwined with the idea that things and materials are active (in opposition to being stable). With their becomings, materials and things hold affects able to invite new perceptions and, in this way, enable the production of knowledge and practices (Valle Noronha, 2019). By being in constant movement, materials can always bring new perceptions.

The becomings of practices and materials maintain and exhibit their history while proposing various relations and futures. Building on the ideas of becoming and of active matter, the examinations on different scales of felting show how the material can generate active materialities of practices. In the next sections, we will first discuss materials and their active becomings, then we will present three scales of felting based on field notes. After these presentations, we will discuss the becoming of relations that emerge from various scales of felting in accordance with the material's origin and practice, various roles of humans and nonhumans, and the environmental connections.

ACTIVE MATERIALS AND MATERIALITIES

Materials, or from a larger view any nonhuman entity, hold embedded capacities that can make significant changes in their surroundings (Barad, 2003). However, Ingold (2007, p. 9; Anusas and Ingold 2013) argues that materials often disappear into the forms of objects and presents their materiality. This disappearance has the potential of instrumentalizing material properties and perceiving them as fixed entities while attributing all the activeness to human perception. Ingold, however, suggests emphasizing the growth and transformation that the material goes through to understand how we make sense of our actions and thinking together with materials.

When materials are perceived as active, their role in shaping the everyday experiences and actions of humans can be recognized (Pickering, 2010). This effect on actions can also extend to shaping the ways of thinking and perceiving the world. Therefore, observing the performative capacities of nonhumans can lay down the causalities between actions of humans and materials (Pickering, 2010). This can then show how relationships are also in constant becoming in a dialogue-like way. These relationships develop naturally from situations by paying attention to these changes, and thinking with them (Puig de la Bellacasa, 2012, p. 197) as each development shapes those following.

For instance, wool's becoming can be observed in its own environment. The proteins in wool fibres absorb UV light while changing its white-ivory colour to yellow as a result of exposure to weather related conditions, such as sunlight, air, and water (Millington, 2006). The capacity to absorb sunlight also gives wool the ability to protect its underlayers (ibid.). The physical transformation from single fibres to a compound surface, with or without human agency, is another physical becoming of wool. The togetherness of these two abilities can affect the becoming of wool into a filter, building a relationship with humans to protect them.

By studying various ways of thinking with materials to make felt, we can reveal new forms of relations. Following the change in a practice in relation to its scale can reveal how the thinking behind the practice and material perception has been evolving and growing. This can demonstrate how a certain material or materiality of a certain practice generates new relationships among humans and nonhumans. We have an ever-changing relationship with our surroundings that is constantly affected by the different conditions. Understanding the changing perceptions of practices can present how engaging with materials on various scales can bring new actions and conceptualizations for humans. Next, we will present three scales of felting.

THREE SCALES OF FELTING

To discuss the materiality of felting and how it shapes relationship-building, we examined three types of felting, mainly in relation to their production scale. The first, hand-felting, is examined based on the first author's personal experiences, the second, semi-industrial felting, is examined based on field notes from observations at an expert maker's studio in Yalvaç, Turkey, and the discussion third, on industrial scale felting, is examined based on interview notes with the chief designer and founder of a felting company in Istanbul, Turkey.

While examining these three types of field notes, the main aim was to reveal the significant differences among the type of the material, tools, size of outcomes, and required time. Although each scale of felting embeds a complex set of relationships and practices, in this section we overview the field with reference to the material, tools, and working environment in order to present the main frames of each practice type.

FELTING BY HAND

For felting by hand, we examined the first author's making process. In this way of felting, wool was purchased online which was already cleaned and carded to be used in felting. Alternatively, the maker could use the manual carding tool to arrange the fibres in an organized manner.

We explored two types of hand-felting for this study: wet felting and needle felting. In wet felting, the main

action of the maker is to rub the wool fibres until they are unified. While rubbing, the hot water stretches the wool molecules to entangle them, and the soap makes this process quicker. Having bubble wrap also shortens the time since each bubble creates additional movement for the fibres. Thus, in wet hand-felting, soap, warm water, and plastic bubble wrap can be used to catalyse the process of entangling wool fibres.

In needle felting, the maker can utilize a specific type of a needle that has slits on the side. By poking the needle, or in other words, inserting the needle into the wool lump several times, knots are created, and fibres are entangled. With needle felting, the maker is able to create precise patterns or delicate three-dimensional shapes with the help of soft moulds, such as sponges.

While making felt by hand, the maker can work individually at a small-scale studio. For needle felting, the workspace can be more flexible since there are no specific requirements such as working with water. Since the production is entirely handmade, the outcomes are often one-of-a-kind artefacts. Besides developing the design idea, the entire process of making a 0.75 m^2 mat with 2 mm thickness can take more than a workday (approximately 10 hours). Needle felting would require several days.

FELTING WITH SEMI-INDUSTRIAL MACHINES

For felting with semi-industrial machines, we base the discussion on the observations we made at an expert maker's studio. Gencer collects wool from sheep breeders in large amounts around three hundred tons per year. He selects the thin fibres since they are softer and cards them via a machine. The preparation process requires additional practices and only after these steps are completed does the actual practice of felting begin.

At this stage, the artefacts are drafted by laying the wool in the desired size and pattern and turned into felt by using a felting machine that applies pressure to the artefact from multiple directions. This machine rotates the rolled wool piece around itself while applying pressure from above and the sides. These forces significantly reduce the production time while enabling the making of thick pieces thanks to machine power. The making of large sizes allows spending a longer time with the wool while laying the designs. This long process positively affects the making since the slowness provides time to reflect on being with and thinking with the wool.

Despite the use of machines or making artefacts that are large in size, the practice of felting still requires a demanding process of hand work, both before the use of the machines when the patterns are laid out and after the machine work when the shape of the felt is finalized via working on the symmetry of the sides or curving the sharp corners. Therefore, the scale of production, in terms of number, is still limited, yet, the number of people this process involves is larger than hand-production since it includes collaboration between various makers and practitioners.

Since the machines in the studio visited enable the production of large sizes, various projects could be developed by four felt makers working collaboratively. This possibility allowed the production of a wide array of products, ranging from garments to insulation panels, with traces of uniqueness. In addition to developing the design idea, the entire process of making a yoga mat that is a 1.12 m^2 yoga mat of 5mm thickness can take about half of a workday (approximately 4 hours) with the machine.

FELTING WITH INDUSTRIAL MACHINES

For felting at the industrial scale, we interviewed the chief designer and co-founder of a felting company. This company often designs and produces artefacts, such as separators for common areas or interior surfaces for acoustic experiences. At the industrial scale, felting is no longer limited to organic materials like wool. Rather, it relies on fibres that can be compounded, such as polyester, cotton, acrylic, polypropylene and polyamide (Küçük & Korkmaz, 2012, p. 2045). In fact, this company prioritizes PET fibres for sustainability reasons. As a result of an extensive research and development process, the PET fibres generated wool-like features in terms of appearance and tactility as well as material qualities, such as flame resistance. Working with plastic-based materials also increases acoustic properties while improving the ability to make three-dimensional artefacts.

At this company, products are designed to be used for their acoustic and insulation purposes. Production is automated to a large degree and operated via computer-aided tools both for design processes and the actual production. The role of humans is often to develop the design idea. The designers experience the tactility of various materials before they begin their design processes while selecting their material range. However, since they seldom change their material range, their contact with the material is usually limited to testing the prototypes.

At the industrial scale, naturally, the production size is large and the artefacts can be mass produced, as opposed to handmade felts, which are produced in limited numbers. Also, from a market point of view, the industrial practices also bring standardized quality to the product.

FELTING IN MANY WAYS

As the aforementioned descriptions show, despite the dramatic changes among the scales, the practice remains felting. This perception proposes that felting has become a practice that is independent of the material

type and refers to the movements of various fibre-based materials that have the capacity to create a compound surface through different tools and methods. As previously observed, such flexibility supports constant transformations and becomings (Figure 1).

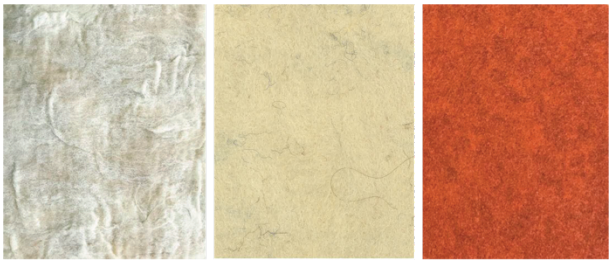

Figure 1: Various felt surfaces. From left to right: wet felting by hand, machine felting, automated felting. Photos: Aktaş, 2020.

These transformations in the practice and material also allow the emergence of new relationships between materials, practices, and the other entities involved. As the scale of production grows, the relationship between human and the nonhuman develops in a myriad of ways. This dynamism confirms the fluidity of practices in constant change in accordance with situated engagements with materials.

Although we reviewed three scales with reference to the production process, the idea of scale covers growth in the general sense. With the growth in production, the scale of the practice's impact area also grows. With growing scale, the distance from the material's origins, the actions of the humans and nonhumans, and the impact upon the environment are significantly affected (Figure 2).

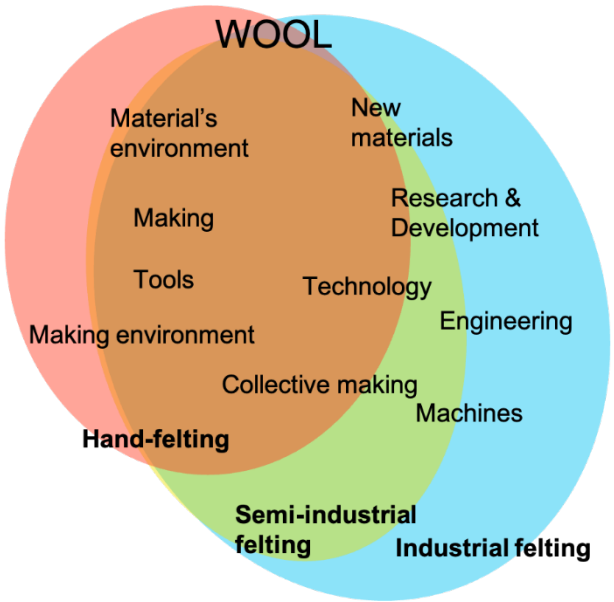

Figure 2: The elements and engagements of felting in three scales. Illustration: Aktaş, 2021.

MATERIAL'S ORIGIN AND THE PRACTICE

Although industrial developments improve human lives by increasing production efficiency and availability, they can also distance the practices from their material roots. When the slowness and bodily participation of hand-making is removed from the process, practitioners lose contact with the origins of the practice in a manner similar to how they distance themselves from the material of the object and focus on how they experience the materiality of it, as proposed by Ingold (2007). Engaging with hand felting that is made with sheep wool can surface its history of being part of a living organism, along with its smell, texture, and bio-waste. Crafting artefacts by hand builds embodied relationships with materials and can directly impact upon how we make sense of the world (Groth, 2017). Making with tools and machines can affect how we make sense of the world in different ways.

At the industrial level, material engagement happens through a different lens for the practitioner: either when they are selecting the right material or after the material is shaped into an artefact. For the practitioner, this eliminates the material engagement from the process of form-giving. This distance builds a particular type of relationship, in which relating to the material might be challenging. This type of making also brings a different type of embodied knowing: the designers enhance their digital literacy to think with computer software when developing design ideas. Therefore, the materiality of the practice becomes more digital for practitioners working at the industrial scale.

The scale of production, the practice, and the material reciprocally affect each other's becoming. With the growth in production size, new needs for the process of making and material qualities might emerge and accordingly can change the meaning of the material and the practice completely. The industrial felts being PET fibres moulded into forms is an example of these new meanings.

CHANGING ACTIONS AND CONNECTIONS

In accordance with the developments in knowledge and technology, new relationships are formed. When nonhumans are assigned to realize parts of human agencies, such as the actual making of felt, the process begins diverging since nonhumans can go beyond human capacities. For instance, in the felting example, felting is no longer limited to wool and the outcomes' physical properties of sound and heat insulation can be played with.

Therefore, on the one hand, the abilities of nonhumans, like plastic-based materials and machines, increase human capacities in an empowering way. The active materials bring new ways of interacting with them (Pickering, 2010), and similarly with the becoming of

enhanced material futures, new engagements highlight the becoming of humans as they might start changing their actions.

On the other hand, with the change in scale, being distant from the origins of the material can potentially shape the relationship with its ecologies. Since humans develop their thinking within their environment (Malafouris, 2013), the distance from material's origins can affect the emergence of relating to the environment. The industrial felting can overshadow the activeness of the material since it provides a limited set of actions to the practitioners to explore while making.

Also, naturally, another significant impact of the scale is based on the footprint that the industry generates. The production scale brings growth in other industries such as transportation and energy. This brings a new responsibility for the designers to be cautious about the results of their practices, and even encourage them to prioritize thinking with materials rather than instrumentalizing them with no attention to their activeness.

BECOMINGS OF PRACTICES AND RELATIONS

Practices, materials, tools and us, we humans, are in constant transformation. These changes often evolve in interwoven and reciprocal ways: through alterations in materials or practices the other elements also change.

Previously, design researcher Mike Anusas and Ingold (2013, p. 58) proposed that objects, especially if produced industrially, contribute to environmental alienation. This exploratory paper contributes to this discussion by exploring the materiality of practices and their emergent becomings on different scales, such as that of hand-making and industrial production.

We propose that the scale of felting affects human-nonhuman relationships in ways that distance the practice from its material roots, and this brings new material experiences for the practitioners in their processes. With the large scale of production, the tools also change and gain greater roles in the process by going beyond human capacities. Although this may create a positive co-existence of humans and nonhumans, it can also cause over-empowering humans to dominate the process of making by developing methods of controlling the material, such as by increasing its abilities to absorb sound or insulate heat without recognizing the impact of their practices. Thus, we believe that it is elemental for makers and practitioners to remain in contact with the material and become tangled with them, rather than controlling the materiality of the process, to build sustainable relationships with and through their practices, materials and the environment.

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NORDES 2021

THE EXTENSION OF THE CRAFTSMAN'S HAND BY ROBOTICS

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ABSTRACT

This paper reflects ongoing research about how new technologies create new possibilities within crafting and how new technologies can build on traditional techniques within the field of ceramics. This research explores how the use of robotics extends the craftsman's hand to utilise both the quality of the craftsman's touch and the robot through wire cutting a lump of clay. The research shows how the craftsman can upscale the power and range of the craftsman's hand and, at the same time, deal with small details and repetition beyond the work of the craftsman's hand.

INTRODUCTION

This paper reflects ongoing research about how novel digital means create new interfaces and processes between human, space and material.

The experiment in question in this paper focuses on the possibilities that robotics brings to ceramic craft practice. Focusing on these ceramic practices, the question is how and where traditional craft-based knowledge, rooted in the skills and experience of making three-dimensional objects, can inform novel ceramic processes that utilise robotics, and how such a new technological development opens spaces for new expressions and allows a rethinking of traditions within craft practice.

Craft practice is based on the idea that the interaction with a responding material guides the ceramicist (Leach, 1940; Dormer, 1994; Sennett, 2008), and crafting and execution work together in a way that is intuitive and humanistic (Leach, 1940; Dormer, 1994; Groth et al., 2013). Craft practice can here be understood through its immediate interface to matter and the result of this reflective conversation with the material is for this purpose named *the craftsman's touch*.

The experiment in this research focuses on using an UR robot, also referred to as a collaborative robot or a 'cobot'. The UR robot is characterised by being easy to programme, e.g. by manually recording the movement of the robot's arm.

Instead of thinking of craft and technology as diametric positions, technology is seen as an enabling force following McCullough's (1998) idea about the close connection between digital work and craft practice.

Thus, the project focuses on robotics as an extension of the hand. It is not based on automation or imitation, but rather on the synergy between *the craftsman's touch* and the robot's ability to scale up the power and the range of the craftsman's hand and its ability to accurately handle small details and repetition at the same time

The use of a cutting wire is a classic technique in ceramics that is often used in conjunction with other techniques such as throwing, extrusion or modelling. The cutting wire technique forms the basis for the initial experiments with the UR robot. A cutting wire is mounted on the robot arm and examined through the making of tile and brick-like shapes. The focus is on the curves and traces produced by the wire.

DIGITAL CRAFTING THROUGH THE USE OF ROBOTICS

The typical robot consists of a 6-axis robot arm with a customised tool attached. A robot is not a tool itself but becomes a tool when targeted by the user through programming and the use and design of the attached tool. These tools may vary from commercially developed tools to customised tools developed by the user ranging from simple homemade tools to advanced automated tools.

The Robotic Fabrication Laboratory (RFL) developed by Gramazio Kohler Research at Eidgenössische Technische Hochschule (ETH) in Zürich specialises in robotics and customisation of tools for their research projects. These projects include the use of clay as well. One such example is RobotSculptor: Artist-Directed

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Robotic Sculpting of Clay, which includes a customised loop tool that can be attached to the robot. Professional sculptors use a loop tool for cutting clay when modelling. Their use of the RobotSculptor enables them to define the style of the result and automates the sculpting process executed by the robot's arms (Zhao Ma et al., 2020)

Another example is the Institute of Advanced Architecture Catalonia (IAAC) research on additive manufacturing technology, such as 3D printing in clay. Their research shows examples that enable the customisation of the form of a building on multiple scales, from the global form to the resolution of the section of the wall, including cable robotics for large on-site, scale 3D adobe printing (Dubor et al., 2018).

Finally, another example is the project *Diversity*, a collaboration between the Danish companies Strøjer Tegl https://www.strojertegl.dk and Odico https://odico.dk (Bundgaard, 2021). In the project, they combine clay extruding through a pre-programmed robotic wire cutter. The clay is cut with a metal-wire while the clay is extruded, and by the movement of the wire, the curve and texture are designed as bricks. In this way, the project takes advantage of the soft material of clay in a traditional production technique in conjunction with the advancement of new technology.

These examples represent the different possibilities in the use of robot technology within the field of research. Nevertheless, *the craftsman's touch* is neither reflected in the making nor in the design in these examples. In this research, *the craftsman's touch* is precisely the pivotal for using robotics, and how the idea of *the extension of the craftsman's hand by robotics* should be understood.

METHOD

The method in this research is explorative and based on practical design experiments. Experimental design practice is used as a method of inquiry and reflective practice, in which the designer engages in a reflection through and on the action (Schön, 1993). 'Design is a way of inquiring, a way of producing knowing and knowledge' (Downton, 2003) and are also used as a material practice for knowledge production (Koskinen et al., 2008). The design experiments are concerned with moving away from the known by creating examples of what could be done and how and by general suggestions about a change to design practice (Binder and Redström, 2006, p.3).

AN INITIAL WORKSHOP

The experiment in question is based on a study with a group of first-year bachelor design students at The Royal Danish Academy that was focussing on how robotics extends the craftsman's hand through wire cutting a lump of clay. The experiment was part of an overall exploratory workshop about the possible synergy between traditional techniques and new technologies.

Initially, the students participated in a workshop with only traditional, analogue techniques. It means that no digital tools have been involved in that part. The initial workshop was based on exploring possible surfaces and textures that could be achieved when cutting with a wire through a lump of clay.

The approach was experimental, and associated with the craftmanship of risk and not certainty (Pye, 1968). The outcome had to be revealed and explored through practical experimentation and was unpredictable.

Some examples of the results from the initial workshop are shown in Figures 1 and 2.

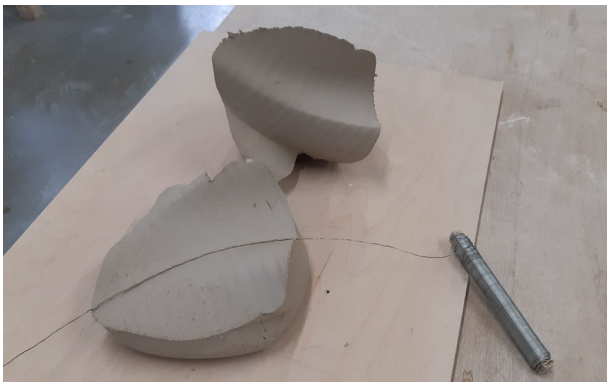

Figure 1. A basic example of wire cutting through a lump of clay

Figure 2. Example of wire cutting through a lump of clay

The students became experienced regarding the idea of *the craftsman's touch* and also familiar with the techniques and materials for the actual experiment with the robot.

The initial workshop results showed various possible curves and surfaces based on the experiential knowledge obtained through the experimentation. The following question for the experiment was how this experience could be transformed and utilised by robotics. The focus was to investigate how this experiential knowledge could be utilised and merged

with the ability of the robot to scale up the power and the range of the craftsman's hand and its ability to accurately handle small details and repetition at the same time.

THE ROBOT EXPERIMENT

At first, the students were introduced to the overall setup, consisting of the UR 10 robot with an attached wire tool and a graphical user interface (GUI) for controlling the robot. The graphic interface was based on the graphic programming interface, Grasshopper, developed by David Rutten (http://www.grasshopper3d.com/), which works as a plugin for the 3D-modelling software Rhino (Robert McNeel & Associates http://www.rhino3d.com/).

The overall process within the experiment consisted of the following steps:
1. Recording a movement by moving the tool attached to the robot.
2. Applying a curve to the recorded movement, here named a filter.
3: Executing the cut by the robot arm through a lump of clay.

RECORDING

By manually moving the attached tool on the robot, it is possible to record the robot's movement (see Figure 3). Since the students now were experienced, they were able to utilise and practice the learnings from the initial workshop. The recorded movement maps the intention of crafting with a wire through a lump of clay, based on the idea of *the craftsman's touch*. Crafting and execution are intuitive and humanistic. Subsequently, the robot is able to execute the movement by itself.

Figure 3. The movement of the robot is recorded by manually moving the attached tool.

The recorded movement is reflected as a curve at the GUI, and it is possible to scale the curve up or down, which will change the range for the execution of the movement by the robot. Furthermore, the recorded movement reflected as the curve consists of a number of recorded points over time. Thus, if the movement is fast, then the distance between the points is longer along the recorded curve. The distance between the points is important since it affects the further process.

THE FILTER

In this experiment, the filter represents a curve that is possible to add to the recorded curve before the final execution of the cut by the robot arm. The added curve is referred to as 'the filter' since it adds refined details to the recorded curve without transforming it as such.

The GUI for controlling the filter is shown in Figure 4. A curve represents the filter based on the pre-sets of mathematical graph types and functions that can be manipulated. Furthermore, it is possible to draw and add a curve as the graph manually.

The filter is added and merged in relation to the number of points at the recorded curve and will either be stretched or compressed depending on the number of points. Few points will stretch, and many points will compress. Thus, using the filter makes it possible to add sophisticated and refined details that can be integrated with *the craftsman's touch*.

Figure 5 shows the recorded curve with the filter.

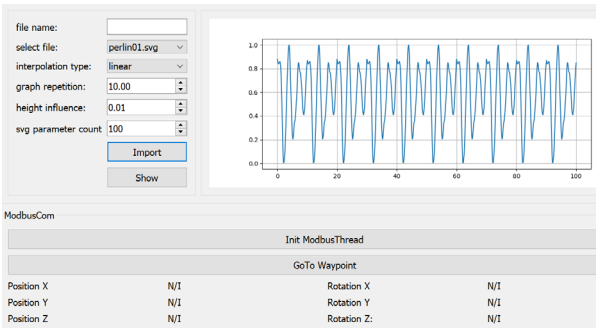

Figure 4. The GUI for controlling the filter.

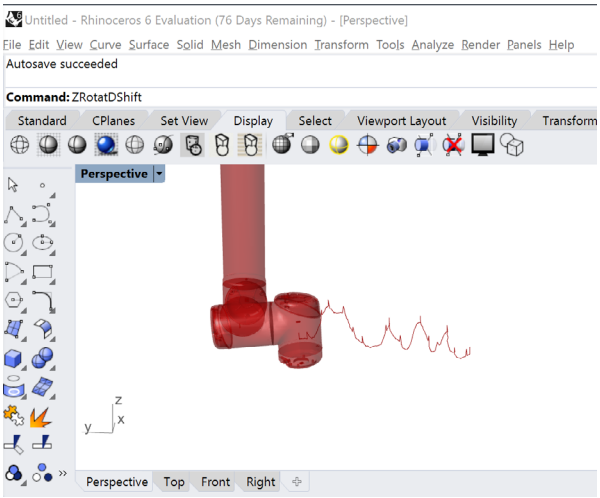

Figure 5. The recorded curve with the filter.

EXECUTION

After scaling the recorded curve and adding the filter, the cut by the robot arm with the attached wire tool is executed through a proper lump of clay (see Figure 6).

Figure 6. The execution of the cut by the robot arm through a lump of clay.

RESULT

The presented process of the experiment was executed several times. Examples of the results are shown in Figure 7–9. What is of interest is how the relationship between the recorded curve and the filter appear. Overall, the curve that steam from the recorded movement is recognisable as the overall curve of the objects. The filter is reflected as lines across the objects indicated with red dots in Figure 7–9. The direction and distance between the lines across the objects are of interest since they reflect the speed and movement of the hands. Thus, the position of the lines reflects how the filter is merged in relation to the recorded curve that is *the craftsman's touch.* Overall, this relationship demonstrates how it is possible to utilise the quality of *the craftsman's touch* and the robot at the same time when wire cutting through a lump of clay.

Figure 7 shows a soft concave object with an overall linear rhythm of crossing lines. Nevertheless, the distance between the lines is not the same on closer inspection. If we view the object from left to right, it is clear that the crossing lines of the object are closer than to the right. Thus, the movement from left to right started slow and then sped up. The crossing lines based on the filter are low but reflect the preciseness and accurateness of the machine. Nevertheless, the crossing lines are dynamic and alive since the distance is not linear, reflecting the personal movement of the hands, i.e. *the craftsman's touch*.

Figure 8 shows an overall dramatic curve, with sharp crossing lines. The sharp crossing lines are striking but appear only a few times and with more or less the same distance. The movement by the hands was dramatic but steadily and quickly executed.

Finally, Figure 9 shows a soft convex object with dynamically clear and defined crossing lines. When viewing the object from left to right, the crossing lines reveal that the recorded movement started fast then slowed down, with some differences in speed in between. At the same time, the crossing lines differ in the distance from side to side. At certain places, the same lines are joined on one side and spread on the other side of the object. Though the lines are precise and similar, they fate across the object. It all shows how the position of the hands dynamically varied in both speed and position.

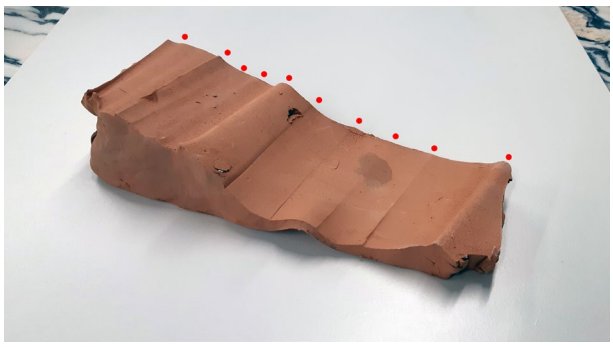

Figure 7. Object with an overall linear rhythm by crossing lines. Length: approximately 50 cm.

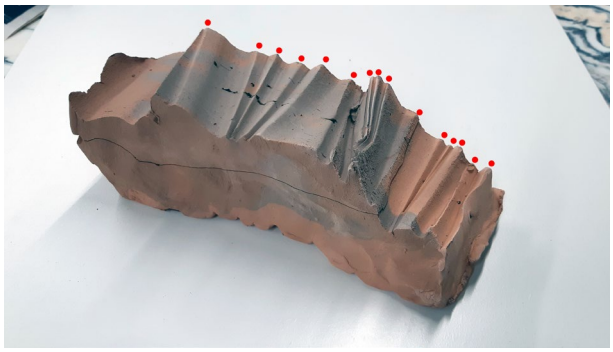

Figure 8. Object based on an overall dramatic curve, with sharp crossing lines. Length: approximately 50 cm.

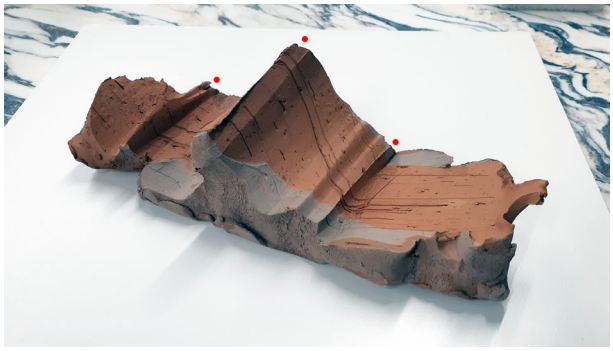

Figure 9. Object with dynamically clear and defined crossing lines. Length: approximately 50 cm.

Overall, the three examples show the possible variation of the setup. The combination of the personal movement and the refined details coming from the filter makes them unique. Thus, the examples represent what the possibilities of the dynamic relationship between *the craftsman's touch* and the robot when wire cutting through a lump of clay.

DISCUSSION AND CONCLUSION

Overall, the experiment has shown how the use of robotics can create new interfaces and possibilities within crafting.

The use of robotics is notable because of its immediate interface to matter, which differs from the experience of using 3D software on a typical computer screen.

Furthermore, the experiment has shown how the use of robotics can extend the hand of the craftsman. By upscaling a recorded curve of the user's hand movement and subsequently applying a detailed curve to the recorded movement as a filter, the results of the experiment have shown how it is possible to extend the craftsman's hand in a way that includes both large and small scale at the same time.

The experiment was based on an initial workshop with only traditional, analogue techniques following the idea of *the craftsman's touch*. No digital tools were involved.

Nevertheless, though the approaches are similar, there are important differences to consider between the initial workshop and the robot experiment in question. The wire cutting in the initial workshop was based on the handhold wire tool as a one-step process. The wire cutting by the robot experiment was a process with several steps: recording the movement of the hands, applying the filter, and executing the wire cut by the robot. In addition, when recording the movement, there is neither a visual feedback nor resistance from the material. To the idea of *the craftsman's touch* interesting aspects are still to be developed.

Nevertheless, the experiment has identified useful, interesting results to build upon. The recording of the curve links to the idea that crafting and execution work together. The application of the filter and the ability to scale up the range and power of the recording opens spaces for new expressions and allows a rethinking of traditions within craft practice.

A further step is to control the robot in real-time by a device such as a Wii-mote. Controlling the robot in real-time by a device makes it possible to have the filter and the change in scale as an integral part when crafting by the use of the robot. Working in real-time will provide a one-step process and visual instant feedback, which will allow a further extension of the craftsman's hand based on the idea of *the craftsman's touch*.

Thus, the robot experiment has demonstrated how it is possible to build on traditional craft-based knowledge by the use of new technologies. This is not limited to the field of ceramics but is representative and relevant for similar craft fields such as textile, fashion, and furniture design where the immediate interface to matter is of special relevance.

ACKNOWLEDGMENT

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NORDES 2021

Paper Session 4

Organisational Re-Scaling

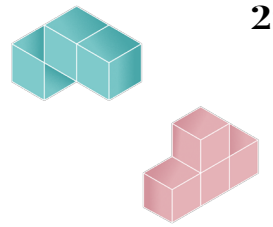
Session Chair | Canan Akoglu

Attempting to Resist Ontological Occupation when Designing for Scale in Healthcare
Josina Vink, Felicia Nilsson, Thiago Freitas and Shivani Prakash (F)

Developing a Design-Based Understanding of Learning in Transitions: A Multiple Case Study
Elif Erdoğan Öztekin and İdil Gaziulusoy (F)

Capturing Scales of Institutioning
Harriet Simms (E)

NORDES 2021



ATTEMPTING TO RESIST ONTOLOGICAL OCCUPATION WHEN DESIGNING FOR SCALE IN HEALTHCARE

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ABSTRACT

Scholars have recently called out how design is complicit in ontological occupation, where one reality makes other realities non-existent. The perpetuation of ontological occupation is a particular risk when designing for scale in healthcare, as Western healthcare is a recognized carrier of modern universalist practices that threaten local ways of caring. In this research, we draw from science and technology studies and anthropology to inform a research through design study positioned within a collective effort to scale-up decentralized care models in Norway. We analyse five attempts at resisting ontological occupation through design and, by doing so, contribute with lessons for design practice on the practical implications of ontological politics.

INTRODUCTION

There is a growing concern about the ways in which design perpetuates ontological occupation (Escobar, 2018; Ansari, forthcoming). Ontological occupation occurs when one reality makes non-existent or erases other local, relational realities (Escobar, 2016). When designing for scale, there is a significant risk of perpetuating a 'one-world world' (Law, 2015), "a world that has granted itself the right to assimilate all other worlds and, by presenting itself as exclusive, cancels possibilities for what lies beyond its limits" (de la Cadena & Blaser, 2017; p.3). In particular when design aligns itself with the goals of scaling modern development, which are inherently entangled with coloniality, design has been responsible for immeasurable loss and extinction (Fry, 2017).

Informed by insights from science and technology studies and anthropology scholars, we take a research through design approach aimed at exploring ways of resisting ontological occupation when designing for scale in healthcare. Healthcare has long been recognized as a carrier of modernity, whereby Western medicine systematically diffuses technologies and organizational structures that enact healthcare as a calculable resource and commodity, an effort which is rarely questioned and generally thought of as a 'good thing' (Gallagher,

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1988). In particular, our work is positioned within a major transition that is taking place in Norway from centralized care models, in hospitals and clinics, toward scaling-up decentralized care models, such as remote follow-up consultations and home hospitals.

Opening up this process for critical questioning, we present five attempts at resisting ontological occupation amid the design of scalable, decentralized models of care. By the term "resisting", we refer to actions — whether verbal, written, physical or cognitive—that are in opposition to power, which may vary terms of their extent of intentionality and recognition by other actors (Hollander & Einwohner, 2004). By unpacking these hopeful yet imperfect attempts at resistance, we reveal some of the counter reactions that can come up, as well as the ways in which design remains ontologically insufficient for such a task, inadvertently perpetuating dominant ontologies and disciplining through its enactments, even amid attempts at resistance. Recognizing both the learning from the practical explorations of this study and its gross limitations, we call for more work on strengthening the resistance against ontological occupation when designing for scale and highlight the urgent need to design for the protection of endangered ontologies.

THE ONTOLOGICAL POLITICS OF DESIGN

Design is a world-making practice through which humans shape their environment and then their environment, in turn, shapes them (Willis, 2006; Fry, 2013). This understanding is grounded in the idea that "in designing tools we are designing ways of being" (Winograd & Flores 1987, p. xi as cited in Keim, 2017). As such, design is inherently ontological as it inscribes direction in all things (Keim, 2017) and, in doing so, reconstitutes ways of being in the world (Ansari, forthcoming). It is important to recognize that design involves power-laden practices that bring into being particular worlds or ontologies (Escobar, 2018).

Through this ontological process, Eurocentric modes of designing, situated within histories of coloniality and modernity (Fry, 2017), have been both "directed by and towards normalising (anti-)relations of domination and exploitation" (Keim, 2017; p.260). Eurocentric modes of designing have enacted a universalizing ontology that occupies other realities by rendering the world one, at the expense of other relational worlds (Escobar, 2018). In response to this ongoing ontological occupation, critical design scholars are calling out for ways of counteracting the ontological politics of the "one world world" (Law, 2015) through pluriversal approaches that support the respectful coexistence of multiple realities (Escobar, 2018).

It is here that the discourses of science and technology studies (STS) and anthropology which attend to ontological politics, offer alternative frames that can help to inform a more reflexive design practice that better acknowledges the ontological politics at play. In particular, within STS there is recognition that reality is always in process and multiple, or fractal, in nature, being enacted and shaped by different practices (Mol, 2002). There is also acknowledgement that methods construct realities through their representation of them, amplifying certain realities and "othering" realities which are inconsistent (Law, 2004). As such, certain methods or explanations can "explain away difference" by translating difference into their own logic using categories that make differences the same (Verran, 2018). Scholars highlight a need to acknowledge deep divergences that make differences between people incomparable, not just divisions of the same world (Strathern, 2018).

A proposed alternative involves "doing our differences together" through a collective commitment to cultivating alertness to one's tendency to impose their own reality as a common frame and instead work towards respectful dissensus in dialogue (Verran, 2018). A key concept to support this enactment is the *uncommons.* The uncommons is a counterpoint to the assumed ontological continuity between people and use of the "common good" to cancel divergence in what is understood as one world (Blaser & de la Cadena, 2017). The term uncommons emerged as resistance to the commons being viewed as a shared ground, or pool of resources, that could be exploited for "shared benefit", further entrenching power asymmetries.

de la Cadena and Blaser propose the uncommons as "the heterogenous grounds where negotiations take place toward a commons that would be a continuous achievement, an event whose vocation is not to be final because it remembers that the uncommons is its constant starting point" (2018; p.19). The concept of the uncommons supports an alertness to divergencies and asymmetries in the commons and it encourages mutual transformation without sameness as the final destination (Blaser & de la Cadena, 2017). Refusing reduction into a shared category, the uncommons instead supports living divergently together in respectful relation. We believe designing with the concept of the uncommons can aid the resistance of ontological occupation through design and support the process of reflexive unsettling that is necessary within Eurocentric design practice.

DESIGNING FOR SCALE IN HEALTHCARE

The discipline of design has a long history of working on healthcare-related projects (Tsekleves & Cooper, 2017). In the last decades, design has been playing an increasingly influential role in healthcare services (Jones, 2013). Industry reports suggest that the practice of service design has been adapted and embedded within a variety of healthcare systems globally (Mager,

2017). Furthermore, there has been a proliferation of design labs popping up within hospitals around the world that utilize design knowledge to enhance innovation processes (Malloy, 2017). There are also a growing number of specialized educational programs that prepare people for a career at the intersection of design and healthcare (Romm & Vink, 2017). Within healthcare, design engages with a variety of complex issues including enhancing service delivery, supporting co-production, increasing efficiency, increasing service quality, and supporting the use of digital technologies (Tsekleves & Cooper, 2017; Jones, 2013).

Within science and technology studies, it is acknowledged that healthcare is a site of complex ontological politics. Through her studies inside a Dutch hospital, Mol (2002) finds that within healthcare realities are done through different practices. She notes that ontology in practice is multiple, as different enactments entail different ontologies that shape lives differently, and these differences are of the irreducible kind. Recognising that many Western, Eurocentric healthcare practices are carriers of modernity (Gallagher, 1988), there is growing acknowledgement of the ways in which Western medical practices render inconsistent realities as "barbaric cultural claims" (Bardwell-Jones, 2018). Particularly when public health is perceived as threatened, there are rich accounts of how healthcare practices assert dominant biomedical ontologies that threaten and attack Indigenous realities (ibid).

In this way, design practices that enact universal models of healthcare are complicit in the ontological occupation of what are perceived as peripheral realities. As COVID-19 regulations accelerate scalable digital and "remote" models of care in people's homes to protect public health, healthcare design practices situated within this systemic transition risk further amplifying dominant ontologies in healthcare and eroding the plurality of ontologies of care that are being enacted within diverse communities. While design efforts supporting digital and distributed models of care are mostly celebrated, gaining quick funding and remaining unquestioned at this critical time, Mol (2002) reminds us that what is "good" within particular healthcare situations is also multiple. As such, there is an urgent need for healthcare design to grapple with the ontological politics of designing for scale. While the literature in STS and anthropology offers helpful and nuanced concepts to think with, there is still little clarity on what this might practically entail for design practice.

TAKING A RESEARCH THROUGH DESIGN APPROACH

To support the exploration around how to resist ontological occupation when designing for scale in healthcare, we took a research through design approach, which leverages the embodied knowledge of designing in context (Frayling, 1993). In particular, we adopted Redstrom's (2017) tactic for research through design called "sequencing" that refers to a movement between design practice and theories from other domains. In this case, our design research was mainly informed by literature on ontological politics from STS as well as anthropology.

This research focuses on the context of Norwegian care settings, both in medical institutions and communities. To situate this work, it is important to acknowledge that the Norwegian healthcare system generally has a high-quality of care, but serving its sparse population area comes at high-cost, which is mostly public funded (Sperre Saunes, 2020). While already a semi-distributed model, Norway is currently shifting more care into community, included facilitated by increasing investment in e-health and communication technologies (ibid). Norway's mainstream healthcare system reflects the Western medical model. However, nearly one fifth of Norway's population is an immigrant or has been born to immigrant parents (Statistics Norway, 2021) and many of the healthcare professionals practicing in Norway are trained in other countries, including 40% of physicians (Sperre Saunes, 2020).

Our research through design work takes place within the Center for Connected Care (C3), a long-term research and innovation initiative supporting a systemic transition within healthcare systems in Norway, moving from centralized care in hospitals and clinics toward distributed care in homes and communities. Within C3, this study is situated amid the Perspectives in Transition project that brings together system stakeholders from two hospitals, a municipality, three health technology companies, two research universities as well as patients and family members. The aim of this three-year project is to take a critical look at the transition from centralized to distributed care, acknowledging the multiplicity of realities of diverse system stakeholders.

This research project and the current study has been led by four design researchers with unique perspectives and positions, partially informed by growing up and practicing design on four different continents. All four of us were partially educated in design in the Scandinavian context, informing our approach to and understanding of design. Furthermore, our engagement in this work was made possible through funding from the Center for Connected Care and, thus, through the very set-up of this research project work, we are implicated in the dominant ontologies within the Norwegian healthcare system.

The research through design work in this study took place over the course of nine months at the beginning of the Perspectives in Transition project. This research includes in-depth semi-structured interviews with 12 system stakeholders including doctors, nurses, personal

support workers, technologists, strategists, and healthcare administrators. The interviews lasted between one to two hours each and generally took place in the interviewee's workplace or home, or through an online video conference (Zoom) in the few cases where it was not possible to conduct the interview in-person. The knowledge gained from these interviews were supplemented by six interviews done with patients and family members during a pre-project phase.

This research included a series of four workshops, three conducted digitally and one hybrid workshop with both digital and physical participation. These workshops were attended generally by the same 12-16 people from various participating organizations (project partners) to promote in-depth exploration and deepen the dialogue across difference over time. These workshops mainly involved design approaches adapted from service design and systemic design. In-between these workshops, informal discussions were also held with the participants to understand their reflections on the sessions and inform further developments. In addition, the design researchers involved also developed a series of materializations to critically reflect, through visual and tangible means, on the ontological dynamics that they were exploring within the project.

The analysis from interviews, discussions, workshops and materializations took place iteratively throughout the course of the project informed by related readings, with shorter summaries being shared back with participants after workshops. The in-depth analysis taking place among the design researchers was captured in Miro, an online whiteboard collaboration tool. In addition, individual researchers also prepared their own written reflections throughout the process on both related literature and the design work conducted.

It is through this collective and individual reflection and analysis that five main attempts at resisting ontological occupation through design were identified and the learnings from each synthesized. We intentionally use the word "attempts" rather than design approaches or methods here to stress that these are early explorations and remain incomplete and non-ideal ways of resisting ontological occupation. Despite their preliminary nature, we believe that the learnings from the enactment of these attempts can help to inform the development of ongoing research on design and ontological politics.

ATTEMPTS AT RESISTING ONTOLOGICAL OCCUPATION THROUGH DESIGN

In what follows, we briefly describe five attempts at resisting ontological occupation that were enacted within the Perspectives in Transition project and highlight key issues that emerged through these attempts.

ATTEMPT 1: EXPLORING DIFFERENCES

What different realities are created through things and the practices they are entangled in?

Amid restrictions to connecting in-person, the research team arranged our first workshop together with the partners digitally. Each participant was asked to "bring-a-thing" that they used in their practice and that they felt played an important role in the transition from hospital to home. Our goal was to explore what different realities are made through these things and the practices they are entangled in.

Many of the things participants brought (shown in Figure 1) related to digital technology, like a computer, smartphone, webcam, conference call speaker and other online tools like a calendar. If we take the example of, the conference call speaker, it is cased in plastic and designed to remain at distance from the body, capturing the wavelengths of anyone's voice and translating it to someone on the other end. The hospital innovation strategist that brought it emphasized its importance, suggesting that it allows hospital staff to connect with patients anywhere to create a sense of safety for them. The conference call speaker supports the enactment of a practice that is remote. It positions the patient in one place and the health care staff in another. The place of the patient is not specific here, but rather the speaker renders their place unimportant.

One thing that stood out from the rest of the digital technology was a pillow that a community nurse brought from her bed, saying "it's best to sleep in your own bed". According to her, technology is an enabler, but the end goal is to be able to sleep in your own bed at home. Home is a place where they feel safe and a send of belonging. With its "unhygienic" textile surface that adjusts to the body it meets, the pillow supports an enactment of a very personal reality. It is part of a practice of sleeping that is place-specific and irreplaceable as it is tied to a local history. For the participant who brought the pillow, the ways in which sleeping in one's own bed is enabled is not in focus, but the end goal is clear.

Exploring these things opened up differences in the way practices are creating realities like the different ways of being in relation to place, related to responsibility and ownership of patients, or creating safety. There were also distinctions between practices where technology was a means to something or an end in and of itself. While the digital format of this workshop limited the ways in which these practices and the realities they made could be shared, this conversation started to point towards some fundamental divergences in the enactments of this transition toward distributed care.

Figure 1. “Bring-a-thing” workshop

ATTEMPT 2: MIRRORING MULTIPLES

How can designers raise awareness of the multiple realities coexisting within a system?

In order to build a richer understanding of the complex interacting realities of the different project partners within the healthcare landscape, the research team conducted a series of semi-structured interviews with staff from each partner institution. These interviews were documented in the form of gigamaps, an approach for large-scale mapping that attempts to “grasp, embrace and mirror the complexity and wickedness of real life problems” (Sevaldson, 2015; p. 4). The individual maps served as material for the development of an integrated relational gigamap that aimed to give a glimpse into each partner’s realities as well as the relationships between them. We hoped to create a visualization that would mirror the multiple realities of distributed care and allow the participants to see themselves and their complex realities interacting inside the healthcare system.

The research team started to build the overall map from analysing what was shared in the interviews, looking for patterns, commonalities and particularities. Participants frequently described the isolation between different parts of the system and used a metaphor of bridges to talk about what happens in between these different parts. One participant expressed frustration about constantly having to renegotiate the conditions of precarious collaboration between the municipality and hospital exclaiming: “no more bridge-building!”.

Attempting to amplify participants’ interpretations, we represented the different realities of the stakeholders in the system on islands and the relationships between them as bridges. On the surface of each island depictions of physical enactments were drawn as described by participants during the interview. Below the surface of the water were the invisible norms, beliefs, rules and roles that participants highlighted as guiding their realities. Based on the connections described, the bridges were generally depicted as frail, fractured, long, winding, and hard to traverse. For example, the general hospital is depicted as ‘Fix-it Island’, a place where hard decisions about bodies happen under a looming clock. From Fix-it island there is a long, broken ladder coming up from ‘Make-do Island’, where municipalities fight amid a scarcity of resources while trying to think of creative solutions to patients’ problems. We called the collection of islands the ‘Healthcare Archipelago’ (shown in Figure 2). Our aesthetic choice of representation was cartoonesque, inspired by classics of the genre, such as the New Yorker magazine one-image cartoons. This choice was meant to intentionally provoke a reaction in relation to the politics of the different realities and their relations

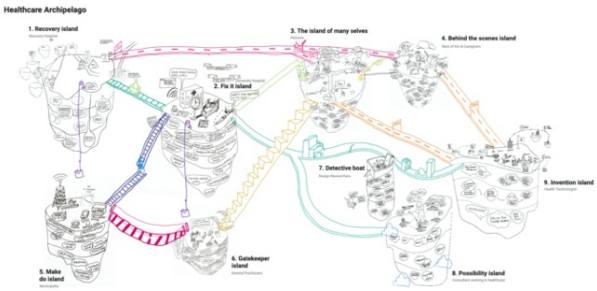

Figure 2. The ‘Healthcare Archipelago’ map

When presenting the resulting map to a panel of C3 partners, one of the leaders expressed concern because they felt the map “only focused on the bad things”. For the research team, that seemed as an appropriate response. In the interviews, we had heard about friction, conflict, miscommunication, incompatible expectations and ways of working. However, perhaps it also reflected our own realities as designers and the interpretive lenses of our own ontologies. In addition, partners expressed difficulties in making sense of the map. It seemed that the complexity mirror was overwhelming, leaving participants intimidated and not able to fully grasp its meaning. Participants expressed that a lot more time was needed to decode and comprehend the map.

By making a choice to highlight certain aspects of the realities we heard, we invariably pushed other things to the background. By simply lifting up this “skewed circus mirror”, we seem to have further alienated some of our partners, leaving us feeling uneasy. Our cartoonesque representation of the islands might have pushed the partners away, making it harder for them to see themselves and their co-existing realities. Finally, even though the map was built out of a collage of insights from their different interviews, what remained were not the particulars, but an impression of the healthcare system. We recognized through this process the ways in which our choices of representation can alienate, obfuscate, blur, and even contribute to “othering” certain aspects of others realities. In this particular case, we traded richness of detail for a

generalized perception of the system that might have perpetuated pre-existing ontological configurations and our own ontology as designers.

ATTEMPT 3: UNRAVELLING REALITIES

How can we collectively understand the nuances of what is at stake when multiple realities collide?

After mapping the archipelago and getting partners early reactions, the research team felt the need for a more nuanced understanding of particular moments where these realties intersect. We identified specific intersections, or meeting points, within the healthcare archipelago, which we called "hotspots". These hotspots ranged from a meeting to create an individual care plan to a hospital nurse visiting a patient's home. They were richly illustrated, attempting to capture details from the interactions (setting, expressions on peoples' faces, dialogue, etc). The design team carried out a few more interviews with specific stakeholders to better understand the particular dynamics between intersecting realities in each hotspot.

These hotspots were brought forward to the partners in a workshop, where we invited them to unpack different interacting realities within each situation by thinking about different logics at play and how they interact (for an example see Figure 3). Based on research that highlights the interactions of these logics in healthcare, we introduced institutional logics, which are frames of action informed by different spheres of Western society that condition people's choices and actions, and are enacted by different practices and symbols (Thornton et al., 2012). According to institutional theory, there are six main institutional logics: market, profession, state, community, family and religion. These logics became the language of the workshop to support the discussion around the hotspots.

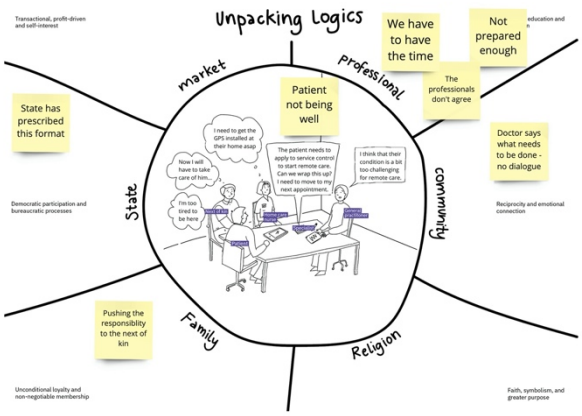

Figure 3. Example of unpacking the logics of a "hot spot"

When unpacking the logics of a hotspot, participants discussed the different factors guiding peoples' actions. For example, in a hotspot related to a nurse visiting a patient at home, there was discussion about how, if invited to sit down and have tea by a family member, the nurse's professional need for efficient action might trump the community-oriented invitation. The workshop participants focused on the working standards that might prevent a homecare nurse from taking time for a patient's family member (e.g. tight schedule, a rigid set of procedures and professional attitude).

The workshop ended with a collective reflection on which logics participants found to be central and which were perceived as peripheral from the unpacked hotspots (shown in Figure 4). This led to a collective acknowledgement that the market, profession and state logics seemed to take priority over the other logics in most situations. This contributed to a strengthened awareness among participants of the risk of imposing these dominant logics over others when shifting healthcare services into the home.

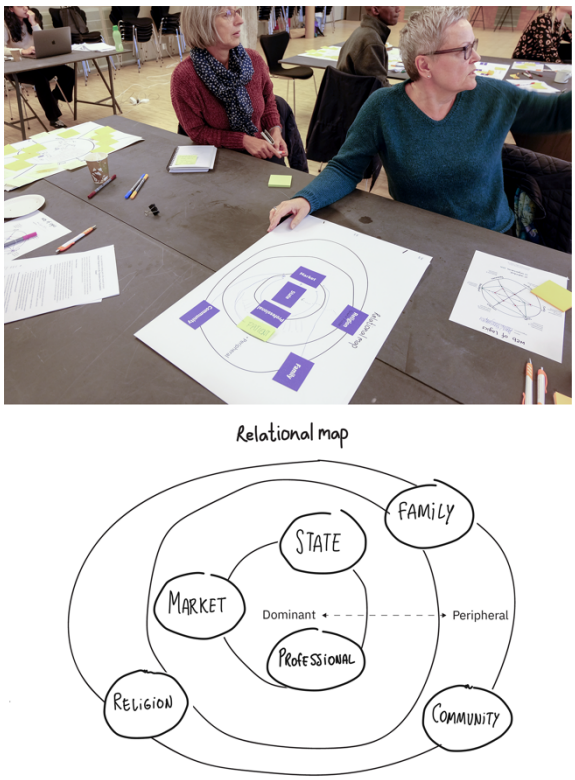

Figure 4. Activity to reflect on the relationship between logics across the "hotspots"

Through the framework of institutional logics, we offered our partners a language to assist in discussing the dynamics between the different realities in the hotspots. Since the participants themselves were enshrined in their own institutional logics this language seemed to reinforce current patterns of ontological domination. In situations where peripheralized logics could have become focal points, a flurry of arguments around the more dominant logics would displace them again to the margins. In addition, when the research team reflected on the activity, we started to recognize the limits of the logics framework and the ways in

which it reinforced particular Western, capitalistic ontologies and hid diverse practices of caring. These reflections motivated the research team to continue to try other strategies to continue resisting ontological occupation.

ATTEMPT 4: MATERIALIZING TENSIONS

How can tensions between conflicting realities be embodied to support critical reflection?

When working with the logics in relation to the transformation toward distributed care, many tensions emerged. For example, when the profession and state logic move further into the home, how will these be negotiated within family dynamics? In order to grapple with and reflect on the potential tensions between the dominant and peripheral logics, the research team decided to materialize one thought or question, around these tensions per day for a month. The goal was to quickly create visual materials and tangible artefacts to provoke discussions around these dynamics and how they felt, as well as and bring forward our lingering questions.

In this process, one group of materializations explored the tensions that arise when medical objects and practices move into the residents' homes (for an example see Figure 5). One materialization involved making a mock-up of a Norwegian advertisement website, called Finn.no, with a sale of a home with medical elements embedded in the interior. Medical equipment was mixed with everyday objects and interiors to provoke reflections on the consequences of moving health care and its related practices into people's homes and family spaces.

Another tension explored in the materializations was around bodily knowledge and measurements. Researchers reflected on how design has a long tradition of transferring knowledge from people's bodies into devices to make life simpler. Moving the responsibility of keeping track of bodily measurements from the health care professionals to the residents raises a couple of questions. Does it give the users more agency or more anxiety to keep track of yourself in numbers and diagrams? If focus is put on the things that we measure, what should be in focus? These questions materialized in alternative measuring devices that track things like loneliness, fear of movement, and feelings, as well as methods of knowing your body without devices.

In addition, these material explorations provoked reflections around the design process itself. How can we embody these practices of resistance? Is it possible to unmake the systems that have got us here? How do design methods discipline us? These processes were explored through a photo documentation of "unmaking" kimchi (fermented cabbage) where one researcher tasted first hand the lack of ability to fully undo the stewing between ingredients. Other materializations included the creation of a line of design methods soaps and a stamp created to clearly mark the ontologically insufficient design methods as a humour reminder.

Figure 5. Photomontage "in a strange habitat" (adapted from photograph by Tu Tu)

The materializations were not more than sketches or quick prototypes, but they created objects to think with to support the team in critically reflecting together. In particular, this process of materializing tensions highlighted the need for space in such design processes to explore the "illogical" and give time to follow the dilemmas that arose amid the tensions between realities.

ATTEMPT 5: CENTERING PERIPHERIES

What happens when traditionally peripheral realities are brought into the focus of designing?

The institutional logics helped us unpack care situations with our partners but there was a recognized need to contextualize these logics in relation to the practices of care. Through insights generated from the previous workshop, the research team adapted the institutional logics into six logics of care (depicted in Figure 6): care as choice (market), care as expertise (profession), care as control (state), care as social connection (community), care as unconditional involvement (family) and care as a way of life (religion). We wanted to explore if working actively to integrate a multiplicity

of ways of caring could aid in bringing into focus the ways of caring that were perceived as peripheral by partners within the formal health system (highlighted with dashed lines in the figure below).

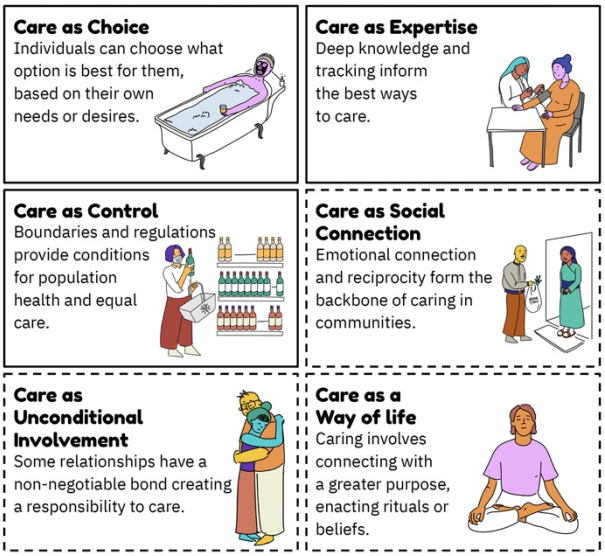

Figure 6. The logics of care

Having gained an understanding of the traditional ways of doing care planning within the current medical model from previous interviews and workshops, we held a workshop with our partners to explore alternative ways of doing care planning with all of these logics of care in mind. We warmed up playfully by having participants make a care plan using each of these six logics of care for a potted plant they brought to the workshop. After the plant care warm-up, we asked each participant to think of four key things they did yesterday and make a storyboard from it. The next step was for them to think about their network of care and draw or write down the people involved in their own daily care network. The last part of this exercise was to use the logics of care and reflect around what they would add, adjust, remove or tweak in their day to support their own care.

After sharing these care plans, most of the discussion still orbited around the traditionally dominant logics, despite our attempt to bring forth alternative ones. Many of the strategies brought up focused on the highly publicized health norms suggested by the state that we should all follow to maintain health such as, exercising regularly and drinking water. There as additional realization among participants was that it is not a common practice to nurture our networks of care. These networks are depended on in acute situations but typically not preventatively nurtured and strengthened.

This activity gave the research team a glimpse into the difficulty of centering what are perceived as peripheries and the importance of putting extra attention to these ways of caring. Through this process it was recognized that there is a need to put exclusive focus on some of the ways of caring that were perceived as more peripheral, rather than try and integrate all at once. In the continuation of the project, the next focus will be on designing with a focus on the ontologies that are perceived as more peripheral in relation to the transition from hospital to home. To mention a few, the next design attempts will focus on designing explicitly for next of kin, informal networks of care, and developing appropriate approaches to care at home.

DISCUSSION

In our research through design process, we enacted five attempts at resisting ontological occupation in the context of designing for scale in healthcare: exploring differences, mirroring multiples, unraveling realities, materializing tensions, and centering perpheries. The enactment of each of these five attempts is shown in Figure 6 as counter forces to the occupation of ontologies perceived as peripheral. By studying these processes, we contribute to emerging discussions about ontological politics in design literature, helping to illuminate the practical implications for designers. While preliminary in nature, our attempts offer some valuable insights into the reactions and ontological dynamics of designing for scale.

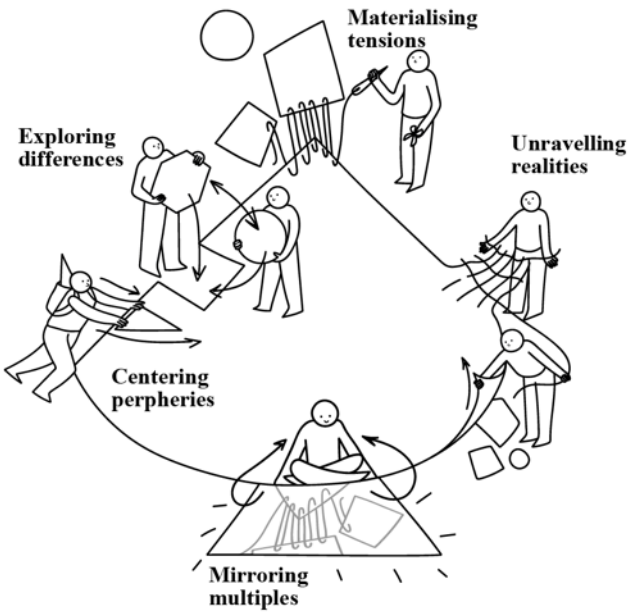

Figure 7. Illustration of attempts at resisting ontological occupation.

REACTIONS TO DESIGN AS RESISTANCE

In particular, our attempts at resisting ontological occupation sparked feelings of discomfort both among our partners and ourselves. There were times when this discomfort arose in relation to overwhelming complexity, such as when working with and making sense of the map of the healthcare archipelago. Other times unease arose from feelings that our practice was inefficient, or even illogical, in relation to achieving the goal of distributed connected care, such as in the process of developing a care plan for one's plant. In

many ways, we sensed some skepticism, among our partners and ourselves, when our mode of designing diverged from typical commercial models of practicing design that have gained legitimacy within Norway.

ONTOLOGICAL INSUFFICIENCY

Despite our intellectual awareness of *ontological insufficiency* and our desire to be humble in our approaches to make sense of things and intervene, we were regularly confronted with the ways in which our attempts still extended beyond the limits of our own ontological foundations. Ansari (forthcoming, p.6) describes ontological insufficiency in design by stating "that the ontological foundations on which we rely on to interpret reality might be contingent, specific, and situated, to the particular world to which we belong, and so therefore, are insufficient as explanatory or descriptive tools for describing other worlds". We attempted to give authority to the claims of others through our process; however, in many cases we ended up imposing our own interpretive lens, or framework for enactment, such as when unraveling realities by unpacking the logics of a particular situation. Here the framework of six logics ended up reproducing the dominant worldviews of a Western capitalist system. Furthermore, by comparing logics as a way of unraveling distinct realities, we inadvertently "explained away difference" (Verran, 2018) by applying one overarching logic – the logic of logics. In addition, the static nature of the relational map of logics failed to account for the evolving dynamics between logics and the ways in which one logic might be enacted through another, such as the religious logic becoming embedded within the state logic in healthcare.

HOW DESIGN DISCIPLINES

Tlostanova (2017, p.53) calls out how even participatory design processes often enact the coloniality of design, "a control and disciplining of our perception and interpretation of the world". Through our attempts, we saw ways in which our design approaches and methods, combined with our tools for communication, restricted certain ways of being. For example, during the online "bring-a-thing" workshop, participants were asked to bring one object and describe how its use was important in their work. While this activity was attempting to illuminate the diversity of their embodied practices, it also controlled perceptions of their world, for example by eliminating more relational perspectives between multiple objects and collectives, or by asking them to emphasize their "professional" self in what was shared. Furthermore, the workshop took place over video-conference limiting how participants could express themselves and share their embodied practice with others. This relates to the ways in which methods "make clean" the mess of reality and, in doing so, remove some of the richness, as highlighted by Law (2004).

It is also important to note our awareness of our own positionality as design researchers and the loaded content of some of our choices of methods and tools. One of the designers expressed concern upon looking back on his choice of object to bring forward in the "bring-a-thing" workshop. The designer brought a camera to show, as a representation of his position as an observer and documentarian of the partners' practices and ways of being in the world. According to him, with the knowledge gathered through this research project, the camera now represents a false neutrality, hiding the position of power and interpretation that he as a designer has in this process. This understanding also raised questions for him about some of the practices that have become commonplace in the design, such as ethnography, which, in his practice experience, has been adopted without critical reflection on the ontological limitations. While we as designers have reflected how we were implicated in perpetuating ontological occupation through our actions, it is also important to note that the very structure of the project, the nature of our partnerships within C3, and the design systems that we have been socialized into also promote such occupation.

STRENGTHENING THE RESISTANCE

While many of our attempts at resisting ontological occupation were wholly inadequate, our research team certainly built vigilance and reflexivity through the process, increasingly recognizing how ontological occupation can "sneak in through the back door" when designing. In the later parts of our practice, we began to focus our efforts on protecting endangered ontologies by centering and amplifying ontologies that are perceived as peripheral within the larger systemic transition. Part of our continued attempts will, for example, include working explicitly to design for diverse family-driven and community-driven ways of caring at home that might otherwise be undermined by a transference of the biomedical model into the home through the transition toward distributed care. We see a need to move away from narratives of such systemic transitions being for the "common good", and instead acknowledge and design for the heterogeneity of ways of being within communities. We call for a strengthening of the resistance through further attention to issues of ontological politics in design education and practice, particularly within the context of healthcare which is recognized as a carrier for the modernity project. We must again caution the reader that we share our attempts here not as inspiration for how designing with ontological politics in mind should be done, but rather so that others might deepen their own reflexivity from our lessons learned in the process. Recognizing the ongoing threat and attack on the rich plurality of

ontologies, it is critical that Eurocentric design practice recognizes that it is complicit, and takes an active stance to counter homogenization and conserve the divergent ways of being that are fundamental to the continued existence of our species.

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DEVELOPING A DESIGN-BASED UNDERSTANDING OF LEARNING IN TRANSITIONS: A MULTIPLE CASE STUDY

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ABSTRACT

In sustainability transitions, experimentation and learning are addressed as key processes that facilitate implementation, diffusion and scaling of transition mindsets and actions. In this paper, we argue that design acts as a means for this action-based transition learning. Contributing to design for sustainability transitions literature, this paper proposes a design perspective on learning in transitions which enables analysing the multifaceted ways, depths and scales of learning that design mediates. Through a multiple case study on sustainable community settlement initiatives, we examine and discuss the roles of design in facilitating interactive learning, and thus in orienting and accelerating sustainability transitions.

INTRODUCTION

Sustainability transitions require deep structural changes that can reconfigure the functioning of environmental, economic, social, cultural and technical systems, their interrelationships and complex-adaptive dependencies (Loorbach et al., 2017). Societies need to build cognitive, practical and affective competencies for such large-scale societal change processes, and develop strategies and mechanisms to proceed with their transitions. For individuals, transitions might mean adapting to emerging circumstances and finding new ways to meet daily needs. For policy makers, it might mean configuring and applying structural changes in order to align adaptations of individuals and societies with sustainability targets. At a larger scale, transitions mean reorganising socio-technical, socio-institutional, socio-ecological and cultural systems collectively for societies.

Systemic changes necessitate applying multiple change actions iteratively and making continuous reflection on action, hence, pursuing action-led learning. Learning in transitions is multi-facetted (van Mierlo & Beers, 2018; Ison et al., 2015; Popa et al., 2015) and multi-dimensional (Öztekin and Gaziulusoy, 2019). It involves understanding what the existing situation is, how else this situation might and should be, and which actions can be performed to deliver desirable changes (Pohl and Hirsch Hadorn, 2007). Therefore, framing, questioning and reframing actions of change, as well as their intentions, purposes, meanings and rationales are part and parcel of action-led learning in transitions contexts. Learning in transitions requires more than formal learning approaches and programmes that mostly proceed with fixed and predefined objectives. Rather, learning that couples large-scale societal change processes are open-ended, social-driven and action-based, and furthermore informal and emergent in everyday life (Pahl-Wostl, 2009). Therefore, collaborative processes, such as of planning, experimenting, and sense-making, can further accelerate learning in transitions (Moser, 2016; Beers et al., 2019; König, 2018; Manzini, 2015, 2017).

In this paper, we argue and present evidence that design acts as a means for this action-based transition learning and thereby we contribute to design for sustainability transitions literature. With the aim of developing an empirically-grounded design-based understanding of learning processes that orient and accelerate transitions, we will scrutinize the roles of design in the implementation, diffusion and scaling of transition mindsets and actions. We will present a multiple case study on community-led sustainable settlement initiatives that explore novel configurations of settlement systems, infrastructures and services as well as alternative practices and cultures of the everyday, aiming at establishing change towards sustainability. We interpret these initiatives as *grassroots laboratories* which, in networks, experiment with systemic interventions and

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innovations that include but are not limited to renewable energy systems, low-carbon technologies, water management approaches, local food production practices, collaborative making cultures, community ownership models, their interrelations and integrations.

In the following section, first, we briefly introduce two theoretical perspectives on learning and transitions: one from transitions studies and the other from learning sciences. Then, we propose a design perspective on learning in transitions which elaborates on the ways, depths and scales of learning that design processes facilitate while implementing, diffusing and scaling transition mindsets and actions. In further sections, we describe our case study methodology, present our analytical insights, and finally discuss, with this evidence-bases, the roles of design in orienting and accelerating transitions with the interactive learning processes that it mediates.

PERSPECTIVES ON TRANSITIONS AND LEARNING

A TRANSITIONS RESEARCH PERSPECTIVE ON LEARNING

Transitions studies put value in niches - applied alternatives to dominant socio-technical, socio-institutional or socio-ecological systems- for learning. Niches represent experiments, actions and interventions that manifest innovative system configurations, transitions approaches and strategies in real-world contexts (Kemp et al., 1998; Geels and Schot, 2007; Loorbach, 2007). Niches, on one hand, enable assessing framed solutions and set assumptions (Luederitz et al., 2017), and, on the other hand, enable co-production of knowledge by forming multi-stakeholder interactions and collaborations (Frantzeskaki and Rok, 2018). Emergence, accumulation and empowerment of niches can challenge and disturb mainstream systems, cultures, and practices, and lead to substantial systemic changes (Geels and Schot, 2007; Loorbach et al., 2017). In short, transitions studies highlight the importance of introducing niches and building networks between and around niches to accelerate the diffusion of sustainable alternatives.

Niche actions, experiments and interventions can facilitate multiple processes of learning for transitions. Transitions literature addresses three systemic learning processes that relate to niches (von Wirth et al., 2019). (i) *Local embedding*: adopting, implementing and developing a niche in real-world contexts, by configuring its design, elements, approaches and outcomes are referred to as local embedding (von Wirth et al., 2019). Embedding enables building context-specific and deeper understandings of transitions dynamics, transitions actions and their consequences (van den Bosch and Rotmans, 2008). At the level of individual, group or organization, it mediates developing place-based and practice-based competencies for transitions by facilitating learning-by-doing (Barth and Michelsen, 2013; Singer-Brodowski et al., 2018).

(ii) *Translation*: When learnings from niches are deployed in building new transitions actions, experiments or interventions in other contexts, it is referred to as translation (von Wirth et al., 2019). Translation builds relations and networks between niches and enables diffusion and broadening of sustainable alternatives (van den Bosch and Rotmans, 2008). It involves analysing, reinterpreting and recontextualizing previous actions, their rationales and elements. When undertaken by a network of actors, organisations, and sectors, it mediates interactive learning between different domains of knowledge and action (Barth and Michelen, 2013; Singer-Brodowski et al., 2018).

(iii) *(Up)scaling*: When niches, in order to increase their impact on transitions, get developed into wider scales, with increased complexities and larger stakeholder networks, this is referred to as (up)scaling (von Wirth et al. 2019; van den Bosch and Rotmans; Naber et al., 2017). Scaling requires tackling a significantly more complex and wider-scale problem. This requires deeply reflecting on and reframing the normative directions and strategic approaches that are guiding transition actions. Such transdisciplinary collaboration facilitates integrative thinking, co-production of knowledge and transformative learning (Mauser et al., 2013; Barth and Michelen, 2013; Singer-Brodowski et al., 2018).

In short, niches might trigger different interrelated processes of learning for transitions. Design is a crucial practice in these processes because it is determinant on how and to what extend approaches, models, processes and contents from previous actions, experiments and interventions shall be transferred, modified and utilized in the formulation of emerging niches. In other terms, design can be framed as a latent *netweaving* practice and process that links together multiple transitions mindsets and actions, experiments and interventions, and their learnings.

Niche-based conceptualizations of learning in transitions are useful to address how different processes that relate to niche actions, experiments and interventions (i.e. local embedding, translation, or scaling) might trigger distinct learning interactions (i.e. organizational, intersectoral, transdisciplinary, etc.), and can contribute to different transitions dynamics (i.e. local transformations, horizontal diffusions, or systemic coevolutions). Nevertheless, this conceptualization seems to fall short more specifically in distinguishing how each learning process might attend to various depths of reflection and reframing.

A LEARNING SCIENCES PERSPECTIVE ON TRANSITIONS AND LEARNING

There are multiple theories of learning developed in learning sciences (LS). We present here Illeris' (2009) work, which categorizes diverse approaches to learning emerging from LS in four distinct types:

- *Cumulative or mechanical learning*, where previously shaped learning element, mental scheme and pattern continues to be recalled;
- *Assimilative or learning by addition*, where a new element is linked to an existing mental scheme and pattern;
- *Accommodative or transcendent learning,* where learning element is broken down to its parts and modified and relinked creatively to respond to another situation;
- *Significant, expansive, transitional or transformational learning,* where, rather than the learning elements or their relations, the whole cluster of schemes and patterns are restructured and reorganized.

This categorization fundamentally signifies that learning is a social, interactive and everyday process (Illeris, 2009). The four types of learning mentioned manifest different versions of how previous actions or actions of others can be analytically reflected on and reinterpreted for new actions. This categorization further distinguishes how different depths of reflection and interpretation might deliver different depths of change in behaviours, motivations and actions.

Transitions research perspectives on learning can benefit from this categorization because it particularly contributes to building an understanding of how different approaches to learning might provide different depths of knowledge exchange and integration, reflection and reconfiguration. For instance, when a niche is to be locally embedded, to be translated into another context, or to be scaled up, its design can be approached (1) as a mere *replication task* (a previous niche experiment is applied as is), (2) as an *additive task* (necessary elements and features could be affixed or removed to meet needs), (3) as an *interpretative task* (systemic relations between elements and features can be analysed, and creatively and integratively interpreted), or (4) as a *transformative task* (underlying mindsets, philosophies, meanings and intentions can be questioned and reframed). In other words, design of niches can reach to different depths of analytical reflection and creative (re)interpretation, and thus can facilitate different types of learning in transitions.

A DESIGN PERSPECTIVE ON TRANSITIONS AND LEARNING

Design scholars who have integrated theoretical and conceptual frameworks from transitions studies and design research, similarly conceptualize several levels in design. These levels represent differing scopes, approaches, goals, matters and contexts that design activities might attend to. For instance, Young (2008) conceptualizes three nested and interdependent contexts of design activities: (1) design in context refers to design at the level of products and artifacts, (2) designing context refers to design at the level of systems and services, (3) design of context refers to design at the level of policy, ideology, purposes, values and norms. Ceschin and Gaziulusoy (2020), on the other hand, distinguish between design attitudes (1) at product level, (2) at product-service system level, (3) at spatio-social level, and (4) at socio-technical system level.

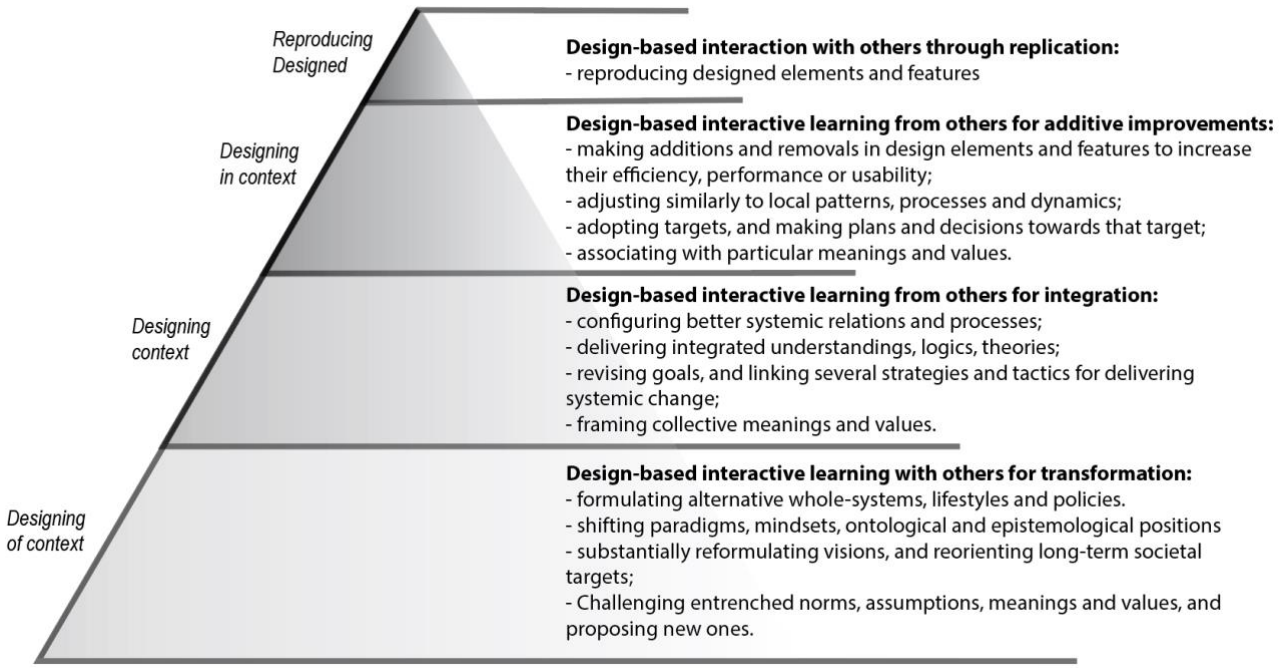

Figure 1: A conceptual framework for design-based interactive learning

Perspectives from transitions studies and learning sciences on learning establish a fertile ground to explore how design, as a netweaving practice, mediates interactive learning processes in transitions. Integrating insights from transitions research, learning sciences and design studies, we propose that design-mediated interactive learning in transition can be understood in four levels of depth and scale (see Figure 1).

(1) At the surface, design-based interaction corresponds to a mere replication process. Directly mimicking design solutions, outputs and practices contains either very little or no reflection and interpretation processes. Consequently, no changes, modifications or improvements - in other words, no significant contributions to transitions - might be observed at this level. Nevertheless, through this interaction, transition actions, interventions and experiments might be transferred from one context to another, however without acknowledging their problem and solution framings, their rationales, meanings and purposes. Thus, this level might evoke mechanical and behavioural learning about reproduction practices, but it is insufficient to facilitate interactive learning on the basis of design.

(2) At the second level, design activity targets making improvements in design features and elements, such as for increasing their usability, effectivity, or performativity. Making improvements in features and elements require considering what can be added, removed, modified or changed (Hyysalo et al., 2017), and, thus, pursuing analytical reflections and design interpretations. However, design at this level does not target making substantial changes in wider system relations and processes where design actions are situated, nor in the overarching values, intentions and philosophies for which design actions might serve. In the context of sustainability transitions this level of design learning might evoke incremental and small-scale changes but, most probably, will fail to facilitate systems coevolution and large-scale transformations.

(3) At the third level, design activity includes creatively synthesizing features, elements, systemic processes and causal relations in order to reconfigure whole systems. This is a highly integrative task, because it requires analytically reflecting on previous configurations and reordering (Buchanan, 1992, 2001) them in novel ways so that design might fit in new contexts and situations, or respond to new problems. Design at this level might deliver better comprehensions of current systems, their positive and negative assets, and how else they might be formulated. Hence, it might pose novel and more comprehensive contributions to learning in transitions.

(4) At the fourth level, design activity includes reflecting on deep sets of references of design, and transformatively reframing worldviews, values, rationales and visions that guide design approaches. Such deep reflections and reframings can create substantial shifts in system trajectories and fundamentally alter wholes of societal systems, including its cultural, technical, institutional and ecological dimensions.

In the following sections, through a multiple case study on community-led sustainability transitions initiatives, we empirically evaluate the conceptual framework and elaborate on how interactive and collaborative design processes facilitate learning in transitions. By utilizing this conceptual framework, we aim to develop an empirically-grounded design-based understanding of learning in transitions.

METHODOLOGY

We have conducted a qualitative multiple-case study (Yin, 2003), through which learning processes that design mediates for transitions are explored. We studied three sustainable community settlement initiatives that have designed and implemented system innovations and interventions for transitions. Aiming to illustrate a variety of approaches, the selection follows a contextual (urban (U), rural (R)) and an organisational taxonomy (bottom-up (CL), community-led hybrid (CLH)) (see Table 1). Hence, these settlements are situated within different environmental, social, cultural, political contexts, and they demonstrate differing solutions, strategies and approaches to transitions. One of the main criteria for including cases in this selection has been their participation in interactive design processes either in peer networks collaborating with other community initiatives or in multi-stakeholder networks collaborating with multiple sectors, research and/or policy institutions.

Data has been collected from each settlement primarily through participant observation. The first author spent specific periods of time in each settlement to experience and observe organisational functioning of these initiatives, their processes of transitions, their everyday practices of living and working. Semi-structured interviews are conducted with community members, to gather historical and up-to-date information about collective design and learning processes in various episodes of the settlement. Additionally, ethnographic interviews were conducted with inhabitants, short-term visitors, volunteers about individual experiences and perceptions about collaborative problem-solving, decision-making and collective sense-making processes that cases demonstrate. Furthermore, mapping and co-creation workshops were designed and conducted to collect additional data about the actors and processes of design-based interactions. Collected data were documented in audio-visual forms, in field notes and memos. Table 1 presents more specifically forms and quantities of data collected from each settlement.

First, we analysed processes of settlements to conceive the occurrence and progression of events, actions, ideas and thoughts in each settlement. Analysing processes enables studying the emergence, change or sequence of

Table 1. The meta data of case study

	Tamera (Case 1)	Understenshöjden (Case 2)	Suderbyn (Case 3)
Name and type of the organisation	Peace research and education centre	Housing cooperative and urban ecovillage	Permaculture ecovillage and non-profit NGO for research, education and networking
Context and Location	Rural, Portugal (Est. In 1995)	Urban, Sweden (Est. In 1989)	Rural, Sweden (Est. In 2008)
Sizes	160-220 people	44 households	12-25 people
Data collection period	2018-2019	2018-2019	2019-2020
Data collection methods and Data Set	Participant observations (9 days) Interviews (5) Published documents Public Speeches (12)	Participant observation (5 + 4 days) Interviews (8) Published documents	Participant observation (15 days) Interviews (8) Mapping and co-creation workshop (5 participants) Published documents

occurring actions or their strategic implementation through time (Saldaña, 2013). We utilized this analysis to generate descriptive timelines that picture the continuous formation, development and evolution of each case. These timelines laid the groundwork for identifying the significant episodes and anchoring design decisions and actions that have been influential on the progression of each settlement.

Next, the learning processes prior to or following these anchoring design decisions and actions were analysed with references to the conceptual framework developed. Data has been thematically analysed and visually schematized with references to the dimensions and depths of design learning outlined in the proposed framework. Finally, these analyses were utilized to assess and reflect on the potential impacts of design processes in diffusing transitions mindsets and actions, and in accelerating and reorienting transitions trajectories.

COMMUNITY-LED NICHE EXPERIMENTATION AND LEARNING FOR SUSTAINABILITY TRANSITIONS

A CASE OF LOCAL EXPERIMENTATION AND COMPETENCE DEVELOPMENT: TAMERA

Having its roots in the student movement in Germany of 1970s, Tamera started in 1995 as a social experimentation project on 200 hectares of land in the rural areas of Portugal. Shortly after moving to Portugal, the community struggled with severe water shortages. Although the community had previous experience with community lifestyles and do-it-yourself settlements, they didn't know how to manage land-water in Mediterranean climates. Searching for solutions, they reached out to several experts. Holzer (2015) offered an alternative perspective on natural water systems and proposed his water retention landscapes model to restore Tamera's microclimate and local ecology. This model aimed to support rainwater catchment by morphing the land and to raise ground-water levels by cultivating natural vegetation and supporting green and gray water cycles. The community then undertook a huge task of planning and constructing a water retention landscape. In their case, it required building multiple lakes, distributed swales to 'slow, spread and sink' rainwater, and multiple land-terraces at several levels to provide space for planting and producing food.

As Figure 2 illustrates, many emerging endeavours for transitions in Tamera can be said to be evoked by the implementation of this water retention landscape model and adoption of a novel water management approach. It can be interpreted as an adoption of a one-system logic, which has initially mediated only in-context interactive learning for Tamera.

However, this system implementation acted as an experiment, through which achievements, points for improvements, and consequences of this approach could be assessed. The community of Tamera observed immense improvements in the environmental conditions on its land. Experiencing these changes inspired the community to experiment with further system interventions and integrations, and to explore regenerative sustainability at larger scales. Consequently, this very first step into transitions gave rise to more comprehensive, experimental and action-based learning processes for the community.

By deeply reframing their visions, actions, rationales and meanings in the context of sustainability transitions, the community expansively reframed sustainability norms and policies of everyday lives. They refined their long-term visions and intentions; and, they associated new roles and meanings to local experimentations for wider-scale societal transformations. These deep reflections positioned local experimentation, whole systems change and regenerative sustainability at the core of Tamera's research focus. Since 2009, they are running a solar test field, where they have been building and experimenting with mutually supportive energy, water, and food

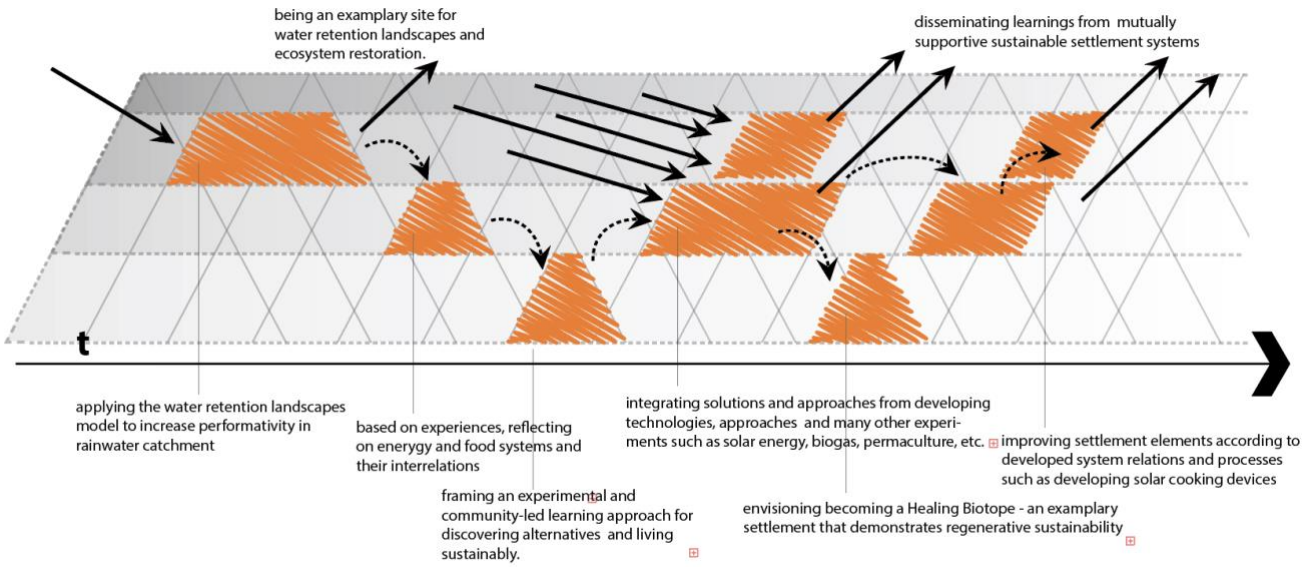

Figure 2: The design-based interactive learning processes of Tamera

systems. Taking an experimental approach enabled the community to develop innovatively integrated systems, technologies and philosophies. Tamera disseminated its design approaches and learnings, innovations and practices to its own peer network and to multiple other settlements through publications, seminars, volunteering programmes and workshops.

A CASE OF URBAN EXPERIMENTATION AND MULTI-STAKEHOLDER COLLABORATION: UNDERSTENSHÖJDEN

In 1989, Understenshöjden started as a group named Ecological Building in Björkhagen (EBBA), which had an idea to recontextualize the ecovillage model in the urban peripheries of Stockholm. Their idea addressed an alternative solution to the economic and housing crises of the era and was aligned with the latest decisions and policies of the City of Stockholm that supported ecological building and self-construction practices. In an exceptionally short period of time, the City of Stockholm supported the project and provided land to EBBA. City's support came with the condition of collaborating with HSB (Cooperative Housing Association) and SMÅA (Small cottage agency of Stockholm City), which were well-established organisations that have long-term recognition and experience for planning and building in Sweden. Such a collaboration ensured shared responsibility for the continuation and realization of the project. Furthermore, this collaboration equipped the project with different expertise, resources and perspectives, and became a means to explore collaborative ways of planning, decision-making and building.

As Figure 3 demonstrates, Understenshöjden was initially envisioned from aggregated - abstracted and accumulated - knowledge about ecovillages and rural sustainable community settlements. The founding group, members and stakeholders of this project neither had no prior knowledge nor hands-on experience about the topic. Undertaking a multi-stakeholder collaboration, then, has been a keystone in the development of the project, because, it settled the design approach and organisational work culture of the community.

The project proceeded with working groups that focused on five topics: (i) sewage system, (ii) energy system, (iii) landscape, ecology and environment, (iv) waste management, (v) architecture. Alternative systems, infrastructures, and design elements were researched by each working group; expert opinions were shared through invited talks; then, topics were discussed in the larger group; and further planning and decision-making were realized on a consensus basis. Analysing previous and relevant projects and reinterpreting their system logics, systemic relations and processes for an urban context was an indispensable part of design. Design activities targeted integrating cutting-edge sustainable technologies and modern infrastructures with whole-system design principles that ecovillages demonstrated. Consequently, through collaborative thinking and decision-making, all members started building knowledge about design principles and rationales, and the system performances, processes and relations that they delineate.

Being situated in the urban context and being involved in a multi-stakeholder collaboration enabled the community more easily disseminate its learnings across sectors and contribute to large-scale societal learning. The design principles and rationales that Understenshöjden demonstrate were carried to multiple different locales, institutions, and projects. For instance, right after its completion, one project leader was employed by HSB to manage and revitalize the sustainability and ecology department. This enabled transferring the design-based

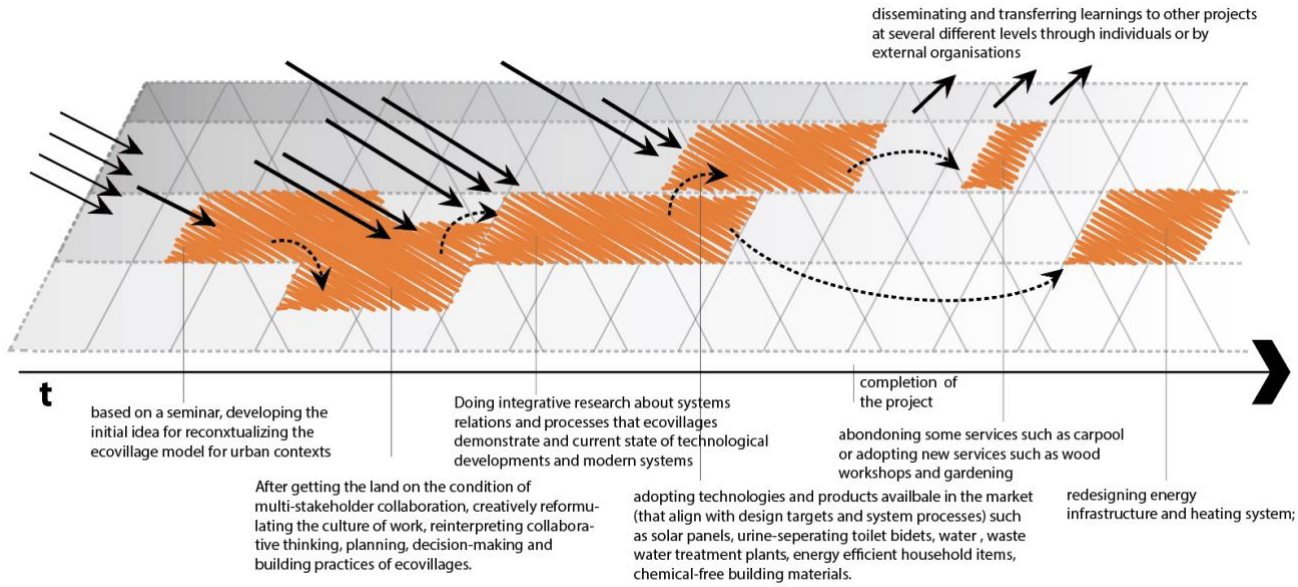

Figure 3: The design-based interactive learning processes of Understenshöjden

learnings of Understendhöjden to emerging projects, such as in the development of Hammarby Sjöstad in Stockholm. This also enabled scaling Understenshöjden's design actions to wider scales, such as in multiplying car-sharing services nationwide. After more than 25 years of its completion, it might be observed that Understenshöjden has posed multiple direct and indirect contributions to urban transformations and sustainability transitions.

A CASE OF TRANSDISCIPLINARY EXPERIMENTATION NETWORKS: SUDERBYN

Suderbyn is a relatively recent initiative, which started with the intention of building an ecovillage by two people. Before founders started up an ecovillage, they were already members and contributors of Global Ecovillage Network (GEN) - an institutionalized peer-network of ecovillages. Through this network, they got acknowledged about the sustainability experiments that ecovillages pursued as well as different sustainability solutions, systems and practices that they developed and integrated. But more significantly, as could be seen in Figure 4, being engaged with GEN for a long-term period, founders have internalized the worldviews, intentions and meanings that ecovillage movement shared and represented.

After purchasing the land, Suderbyn was challenged with attracting people and forming a community. Suderbyn developed a European Voluntary Service (EVS) programme, which offered young and interested individuals hands-on practical experience about sustainable lifestyles on their site. This was one of the first in ecovillages to develop and undertake a project under a governmental funding. Then, it became an exemplary project for its facilitation of dialogue and collaboration between governmental institutions and local community initiatives of ecovillages. Many other ecovillages, which got informed about this project either through GEN network or through informal networks, started being partners of this programme. Following many years of its recurrent applications, this programme is a regular practice and strategy nowadays that can be observed in numerous ecovillages.

After positioning transdisciplinary collaboration and inter-sectoral dialogue as its core approach to sustainability transitions, in 2016, Suderbyn hosted the Closed Loop project, which was developed in collaboration with Finnish Natural Resource Institute (LUKE) and Baltic Sea Conservation Foundation. As part of this project, a biogas-based closed loop system was planned and implemented in Suderbyn. Suderbyn community was acknowledged about appropriate technologies and community practices of biogas through Tamera's experiments (see above). Nevertheless, by installing a novel biogas system and infrastructure, this project marked the research focus of Suderbyn as alternative energies of biogas.

Suderbyn got commissioned to many research and education projects until then, with roles ranging from research leader to partner, or as a demonstration and experimentation site. For example, in last couple of years, Suderbyn received LEADER funding for three different research projects, all of which research on energy technologies or practices that relate to biogas. In Off Grid project, the largest coalition among these three, Suderbyn collaborates with research and education centres in this project as well as local action groups (LAGs) and local practitioners in Sweden, Latvia, Lithuania, and Estonia. In these projects, while Suderbyn learns through transdisciplinary collaboration, it also transfers its learnings and experiences back to peer community initiatives and ecovillages, facilitating proliferation of similar collaborative projects.

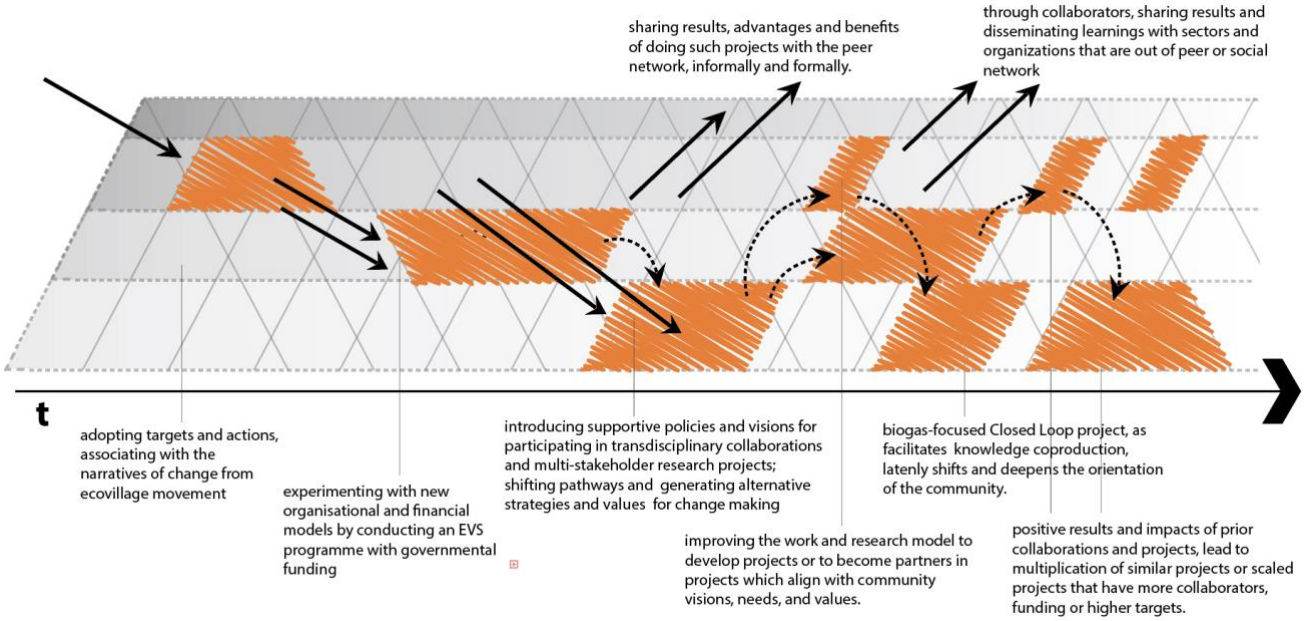

Figure 4: The design-based interactive learning processes of Suderbyn

DESIGN-BASED INTERACTIVE LEARNING PROCESSES, AND THEIR IMPACTS ON SUSTAINABILITY TRANSITIONS

Transitions encompass different depths of interactive learning processes which are, explicitly or implicitly, formally or informally, mediated by design. One of our major findings is that design continues to mediate interactive learning after the planning and implementation of interventions, with the evidences, experiences and reflections it generates. Prior to the implementation of interventions, while formulating design actions, interactive learning is facilitated through the collection, interpretation and synthesis of dispersed transition actions and solutions. After the implementation of interventions, design contributes to interactive learning processes and transitions dynamics by manifesting, exemplifying and disseminating developed transition actions and solutions. Therefore, transitions require interweaving learnings from previous transitions actions in ongoing design processes, but also require interweaving gained local learnings to emerging transitions actions elsewhere.

For instance, by developing new community strategies, organisational and financial tactics, Suderbyn exemplifies how community-led sustainability initiatives can actively contribute to building intersectoral, interdisciplinary, and international integrations, and, thus, to collective action. On one hand, the approach of Suderbyn has inspired similar community initiatives to explore new ways of working with organisations, institutions and funding agencies towards societal transformations and sustainability transitions. Suderbyn demonstrated how, by participating in transdisciplinary programmes, local communities can enhance their active roles in societal processes of change making. On the other hand, the active involvement of Suderbyn in transdisciplinary projects has been illustrative for organisations, institutions and funding agencies of how change makers can be mobilized in knowledge co-creation and policy making.

Design-based interactive learning does also emerge in the aftermaths of design actions, once generated experiences, consequences, risks and tensions can much clearly be observed and understood. Multi-stakeholder collaborations of Understenshöjden revealed how settled local policy regulations and practices might conflict with alternative settlement systems and proposed design solutions that tend to be more sustainable. Despite the tensions that such conflicts generate, these instances are important to discover the structural limits and barriers to change and to build communication between different parties. Such dialogic interactions present evidence that bottom-up organisations and top-down steering mechanisms can supportively interact and contribute to generative change.

Another major finding is that levels of design-based learning are not mutually exclusive or separate from one other; on the contrary, they are fairly embedded and fluid. Different levels of design-based learning need to be dynamically managed and connected to deepen local transformations and expand sustainability transitions. For example, Tamera started its transitions at the level of design-based interactive learning for additive improvements, by implementing a developed water retention landscape model and water management approach. While experiencing transitions on its land, the community of Tamera reflected on the values, rationales and visions within which community actions were framed. These reflections flourished multi-facetted learning processes in Tamera, at multiple levels. It should be noted that reflective methods and mechanisms, which Tamera developed and practiced for enhancing

community cohesion, had a crucial role in facilitating and managing long-term learning processes of the community. Tamera's competence in reflective thinking and dialogic decision-making enabled deeper, open-ended and explorative learning processes to emerge during their transitions.

In short, design-based interactive learning from others for additive improvements might initially seem to deliver limited learning outcomes and to lead only incremental advancements. But, such as in Tamera, if learning is expanded and deepened through well managed reflective and interpretative processes, it might lead to transformative learning processes in the long-term, and pose major contributions to transitions. In other words, an initial design task and its corresponding level of learning do not bound future learning processes. Design tasks act as entry points, which later open up highly complex, interactive and multifaceted learning processes.

To sum up, depths and levels of interactive learning can be fluidly interrelated with one another, either when design is led by one community endeavour such as in Tamera, or by multiple stakeholders such as in Understanshöjden, or by transdisciplinary collaborations and international research consortiums such as in Suderbyn. It is difficult to make general and direct correlations between the organisational complexity that determines the size and scale of interactive networks, and the processes and depths of learning they might lead to. However, *netweaving by design* seems to have direct influences on the depths of learning that design processes might mediate. Hence, netweaving between multiple domains of action and knowledge, across time and space, seems to be an important (leadership) practice to develop new understandings and actions, to generate deeper learning and transformations, and to accelerate societal change and sustainability transitions.

CONCLUSIONS

Design is not a practice which develops its actions and solutions in isolation. As much as reflecting on what is being designed, designing includes analysing previous actions and solutions, and reflecting on how previously demonstrated features, processes, or approaches might be beneficially reinterpreted for developing novel actions and solutions. This is not different in the contexts of sustainability transitions. Undertaken either as a profession or as an everyday act, then, design is an interactive learning process.

In this paper, we looked into three cases that exhibit distinct approaches to designing sustainable community settlements and implementing systemic change. Presented cases have reinterpreted solutions and actions elsewhere, recontextualized and integrated them to formulate their particular settlement design and lifestyles, and to delineate their transition actions, worldviews and visions. Whichever their initial design approach and depth of interpretation might be, continuous and collaborative reflection and action has been fundamental to deepen their design-based learning. Our findings signify that design-based learning might be attained internally at the level of community and lead to deepening in local transitions actions and ideas (Case 1); it might be accomplished in collaboration with different organisations and sectors, and lead to diffusion of transitions actions and ideas (Case 2); or it might be carried out through transdisciplinary consortiums and projects, and lead to building interactive networks of action and knowledge (Case 3). Despite their different learning journeys, studied cases and similar community initiatives commonly practice reflective methods, techniques and procedures to facilitate deep and continuous learning along with design processes, such as regular group discussions, collective decision making, community work and living. Reflective, collaborative and interactive approaches, thus, can further enhance design-based learning and accelerate sustainability transitions.

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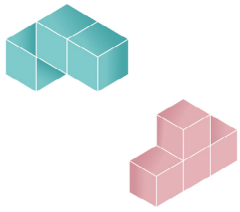

CAPTURING SCALES OF INSTITUTIONING

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ABSTRACT

The concept of Institutioning (Huybrechts, Benesch and Geib, 2017) calls for Participatory Designers (PD) to not only focus on the micro-level impact of their work, but to also understand how the institutions they are connected to are involved and impacted. This paper explores this concept within a Higher Education Institution (HEI) and local neighbourhood context, using two methods of analysis to draw out insights around the dependencies and impact of the institution. Firstly using Situational Analysis (Clarke, 2005), the context is captured at a meso-level at each stage of engagement revealing insights into the impact of PD methods. The dependencies and impact (both actual and potential) are captured through a new method called Institutional Frame Mapping, aiming to understand the different scales of connection between the institution and project. The paper concludes with potential opportunities to develop these methods and further embed Institutioning within PD practice.

INTRODUCTION

PD has historically focused on creating a more democratic process by bringing participants and their context expertise into the design process (Halskov and Hansen, 2015). In recent years this practice has been criticised for becoming de-politicised when working in community and social settings, with practitioners focusing too much on the micro-level impact of their work (Huybrechts, Benesch and Geib, 2017). This paper expands on how the concept of Institutioning (Huybrechts, Benesch and Geib, 2017) was explored within a Higher Education Institution (HEI) and local neighbourhood context, seeking to re-politicise PD through the reengagement and reframing of the HEI within the PD process. Two methods of analysis were used to understand the different scales of involvement of the institution and better understand the impact of PD methods on the context at different scales. The first method is Situational Analysis (SA) (Clarke, 2005), used to examine the impact of PD methods on a meso-level at each stage of the project. This is supported by reviewing the different scales of impact and involvement of the institution, on a micro-, meso- and macro-level, using a new method called Institutional Frame Mapping. In this paper micro-level is defined as the immediate community scale, meso-level as the organisational and institutional scale and macro-level as the policy, economic and cultural scale. This paper argues for the continued need to further engage institutions within PD processes for more effective transformative impact and identifies an opportunity to further embed methods such as SA to understand the impact of PD methods on a range of scales.

INSTITUTIONING

Since its origin, PD has been a politically engaged field and has evolved around the importance of democracy within the design process. Now that the field has spread from technology to more social contexts, designers are working with dynamic networks of people and services, making it necessary for them to be skilled in dealing with contestations, disputes and conflict in these complex “constellations” (Emilson et al., 2014 p.40).

Although PD is rooted in politics and democracy, Huybrechts, Benesch and Geib (2017) argue that recent moves towards community and social contexts have led PD projects to become *de-politicised,* focusing too much on micro-level impact such as capacity building for participants and community-led outputs. With PD and co-design projects normally closely linked or supported by institutions, they believe projects need to be explicit about the impact PD projects can and should have on the institutions they are linked with. When talking about PD projects, designers often choose to distance themselves from institutions and focus on participation ‘on the ground’, contributing to the belief that institutions are inert and apolitical and that change can only happen outside of them. In response to this,

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they propose the concept of Institutioning, a reengagement and reframing of institutions within the PD process to position them as "active sites of change" (p.151). Designers should articulate and reflect on the various institutional frames (policy, financial, cultural) that a PD process depends on and explore what direct and indirect effects the process has had on these frames. Being aware of the *ripple effects* of PD projects on meso- and macro-levels, designers can actively explore how PD processes can engage and revitalise institutions, challenging or enriching institutional frames.

Others have also discussed and developed approaches to push PD to have greater impact politically through strategy, networks and scale. Looking at large scale systems and the high rate of failure with new designs, Shapiro (2005) argues that PD offers strategies for "real engagement" in large scale systems through clarity, negotiation, integration and democratic processes (p.36). Bodker, Dindler and Iversen (2017) argue that to ensure sustainable and impactful PD projects, designers need to develop *participatory infrastructuring* and *knotworks* through utilising both horizontal and vertical participation.

The critique that PD has lost its political prowess is an important one and forces designers to critically consider the impact and legacy of their projects, being explicit about how PD processes are *institutionally entangled* and/or how institutions can be further engaged and embedded in these processes. By consciously and creatively including institutions, or decision makers, within the PD process, there is a greater opportunity for mutual learning and potential for institutional and policy change.

CASE STUDY

In June 2018, the Glasgow School of Art's (GSA) Mackintosh Building caught fire, destroying the building and greatly impacting the surrounding neighbourhood of Garnethill. This incident increased tensions between residents and organisations of Garnethill and GSA. In response, GSA decided to evaluate how it impacts and connects with Garnethill by appointing a Community Engagement Officer to focus on developing a more constructive and positive relationship. I took on this role part-time in November 2018 and, running alongside, undertook a two-year research project to explore how PD methods can be utilised within this context to immerse, analyse and rebuild connections between a HEI and a neighbourhood, both dynamic and complex contexts.

This research explored how the civic role of GSA can be developed by opening up effective avenues of dialogue with local stakeholders using PD methods. Following a Participatory Action Research methodology and using methods of conversational scoping, walking interviews and co-design workshops, context-specific PD tools were developed to facilitate participants in reflection and ideation about the future of Garnethill and the role of GSA within it. The outputs of this value-driven research were a community engagement strategy, co-developed by 20 local stakeholders, and a series of identified engagement opportunities.

CAPTURING MESO-LEVEL IMPACT THROUGH SITUATIONAL ANALYSIS

The first step in understanding different scales of impact of a PD process is to analyse it on a meso-level. SA offers a reflective framework to examine contexts on symbolic, discursive and relational levels (Clarke, 2005; Clarke and Star 2008). This form of mapping visually captures human elements, materials and symbolic/discursive elements, visualising how they each relate or do not relate to each other and the key commitments and discourses in the situation. SA has been used within PD research to map out engagements and complex interactions, with the aim of making explicit the impact of collaboration and participation through the design process (Johnson, 2016). This process can analyse how a context (or situation) has been impacted by PD methods through highlighting the elements, commitments and discourses revealed at each stage of fieldwork.

After following the first two stages of analysis as outlined by Clarke, situational and relational maps, I created Social Worlds/Arenas Maps based on the data collected at each engagement. I chose to use this option for further analysis as it is rooted in Symbolic Interactionism, the theoretical approach of this research, and focuses on "meaning-making social groups … and collective action" (Clarke, 2005; p.109). Social worlds are described as "universes of discourse" (Strauss, 1978, p. 120) and by examining these social worlds through specific questions, in this case the impact of PD methods, these maps visually set out collective and complex social action and discourse, providing a meso-level of analysis rather than just individual discourse (Martin et al., 2016). This analysis took place after the fieldwork was completed, using data captured through notes, annotated engagement tools, audio recordings and my reflective journal. I structured the analysis chronologically, mapping the context after each stage of fieldwork so I could compare the methods to see how the research process had impacted the context. I analysed the data collected to identify discourse, commitments and opportunities, focusing on collective social action and actors. The creation of the maps closely followed the process described by Clarke (2005) and further detail is available in my thesis (Simms, 2021).

The first method was conversational scoping over six months from January to June 2019, where I built

knowledge and relationships within the context through immersion and informal, unstructured conversations. Through SA mapping, the data captured shows the current state of the context, revealing the complexities, values and conflicts expressed by local stakeholders and the entanglement of GSA and Garnethill (See Figure 1). Key conflicts were the Mackintosh Fires, exclusive regeneration, impact of students and communication between GSA and Garnethill, as well as in general between local stakeholders.

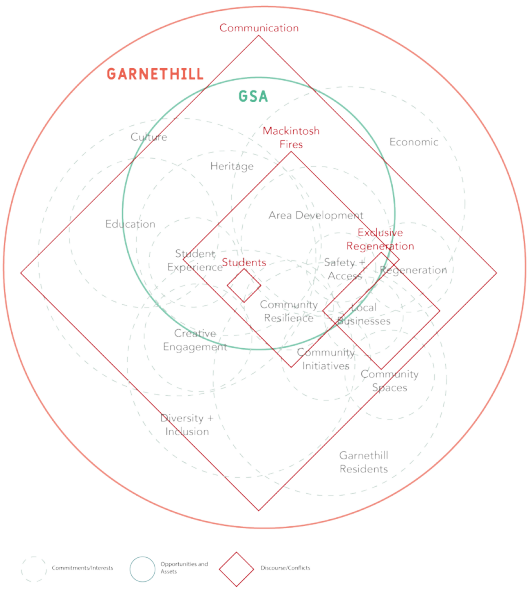

Figure 1: Conversational Scoping Social World Map

With these initial insights I had gathered, the next method I used was walking interviews, focusing on refining the emerging values through more direct and intimate interaction. Between August and October 2019, I conducted individual walking interviews with 16 participants from Garnethill and GSA, asking each one to lead me on a walk through the neighbourhood whilst discussing a series of questions around the context and relationship between Garnethill and GSA. The SA map reveals the method captured personal perspectives, identifying the values of stakeholders and providing them with a space to share their conflicts and frustrations individually. The key conflicts that were raised were issues of power between GSA and Garnethill, trauma and change, visibility and communications and relations. It also identified that many of these values and conflicts were shared between the participants, showing that there was an opportunity to bring them together around these shared perspectives (See Figure 2).

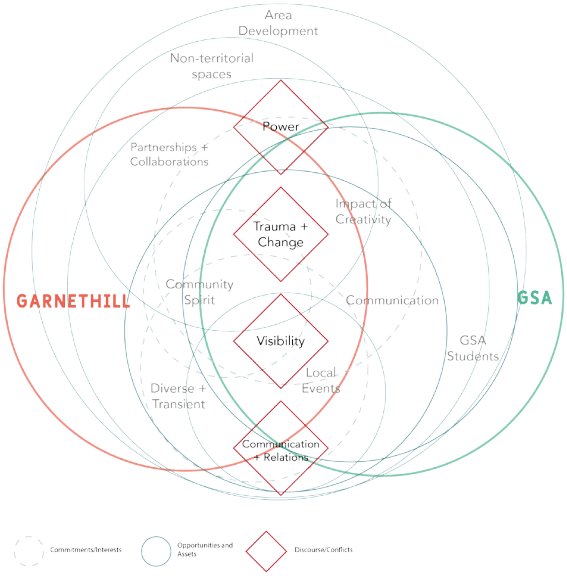

Figure 2: Walking Interviews Social World Map

The next engagement was a co-design workshop in February 2020 where I invited 12 participants, split evenly between Garnethill and GSA, to negotiate and develop the shared values and identify engagement opportunities. The workshop was designed to be value-based, so the conflicts and challenges were reframed as questions and opportunities. The map confirmed that this method focused on opportunities and values, rather than conflicts raised at the walking interviews, as no conflicts appeared in the data collected from participants. Instead the workshop provided a space for constructive dialogue, shared values, and future-focused aspirations (See Figure 3). Key interests for GSA and Garnethill's engagement strategy were healing, accessibility, representation, sustainability, long-term and an opportunity to humanise the institution. The four opportunities identified were collaboration and partnerships, strategy and development, communication and engaging students.

The maps revealed that the value-driven framework and PD methods enabled a process of examining and reframing of the context. It also showed that the PD process allowed conflicts to be identified and heard, but being value-driven there was a focus on finding commonality and shared aspirations that would bring participants together to develop a positive narrative going forward.

SA was used alongside Thematic Analysis (TA) in this research (Braun and Clarke, 2006), with TA analysing and identifying themes from the data. The two methods complemented each other as TA focused on the micro-level, identifying shared themes and values between participants, whilst SA focused on the meso-level and identified changes in the context and the impact of the PD methods.

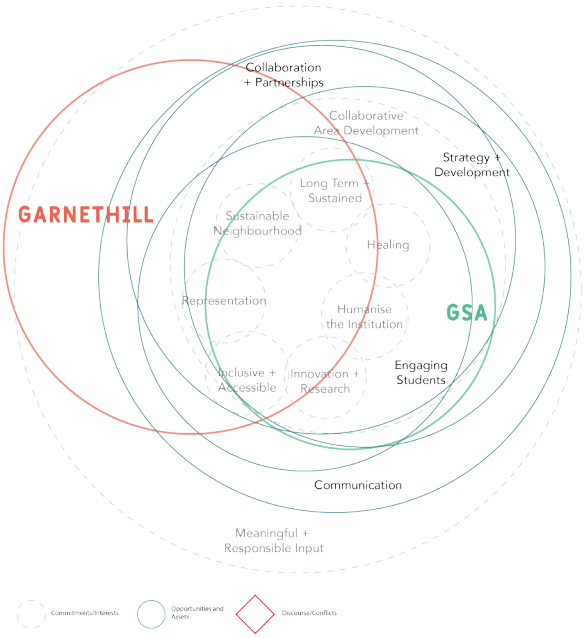

Figure 3: Co-Design Workshop Social World Map

INSTITUTIONAL FRAME MAPPING

When outlining Institutioning, Huybrechts, Benesch and Geib (2017) argue that designers need to reflect on the different institutional frames that a PD project may depend on and affect. To further embed the concept of Institutioning into this research, I introduce Institutional Frame Mapping as a method of mapping out these institutional frames to analyse how an institution has supported and been involved in the process and the impact (and potential impact) of the research on the institution, on a micro-, meso- and macro-level.

For this research, I created a map that shows how GSA has been involved and impacted at different scales (See Figure 4), with GSA in green and Garnethill in orange. Initially GSA was involved through the creation of the Community Engagement Officer role, part of a new community engagement drive in response to the impact of the Mackintosh fire. This then led to an agreement to fund this research which gained the involvement and support of the Innovation School and senior management in the development of the research. Unlike some PD projects, the research has also directly involved the institution through staff and student participants and with GSA's civic role being a focus of the co-design briefs. It was important to include Garnethill stakeholders in the mapping as their involvement and impact were key to the research.

Looking on the right-side of the map for impact and potential impact, the research outputs were a co-designed framework, set of values and developed network with local stakeholders to progress with. The potential impact is based on discussions with senior management and future opportunities to impact policy and strategy within the institution.

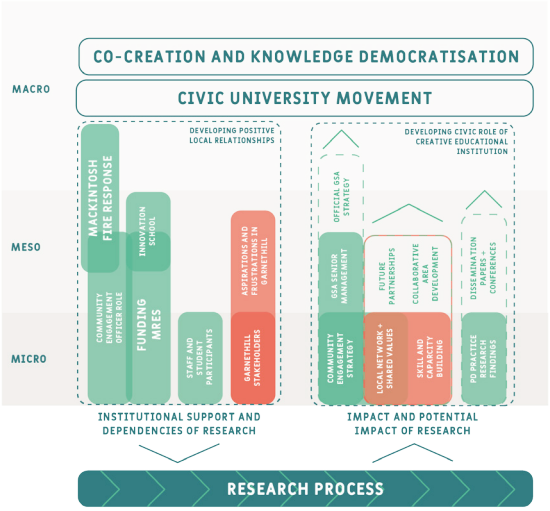

Figure 4: Institutional Frame Map

The map identified that the co-designed outputs have constructively challenged GSA's community engagement drive and have provided a strong foundation for future development of the civic role of GSA on an institutional level. This process of analysing the dependencies, different scales of involvement and impact of GSA within the research provided a clear picture of how the research has and can impact the institution and highlighted opportunities where further involvement and connections could be nurtured between the institution and local neighbourhood.

FUTURE OPPORTUNITIES

Both SA and Institutional Frame Mapping were undertaken at the end of the research as reflective methods of analysis and provided strong insights into the scales of impact and involvement, visualising micro-, meso- and macro-levels. There is an opportunity to explore these methods further, using them before and during the research to provide insights to inform the direction and design of a PD process.

Using SA after each stage of engagement, to support findings identified through other forms of analysis, would give designers a greater sense of the context as a whole through an awareness of the conflicts, silences and discourse within it and identifying collective social action. These maps would also capture the impact of PD methods on a meso-level in real time and the maps can be compared at the end of the process to understand how the context has been impacted.

Following Huybrechts, Benesch and Geib's (2017) call for designers to be explicit about how their work is *institutionally entangled,* Institutional Frame Mapping provides a method to capture and visualise this. As the first version is specific to my research, I have created a template map that can be used for similar projects (See Figure 5). It highlights the different institutional frames based within the map and also provides prompts for designers to consider how to effectively design and

structure their research to engage and impact the institution or organisations involved.

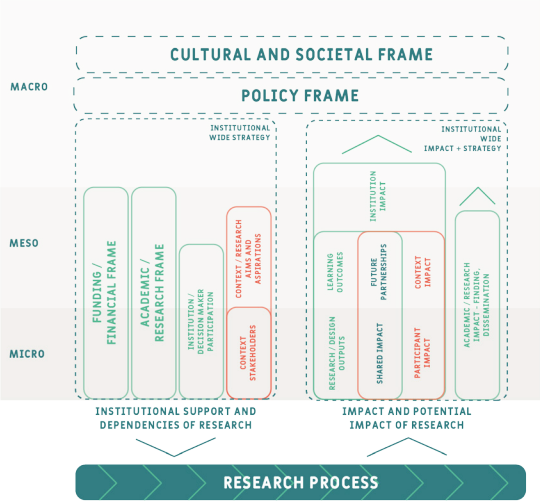

Figure 4: Institutional Frame Map Template

There is an opportunity for designers to conduct this type of mapping at the beginning of their process to inform the design of the research and recruitment of participants. Institutions are highly complex and this mapping method can provide a clear overview of how the institution they are connected to is involved and highlights potential opportunities to involve it further during the PD process. Also identifying the institutional frames, such as policy, would enable designers to understand how their projects can directly or indirectly inform institutional policy through their work and findings. Reflecting on my own research, I feel mapping these institutional frames at the beginning of the project would have helped me understand GSA's different scales of involvement in the research and better inform how I engaged with decision makers and management throughout the process.There is a need for institutions to become more active and engaged with their local areas and communities and PD offers clear avenues to do this, whether that is through direct projects such as this research or indirectly through the research institutions fund and support. Designers have a responsibility to understand the scales of impact of their work and can be explicit about this through embedding Institutioning within PD projects. It is not possible to know at this stage the extent to which these research outputs have had a transformative impact on GSA at an institutional level. However, this process of incorporating Institutioning through these methods of analysis has enabled a clear reflection on the different scales of involvement by the institution and potential scales of impact and participation going forward.

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Paper Session 5

Policy Worlds

Session Chair | Lucy Kimbell

Co-Citizen Design Labs in Resilience Making
Stephanie Carleklev and Wendy Fountain (F)

Beyond a Living Lab: Scaling Social Innovation
Signe Yndigegn, Lone Malmborg, Maria Foverskov and Eva Brandt (F)

In search of (Organizational) Learning and Translation in Public Innovation Labs
Anna Seravalli (F)

NORDES 2021

CO-CITIZEN DESIGN LABS IN RESILIENCE MAKING

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ABSTRACT

In this paper we share our resilience making approach for a first year design program in which we work intentionally with scale – through the subject matters of resilience, and through our learning design. We respond to the provocation of matters of scale in design to progress our design research in two ways. The first contributes to discussion of design education's remit from within ecological and existential crises, relative to expanding (design) knowledge. We then give focus to the co-citizen design lab that students conduct to illustrate how the inter-scalar relations we explore manifest through students' design action. Here we draw on the 2019 and 2020 co-citizen design labs and evolve its learning design for a third iteration of resilience making in 2021. We conclude by suggesting resilience making as a purposeful way of practising hope and small, ecologically and socially viable transformations.

INTRODUCTION

We articulate in this paper a small approach in design learning and research – resilience making – that is entirely contingent on matters of scale. Viewing scale as relative size, our module is just five weeks in duration, or equivalent to one twenty-fourth of an international BFA program in design. This ratio, however, belies a nested approach to learning directed to re-making ecologically and socially just futures through design. Since 2019, the Resilience module that consolidates students' first year in the program has become an enactment of living curriculum and an evolving design research platform. To date, our explorations of resilience concepts with students have prompted:

- The articulation and iteration of a learning design through which students journey from the scale of the self, to community, to regional system in the lead-up to devising a design lab for a co-defined system scale;

- Expression of increasingly critical, pluralist and artistic perspectives on resilience and how they manifest ecologically and socially;

- Re-workings of key tenets of sustainability and design education that we have unsettled with the help of recent calls to decolonise design (e.g. Escobar, 2018; Tunstall, 2013), to practice different human-nature relations (e.g. Head, 2016; Ingold, 2020), and to strengthen ecological literacy in design learning (Boehnert, 2018); and

- Assembly of a systems-based, relational and embodied position toward design knowledge and learning (e.g. Capra and Luisi, 2014; Cooke et al., 2016; Wals, 2020).

Scale is at play in our work in two key ways. Scale and inter-scalar phenomena are core to the subject matters of resilience – grounded as they are in the ecological sciences and complex systems theory (Folke, 2016; Meadows, 2008; Walker and Salt, 2006). Resilience also has its origins in materials science and psychology (Olsson et al., 2015). Second, we use scale to structure a series of learning engagements that increase in scope and complexity over the five-week module. This expansion aligns with the nested scales underpinning the entire design program and which is made visible to students and teachers (Figure 1). Students progress from exploration of the local in Year 1, the regional in Year 2, through to practising design with global scale insight by completion of Year 3. In tandem, there is a shift in focus from design object/product and materiality through systems, networks and services, toward critical and norm creative design practices that grapple with power structures and paradigms.

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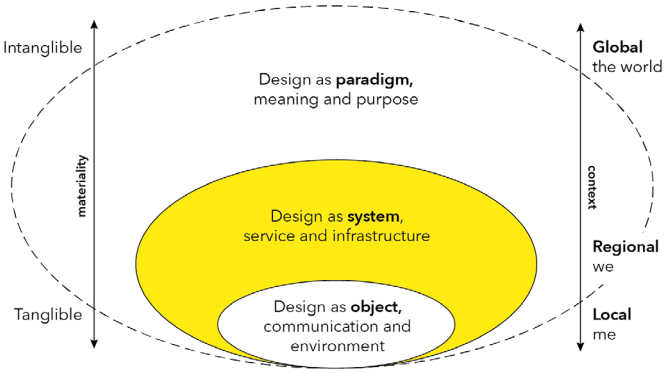

Figure 1: The scale of our module (yellow) rests within the nested scales underpinning the entire design program. Instead of seeing the scales as a linear process (from Year 1 to 3), we see all three scales at play to different degrees. (Adapted from Tham, 2019)

Central to our work within the inter-scalar relations above, is the interplay between resilience concepts and design processes. In his synthesis of resilience thinking, transdisciplinary environmental scientist Carl Folke provides a popular definition of resilience: "... the capacity to persist in the face of change, to continue to develop with ever changing environments. Resilience thinking is about how periods of gradual changes interact with abrupt changes, and the capacity of people, communities, societies, cultures to adapt or even transform into new development pathways" (2016, no pagination). In resilience thinking and practice, social-ecological systems are indivisible – though their coupling is flagged as stubbornly binary and problematic (Cooke et al., 2016; Head 2012; Head 2016; Mancilla García et al., 2020). Resilience plays out differently in social-ecological systems over time and space, distinguished by Folke (2016) as 'persistability', 'adaptability' or 'transformability'. These distinctions also form the basis of a 'social resilience' framework put forward by Keck and Sakdapolrak (2013). As design teachers and practitioners, we see the adaptive and transformative dimensions of resilience aligning well with the generative and re-making possibilities of systemic design processes:

"Resilience whether for adaptability or transformability operates and needs to be addressed across levels and scales ... Shifting pathways or basins of attractions at one level or scale does not take place in a vacuum. Any transformation draws on resilience from multiple scales and diverse sources of actors, organizations, institutions, recombining experience and knowledge, learning with change, turning crises into windows of opportunity, and allowing space for or even governing transformations for innovative pathways in tune with the resilience of the biosphere ..." (Folke, 2016, no pagination).

Certainly, our approach with resilience since 2019 has been shaped by amplifying crises – global heating, earth systems degradation, biodiversity loss, widening inequality, fragile democracies – and as we write, an ongoing global pandemic. Our collective 'eco-anxiety' was palpable well before the Coronavirus ruptures, at times debilitating for students and teachers, at other times feeding our resolve for creative change. We therefore undertook to work with these existential fears through design research, and we share here what we experience as an inter-scalar, 'living curriculum' (Wals, 2020) and authentic practices of hope and care with our students (Head, 2016; Rodgers et al. 2019). Through co-writing, we have responded to the provocation of matters of scale in design to progress our design research at two linked scales. In the first we contribute to discussion of design education's remit from within ecological and existential crises, relative to expanding (design) knowledge. We then give focus to the co-citizen design lab that students conduct to illustrate how the inter-scalar relations we teach manifest through design action. Here we draw on the 2019 and 2020 co-citizen design labs and evolve the learning design for a third iteration of resilience making in 2021.

DESIGN LEARNING – FOR THE FUTURE OR PRESENT-AS-FUTURE?

Our purpose in discussing future design education is not to construct a comprehensive argument or proposal for its re-direction. Rather we enter ongoing discussions to align our work with key shifts toward re-directing higher education for reasons of urgency and pragmatism in the face of concurrent global crises. There is growing recognition of the inadequacy and dissonance of traditional, discipline-bound curricula that suppose to equip students for 'sustainable futures' (Barnett, 2017; Lotz-Sisitka et al., 2015; Sterling, 2014; Wals and Rodela, 2014; Wals, 2020). At the same time, we recognise higher education is where we can explore and challenge knowledge, skills, attitudes and values. The pervasive calls to prepare design graduates for increasing complexity and ever more 'wicked problems' (e.g. Wilson and Zamberlan, 2017) imply to some extent that it is within our power as teachers to align competency development with an anticipated yet 'unknown future'. The early foundation for our work was in confronting that we cannot continue to see the self, society, nature and the future as separate entities – and to teach this as such to our students. Instead we need to embrace more holistic, systemic and relational worldviews. The framing of reality via the process-relational perspectives in social-ecological systems of Mancilla García et al. (2020) offers new guidance to design education in our view. Foremost is their post-object understanding and its integrative potential:

"The social and the ecological only exist by virtue of the interactions between them, and can thus only be understood ontologically with respect to each other. In

this view of reality, relations have causal agency and stand prior to objects, whose identities are formed by relations" (2020, no pagination).

Apart from helping us dismantle separationist thinking, this perspective helps us work our way out of practising design education in an integrity void, promising our students knowledge and skills that will prove useful only later in their lives (we hope) while they daily fear the weighty uncertainty of their future. Prompted by new orientations to understanding complexity, cross-scale dynamics (spatial and temporal) and the idea of a constantly reconfiguring 'possibility space' (Mancilla García et al., 2020), we ask then if we can also adopt a new temporality in which we seize the future as our present? And can our practice of the present through design be generative of a mosaic of new processes and relations that are more ecologically and socially integrative?

RESILIENCE MAKING

We approach the challenge of creating these generative conditions mindful that 'resilience' is not a unified or stable concept (Olsson et al., 2015). As such, its subject matters are explorable through design but we have to make this exploration viable for the scale of a five-week module. Using the scales of self, community and regional system sets up defined – yet porous – boundaries through which multidisciplinary perspectives on resilience can be engaged with. Resilience is often promoted for its relevance in addressing complexity and uncertainty in the face of social and environmental challenges. At the same time, it is critiqued for its tendency to reinforce existing social and ecological conditions (negative persistence), or to require people or other species to adapt while destructive power structures and systems persist and go unchallenged (Lotz-Sisitka et al. 2015; Olsson et al. 2015). These conceptual tensions have, however, helped us to develop a pedagogical response that rests within the learning objectives while at the same time fulfilling the focus of the semester, design processes and methods, and supports students to creatively direct design processes toward "developing new capacities to act and create ecologically viable ways of living over time" (Boehnert, 2018, 75).

In our approach to resilience making we prioritise the concept's transformative potential to explore and question alternatives, and to make visible possibilities to become positive forces in shifting relations and interactions between people and living systems. We are using 'resilience making' as an overt term-in-progress. It is an awkward coupling that nonetheless values the making of creative adaptations and transformations – no matter how small. 'Making' is also familiar to our students as their language of creative practice.

Resilience making is contingent on working mindfully with scale and context, and empathically with others (including non-human others). Its social-ecological systems lens allows us to work with non-linear and cross-scale dynamics, seeking out connections, patterns and feedbacks, and to experiment with redundancy and regenerative cycles. It also allows us to openly value diversity and multiple forms of knowledge and know-how, including latent vernacular practices.

We have come to see resonance between our resilience making approach and its openness to the current crises we are all experiencing, with Lesley Head's (2016) framing of the Anthropocene and simultaneous practices of hope and grief. Her emphasis is on climate change and the spatial-temporal scale of the everyday: "Hope is practised and performed; it is a sort of hybrid, vernacular collective worked out in everyday practice and experience. It amplifies and inverts some of the things we are already doing" (2016, 80). And further urging for practices of hope to be generative (through design in our case), Head argues:

"If there is work to be done in acknowledging painful emotions [including grief], there is also work to be done in exploring their generative, transformative potential. Anthropoceneans disconnect hope from emotions of optimism, and from an unfolding future. They find hope in practice and being. Disruptive frictions can be welcomed for the opportunities they provide to effect transformation. Prolonged drought has shown the potential to transform water usage. Disasters [and pandemic] generate networks of care and sharing" (2016, 168).

KNOWLEDGE AND KNOW-HOW IN RESILIENCE MAKING

The design practices we are seeking to equip students for operate in an expanding and dynamic design field, within overlapping and escalating ecological and existential crises. Based on the urgency and gravity of the challenges we are living with and through, we needed to develop a learning design that supports students in becoming reflective and caring practitioners who are not only able to embrace more holistic, systemic and relational worldviews, but to act within them. Therefore, our deliberations here are focused on what kinds of knowledge, competencies and understanding actually support the process of exploring and proposing ecologically and socially viable ways of living, through design.

As an interdisciplinary knowledge domain, resilience qualifies regarding its relevance, responsibility and opportunity – three criteria Barth (2015, 78) sets out for the selection of themes and topics supporting learning for change. At the same time, the ambiguity of the term resilience makes its use ineffective without a

conversation around what needs to be preserved and developed as well as a cross-scale understanding of the context and inhabitants. In addition to the fact that only simple problems have simple answers, the deep complexity of our challenges – often related to systemic failures and conflicting values and worldviews – require us to bid farewell to the idea we can teach knowledge and facts that automatically lead to the 'right solutions'. Similarly, knowledge that views the world in terms of fragments, categories and ever smaller parts is of limited use. The knowledge we need views the world as a plurality of relations and connections, coupled with a humility for our always partial understandings and the fallibility of dominant Western knowledge canons (Escobar, 2018; Sterling, 2014; Tunstall, 2013).

Resilience making therefore treats knowledge as something that is not pre-constituted and cannot be transferred by the teachers. Rather, it is knowledge that students co-generate in an active engagement with the context and participants within in a particular system that they co-define. It is only within those relations where relevant knowledge can be assembled and used. According to Stephen Sterling (2014), a long-time researcher in ecological thinking, systemic change, and learning at individual, institutional and social scales, any educational response to the challenges of our time must address how we perceive, think and act in this world:

"Notwithstanding the negative effects and potency of greed, ignorance, abuse of power, fundamentalism and so on, there is a critical mismatch between deeply engrained patterns of thought resulting from our Western cultural and intellectual legacy of reductionism, objectivism, dualism, materialism and so on, and the dynamic and systemic nature of the Earth and the human world" (Sterling, 2014, no pagination).

He proposes a model based on three interrelated dimensions of human knowing and experience: *seeing* (perception), *knowing* (conception) and *doing* (practice). All three need to be activated for a sufficient and whole system response to sustainability (which we qualify as meaning ecologically and socially viable ways of living over time, after Boehnert (2018)). Sterling identifies the following key problems in the three areas:

"In the area of *Seeing*, the key problem currently is one of narrow boundaries, of egocentrism, of lack of awareness or care for 'the other', and limited spatial and temporal inclusion. In the domain of *Knowing*, the key problem is over-specialism, and lack of understanding of, and thinking congruent with, systems, pattern, connectivity, consequence, interdependence, and so on. In the domain of *Doing*, the key issue is lack of ability to design, decide, and influence in a way which promotes integrative and synergetic behaviours and actions that add to overall systemic wellbeing rather than the reverse" (Sterling, 2014, no pagination).

This connects to our second concern which spurred us to re-design the module in 2018-19: how can this understanding of the interrelated dimensions of human knowing and experience be addressed and turned into an authentic and transformative learning opportunity? Reconsidering the process of learning with Kolb's experimental learning cycle (2014, 51), learning arises from the creative tensions among activities of concrete experiencing, reflective observation, abstract conceptualisation and active experimentation. What makes the model of seeing-experiencing, knowing and doing so appealing is that it corresponds with our understanding of design processes and practices of design. Following the thinking of Nelson and Stolterman (2014), design distinguishes itself by bridging the practical and theoretical knowledge divide, consisting therefore of a particular form of learning that is not fully comparable with other disciplines. It is first in the combinations of knowing and doing that design learning shows its full potential.

Resilience making unfolds then as an open and collaborative learning environment in which we translate the three interrelated dimensions of human knowing and experience, visualised via this learning design (Figure 2):

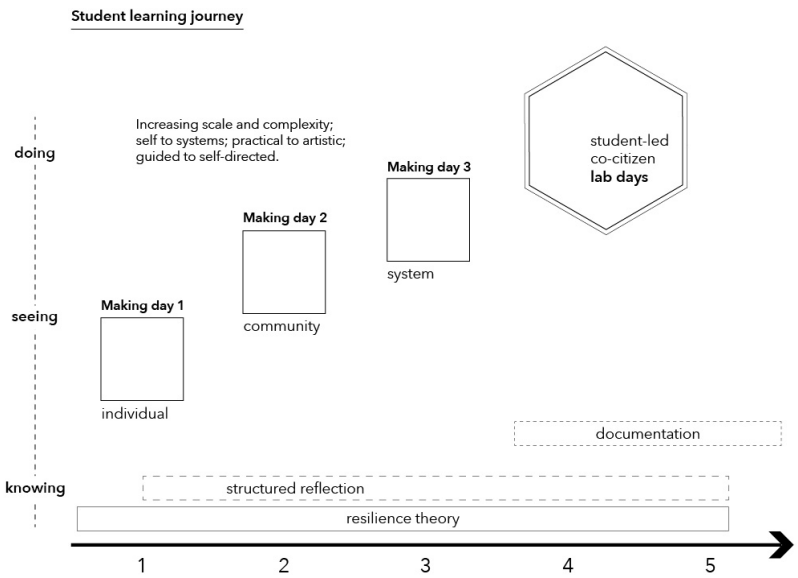

Figure 2: Student learning journey over five weeks for the integration of knowing, seeing and doing via making activities with increasing system complexity and scale

Through a series of lectures, seminars, weekly workshops in the form of 'making days', and short reflective texts, the students consider how resilience manifests and can be practised before phasing into their 'co-citizen design labs' (elaborated below). By choosing

their own opportunity space in which to explore resilience, the students are largely self-directed in collaborating with other students and the inhabitants of their focus system. Within this framing of the design lab, students can develop an awareness or care for 'the other'. Indeed, we use the term 'co-citizen' (adapted from Rockström, (2018)) as a provocation to consider interdependence and multispecies thinking in identifying their 'others' – beyond Rockström's human co-citizens. The small system scale students are asked to co-define allows them to identify relations, connectivity, patterns and interdependence between all involved. Having said this, it is important for us to problematise the role of the designer in this context and the tendency to make decisions on behalf of the other, and to influence causes of action without being fully aware of the consequences that may eventually result.

There is an irony, we acknowledge, in guiding students along this seemingly linear progression in scale from the self/individual to the community, through to a regional scale system (see Figure 1) when systems are unfailingly characterised as non-linear, dynamic, complex networks with spatial and temporal dimensions (Capra and Luisi, 2014; Meadows, 2008; Walker and Salt, 2006). What has been revealed in this co-writing process, however, are the uncritical ways in which we at times privilege 'scaling up' and 'going global' in our teaching. We attribute this in part to having internalised the typical 'starting-up to scaling' trajectories of design thinking (e.g. IDEO, 2016) and design for social innovation (e.g. Reypens et al., 2020) – both of which have become key sites of design practice and graduate employment. In light of the 2020 pandemic exacerbating multiple crises in multiple regions, we are now questioning whether we can unburden students of the implied responsibility for effecting change at the global scale. Can they in fact build resilience through design, sooner, at the local or grassroots scale? We suggest many already are, and that we can now collectively understand these cross-scale systems we inhabit as sites of the 'living curriculum' outlined by Wals (2020), with nodes of action distributed across campus, study spaces, homes, townscapes, landscapes and online spaces. 'Small-scale' for us then denotes everyday habitation and proximal dilemmas, and crucially a scale where there exists genuine scope for students to effect change. We actively encourage students, however, to seed cross-scale actions through design actions that invoke and respond to regional through to global challenges as a way of practising design agency.

THE CO-CITIZEN DESIGN LABS

The co-citizen design lab is central to the module. After three weeks of exploring resilience as per Figure 2, the students devise, conduct and document (via low-fi video) their co-citizen design lab over 10 days or so. The design challenge for the labs, which are always conducted in small groups, is to actively foster greater resilience within a system the students already inhabit. During the process, they connect the previously explored theory and making days to carry out resilience making as adaptive and/or transformative action, exploring different strategies for effecting change in relation to scale – of the self/individual, community and/or the broader regional system in which they are located. There are alternative delineations of scale we could use, such as the 'micro/niche, meso/regional, macro/landscape' adapted by Wals (2020), but to date students have related with ease to those above.

We see the design lab as a structured, participatory approach to generate insights and bottom-up responses to complex issues, driven by the interest and concerns of the students. Various design lab models have proliferated in recent decades, but the advantage of the basic lab format for us, as described by Binder and Brandt (2009, 119-121), is for enabling collaborative inquiries in the form of experiments without pre-defined materials, methods or places. Further, students are encouraged to iterate how they articulate their particular design challenge. The design lab format offers a way of connecting seeing, knowing, and doing via a small-scale and emergent design action. Parallels exist between the design lab as a pedagogical approach and both inquiry-based learning (IBL) (e.g. Aditomo et. al, 2013) and problem-based learning (PBL) (e.g. Savin-Baden and Major, 2004). All three approaches prioritise student-led inquiry or investigation which is instigated by challenges or problems, though the origin of the challenge or problem may vary considerably. The latter form - PBL - is often adopted in learning contexts approximating professional and clinical practices with their inherent human and technical complexities.

Our design lab format, by way of contrast, places emphasis on the students framing and re-framing their chosen challenge through an iterative and generative process contingent on situating themselves in a specific social-ecological system. The design lab contexts and challenges are therefore not pre-defined; each group lab is process driven and an open but supported learning space in which students apply and test out explicit design methods they have learned in the preceding modules. Students' motivations and values can be channelled into a conscious exercise of agency – individual, collective and arising from the artefacts and relations they design. This prompts reflective conversations about agency not being conferred by others, but needing to be practised relative to different system scales.

In documenting the experiences of students each year (with their consent), some shared in their reflections that the design labs were the first time they felt they were

exercising agency, or came to view their earlier activism as a system intervention. The work generated by students is documented through collecting process materials (sketches, images, reflections, maps etc.) in their group project books, a short documentary film of the design lab and written reflections. Together with insights from student de-brief sessions, and student and staff evaluations, this cumulative archive forms the base of our research.

The design labs carried out by students in the past two years span design challenges within the university/ campus system (related to student well-being), to engaging with local social-ecological systems. While some labs grapple with our relations to the ecological, several others focus on the social, including participation and democracy, care and vulnerability (noting these emphases are our interpretation, not a conscious bifurcation by the students). Most labs combine exploration (exploring the conditions of resilience in a particular system) with a design process that focuses on facilitating activities and engaging others.

The co-citizen design lab "*Food Hiking*" (May-June 2020), for example, encourages the practice of foraging in the campus locality focusing especially on international students unfamiliar with the ecology, sharing stories about foraging in their home countries, and eventually creating a direct cooking and tasting experience of the collected food for the participants (within Covid-restrictions at the time).

Figure 3: Students foraging wood-sorrel during "*Food Hiking*"

Figure 4: "*Food4thought*" provides an excellent example of adaptation and students' adaptive capacity with food systems, culture and integration – within Covid-19 restrictions.

In the "*The Big Build*" design lab (May-June 2019) the students decided to become 'free space agents' and to try to engage peers via skill-sharing and building activities in the middle of campus (using reclaimed and borrowed materials). The goal of this lively, exploratory and open-ended design process was to engage diverse students in an activity towards a common goal, discussing public space, needs and care in the process. The students elicited new insights with their random collaborators by 'trying to meet them where they were' (culturally, politically etc), and experimenting with keeping their own 'group think' at bay. The connection between resilience, knowledge and agency clearly manifested in the documented activities.

Figure 5: 'Random' students building together on campus open space (using reclaimed and borrowed materials) during "*The Big Build*" design lab.

In critically reflecting on the design labs to date, and drawing in new insights around change processes, we suggest there are crucial connections at play between embodiment, agency, co-citizenship and scale. We see embodied experiments in the labs arising from what Fountain et al. describe in learning design as "conditions for a lived approach to capability development that challenges students' beliefs through action within the messy complexity of the systems they are inhabiting" (2019, 87). This provides the students with possibilities for an engaged and lived experience of transformative praxis, as an example of "transformative, transgressive forms of learning … that involve multi-voiced engagement with multiple actors" and touch on co-learning, cognitive justice, and the formation and development of individual and systemic agency (Lotz-Sisitka et al., 2015, 78). Conversely, this highlights that the instrumental relationship between learning, citizenship and democracy, or the idea of learning as a way to provide solutions for numerous social and political problems, is not unproblematic (Biesta et al., 2013).

It is essential for the design labs that students' design processes move out of the studio space and involve others inhabiting a particular system. This does not unfold by applying participatory design methods per se,

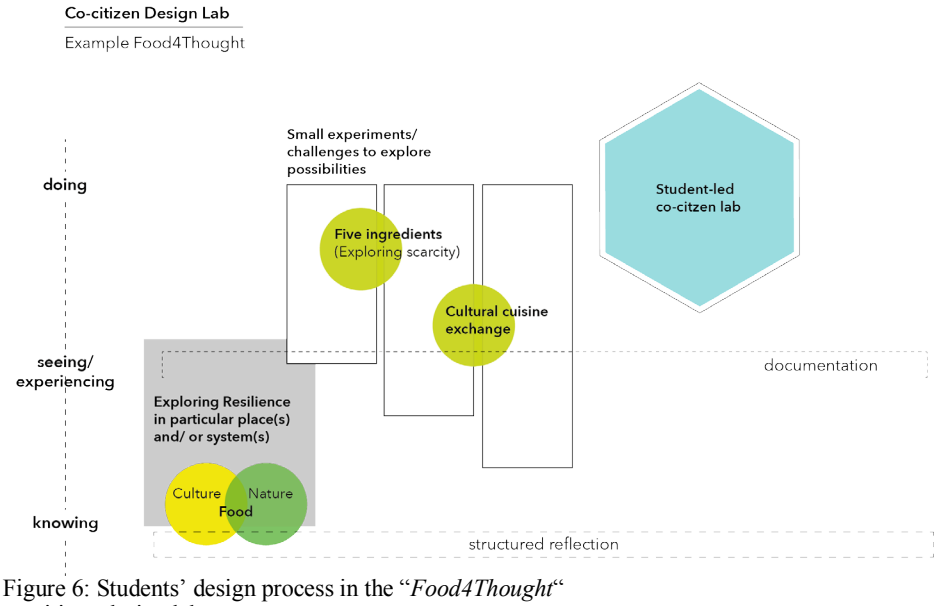

Figure 6: Students' design process in the "*Food4Thought*" co-citizen design lab

but by shifting the focus from values and interests of an individual or entity to considering what is valued and relevant to multiple interests (which could well include indifference to humans). This connects back to the 'co-citizen' provocation, promoting a relational view of system habitation and opening up for dialogue and interaction. The concept of co-citizenship therefore allows us to engage with a richer field than if we would only speak about 'sustainability' – a weak concept which too often is reduced to a trade-off between economic growth, the needs of humans and 'nature'.

While many of our most pressing issues are global, they are also contextual, taking a particular form in particular places. They are also perceived as far beyond the influence of an individual design student. Therefore, common approaches in design education that seek to make change in the world by identifying relevant, urgent topics with little consideration of realistic, well-scaled learning design can leave the students feeling powerless and frustrated. Unless the students manage to translate their work into a realistic scale, they tend to develop abstract and speculative design projects, often feeling they are not contributing to any change at all. Having said this, there is of course a place for abstract and speculative design projects, but not always.

The strategy therefore is to work with continua (i.e. local to global, simple to complex, personal to public) to propose design responses that allow the students not to view a situation from afar, but to perceive from within in a networked way by exercising empathy for others. Coupled with the embodied experiments of the design labs, this aligns with Cooke et al. (2016) who propose re-connecting individuals with global scale dynamics – namely the planetary boundaries – via grounded, embodied action in preference to mere mental models.

As a result, students gain from a direct experience around values, interests and design possibilities within a personally and collectively relevant space.

EVOLVING THE CO-CITIZEN DESIGN LAB FOR 2021

In approaching the next iteration of resilience making, our immediate challenge is to overcome the still rather human-centred approach to thinking and decision making, towards an understanding of the world in which nature is more than a resource or something existing separate to us or to the urban environment. We also intend to develop improved guidance for students throughout the entire learning journey. This will range from explicit formulation of values, to supporting the exploration of the systems they work with. While we have introduced system mapping, we need to intensify the work around using those maps to analyse and to identify opportunities for resilience making. This will include involving more and different perspectives (e.g. actively including the voice of the non-human), as suggested by Lotz-Sisitka (2016) when speaking about transformative, transgressive learning to explore and confront contradictions, as well as identifying what is not there (absence) and what could be there (new practices). To this re-design of our mapping activities we will also adapt the process-relational perspectives of Mancilla García et al. (2020).

Depending on pandemic conditions in 2021, we will revise the three making days relative to what is possible. We adapted these effectively in 2020 to fit within restrictions, but with new insights stemming from Head's (2016) relational practices of hope and Ingold's (2020) ideas of kinship with the earth, we see new opportunities. The community and regional scale making days in particular invite inquiry to discover and revive practices of localised resilience making which

can be understood as cultural improvisations for day-to-day survival.

Finally, we have become aware that the design labs are persisting as 'living artefacts' and points of reference by the students at different stages of the design program. We wish to initiate a collegial exploration of how the co-citizen design labs in the first year can inform relevant progression with subsequent labs that expand the students' capabilities in designing and making transformative change.

CONCLUSION: RESILIENCE MAKING AS A PRACTICE OF HOPE

We have shown in this paper how cross-scale system concepts can be actioned in design learning in ways integrative of social and ecological relations, and human knowing, experience and action. Through this co-writing process we have critiqued and evolved our resilience making and co-citizen design lab pedagogy, aligning with moves toward more grounded, living curricula in higher education. From within our experiences of concurrent crises, we have also suggested design learning is not for an 'unknown future' but a present-as-future where our collective design agency is already at work seeding transformations while we all co-develop new adaptive capabilities.

At the same time, we have clarified the value of process-relational thinking and firmed our case for small-scale, 'hybrid vernacular' practices in our resilience making approach. We better understand *how* we can foster possibility spaces for learning how to make adaptations and transformations through design action. The co-citizen design labs shared – as combinations of cross-scale knowing and doing – are emerging as a model to experiment with ecologically and socially viable ways of living. We now see these design labs offering a purposeful way to work through grief and hope from *within* the crises of our present – even beyond formal education. To that end, we are scoping possibilities to conduct such labs as design practitioner-teachers in our respective communities, which will enrich iterations of resilience making to come.

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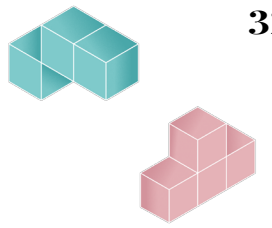

BEYOND A LIVING LAB: SCALING SOCIAL INNOVATION

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ABSTRACT

This paper reflects on experiences with practicing and scaling a social innovation concept that was co-produced between public and private partners and citizens in a living design laboratory in Denmark from 2009-2012. The concept is a public service supporting ad-hoc exercise communities for senior citizens in public parks, based on playful activities. This paper builds upon follow-up studies which have been made since the project ended. We discuss how practicing the service unfolded over time, and how two municipalities have attempted scaling the concept. We deepen the understanding of theoretical concepts of scaling with experiences from practice by e.g., discussing ownership, exchanges between formal institutions and informal civic engagement, and a need for clarifying new roles and responsibilities.

INTRODUCTION

In recent years, public sector and governmental units have explored how social innovation projects, co-produced jointly by citizens, and public and private partners, can transform a political agenda into meaning-ful proposals for change (see e.g., Bason 2010; Freire and Sangiorgi, 2010; Manzini and Staszowski 2013; Ehn et al. 2014; Manzini 2015; Tortzen 2016; Binder and Brandt 2018). We employ Ezio Manzini's definition of social innovation "as new ideas (products, services, and models) that simultaneously meet social needs and create new social relationships or collaborations" (Manzini 2015, p. 11). Manzini argues that the overall ambition of social innovation is to contribute to the development of sustainable societies, and that they are advantageous benefits for society as such and enlarge society's capacity to act (ibid). In a Danish context, Tortzen argues that systematic empirical research on how co-production projects involving the public sector and citizens evolve in practice is lacking investigations of their value and gains (Tortzen 2018). To increase gains, the value of investments for the public sectors and other professional actors, there is an interest in scaling successful innovations beyond the initial local context and initiative. However, in our literature review, we have not found any longitudinal (design) research studies on how social innovation concepts in the public sector are: 1) evolving within the same local context over time, 2) spreading to other contexts. Often, design research projects are carried out within a limited timeframe, and the researchers withdraw from the project when the funding runs out.

However, we found two design research initiatives with a long-term perspective. Firstly, in Malmö, design researchers from Malmö University have from 2007-2019 engaged in three living labs (Ehn et al. 2014). An important difference between The Living Labs in Malmö and The Living Lab Valbyparken, which this paper is about, is that in Malmö, the collaboration was between local non-governmental organizations and citizens while the one in Valbyparken was anchored within Copenhagen Municipality. Secondly, since 2010, the design researchers from the INDACO Department at Politecnico di Milano promoted the *Feeding Milan: Energy for Change* project in partnership with University of Gastronomic Sciences and Slow Food Italy (Manzini and Rizzo 2011). *Feeding Milan* differs from The Living Lab Valbyparken in the sense that no public sector units have been involved.

SCALING SOCIAL INNOVATION

In distinguishing different practices and strategies of scaling social innovation, Westley and Antadze (2013) describe the distinctions of *scaling out* as disseminating

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benefits to be felt by more communities and individuals, from the difficulties in *scaling up* as connecting to opportunities as resources, policies, and values occurring in the broader economic, political, and cultural context. Manzini (2015) further addresses these different strategies of *replicating as scaling out* and *connecting as scaling up. Replicating as scaling out* describes a strategy of recreating and reconfiguring horizontally the most promising practices across contexts, as for instance, replicating a project, while attuning it to a new context. Manzini stresses that no individual case can be reproduced because they will always be deeply rooted in the specific context and shaped by the main actors involved. Instead, he argues that when discussing how to replicate collaborative organizations, "we are in reality discussing how these ideas may spread and how different groups of people may recognize, adopt, and localize them (that is, adapt them to different contexts)" (ibid., p. 180). The second strategy, *connecting as scaling up*, deals with connecting and integrating several small collaborative projects into larger framework programs. According to Manzini, "it can be done by connecting them horizontally with similar or complementary initiatives, and vertically with other types of organizations (social, economic, and political)" (ibid., p. 180).

Rossitto et al. (2020) argue for shifting designers' focus away from *scale,* as a mere quantitative growth, to one on *scaling*; that is the variety of practices, along with the role of human and non-human agents, that contribute to the ways local initiatives proliferate across contexts and over time. They point to how researchers such as Biørn-Hansen and Håkansson (2018) suggest different modes of scaling. *Sustaining* relates to the work of organizing initiatives such as defining practices and attracting members and resources. *Growing* includes processes to build up and consolidate the socio-technical infrastructure to enable more people to take part. *Spreading* deals with the creation and dissemination of new skills, ideas, and knowledge. Rossitto et al. (2020) further point to how transition scholars such as Naber et al. (2017) have distinguished patterns of upscaling practices as *growing***,** *replication***,** *accumulation,* and *transformation*. *Growing* and *replication*, respectively, relate to an increased number of actors participating in a given initiative and reusing the same concept in different locations. *Accumulation* and *transformation* are indicative of more qualitative changes: in the former, different initiatives are connected to each other; in the latter, a given initiative shapes a change at an institutional level.

This paper theorizes and reflects based on these various notions of scaling and what issues are important when moving from a social innovation project to sustainable scaling in practice within a public context. We do this through a follow-up study on re-thinking public services; on what happened beyond 'The Living Lab Valbyparken' - an ad-hoc exercise community in a public park part of the SeniorInteraktion project (Brandt et al. 2010, Malmborg and Yndigegn 2013, Yndigegn 2016, Foverskov 2020). We focus on 'beyond' the living lab, as *after* researchers left the project, including attempts to scale the concept and practice to other places and cities. The paper is structured as follows: Firstly, we present the SeniorInteraktion project, The Living Lab Valbyparken, and the additional empirical material that this paper builds upon. Secondly, we discuss how the ad-hoc exercise community in Valbyparken unfolded from a living lab to a sustained practice, and practices of scaling the concept to other public parks within the same municipality as well as scaling to another municipality. Lastly, we discuss ownership, exchanges between formal public institutions and informal civic engagement, as well as scaling as organizational transformations including needs for clarifying new roles and responsibilities.

THE SENIORINTERAKTION PROJECT

The SeniorInteraktion project was a practice-based design research (Vaughan 2017) using a participatory design approach (Brandt et al. 2013) to assist partnerships among Copenhagen Municipality and nine private and NGO partners in exploring new forms of public services to senior citizens, based on community building (Brandt et al. 2010, Yndigegn 2016, Foverskov 2020). As collaborating partners, the design researchers come from two design research institutions: the KADK and the IT University of Copenhagen. The project owner was the Health and Care Administration at Copenhagen Municipality.

The SeniorInteraktion project focused on improving the quality of life and well-being by designing for social interaction among senior citizens. The project suggested a new horizontal service model resonant with Cottam and Leadbeater's critique of the Public Service Reform, stating how "solutions need to be assembled around people and their distinctive needs rather than defined within organisational hierarchies" (2004, p. 17), further aligning with Meroni and Sangiorgi's definition of collaborative service models "as a way to redesign public and community service" (2011, p. 119), and joining Morelli et al. (2021) who describe a recent shift toward services as processes of value co-creation. Our aim was to develop a new horizontal service model, including socio-material infrastructures that increased physical and social interaction among smaller groups of senior citizens contributing to social well-being (Brandt et al. 2012). Thus, our focus was on enabling self-organization and care among senior citizens.

As opposed to perceiving public service delivery as a conventional offer to the individual, we developed a horizontal service model supporting communities of senior citizens. These communities were intended to be driven by citizens, but firmly supported by what we later termed as 'a helping hand' (Yndigegn

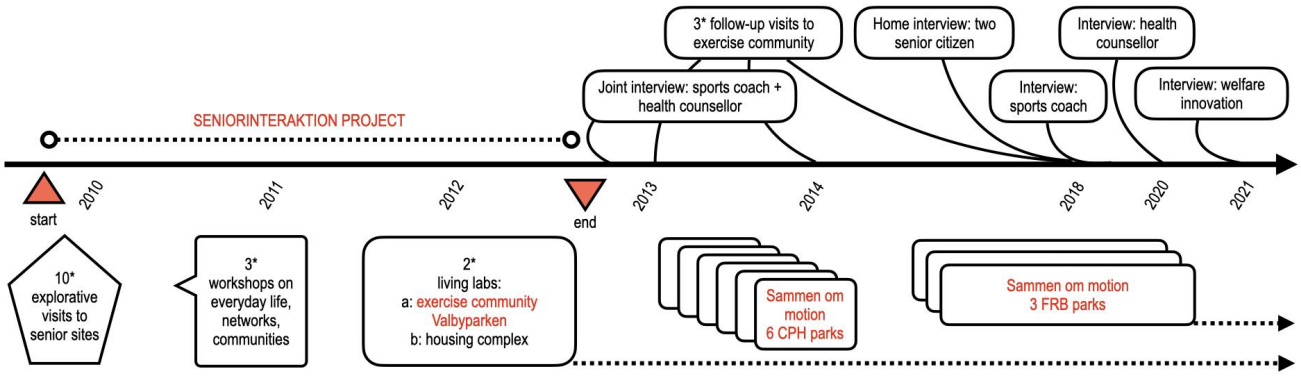

Figure 1: Overall project timeline and follow-up activities

and Aakjær 2018) for organizing and occasionally facilitating the communities from the public side. We refer to this constellation as a citizens-driven service.

More than 100 senior citizens, 15 codesign researchers, 9 industrial / NGO partners, and 10 municipality professionals were involved. The first part of the SeniorInteraktion project was conducted as a design laboratory (Binder and Brandt 2008) including field visits to 10 local senior homes and activity centers, and three full-day codesign workshops evoking and enacting, for instance, a number of future scenarios. The last part of the project was conducted as two living labs (Binder et al. 2011) running in parallel and lasting about one year each. Here we explored new potential practices through 'rehearsing the future' (Halse et al. 2010) with: 1) seniors in a municipal co-housing complex and; 2) a group of seniors and partners establishing an ad-hoc exercise community in a public park (Yndigegn 2016, Foverskov 2020). Today, senior citizens from The Living Lab Valbyparken are still joining each other every second week to play games and drink coffee (see figure 1).

INFRASTRUCTURING FOR CONTINUATION

When we initiated the project, there was an increasing interest in the concept of 'infrastructuring' as introduced in the Scandinavian design community by Björgvinsson et al. (2010) and Binder et al. (2011), based on the work of Star and Ruhleder (1996), Suchman (2002) and Karasti and Syrjänen (2004). We applied this concept as a way to design for social innovations to sustain and continue after the project ended (Olander et al. 2011). Following Björgvinsson et al. (2010) we define infrastructuring as organizing social-material gatherings and contextual experiments to build arenas for social innovation. In this process, social aspects and what we call infrastructuring elements are connected to create possibilities for new things and practices to emerge and be sustained. In the Living Lab Valbyparken, we explored the overall horizontal social service model concept as an alternative way of creating activity offers in the public sector, that challenged the classic idea of fixed rehabilitation courses. For nine months, we gathered every second Friday for three hours in the public park. Step by step, an infrastructuring practice of supporting the physical playful and social aspects of the gatherings including sharing stories of the activities in-between the gatherings were developed in order to support the ad-hoc exercise community continuing the gatherings, coordinating playful activities, and inviting others to join.

Physical infrastructuring elements included tools for playful activities such as croquet equipment with a twist, disc-golf, scorecards, a pull along wagon, a bench, a staircase tribune, and flagpoles. They were all developed and built in the park. A tool shed was borrowed from park officials and was provided with a code lock. The code lock was an important infrastructuring element as it helped distribute the shared ownership, and enabled new possibilities e.g., some of the seniors brought their grandchildren to the park between our Friday gatherings and used the playful tools. Other infrastructuring elements included flyers and a mobile app developed in order for the seniors themselves to suggest and coordinate activities, but also to invite friends and relatives within their networks to the exercise community. The app contained an archive of playful activities for inspiration, when the seniors were going to be on their own without the sports coach. Additionally, a blog 'Aktivt udeliv i Valbyparken' (active outdoor life in Valbyparken) was used between the gatherings in the park to share e.g., images and stories. Initially, it was primarily the design researchers who used it, but the seniors took over little by little (Malmborg and Yndigegn 2013).

FOLLOW-UP STUDY: EMPIRICAL MATERIAL

We, the design researchers, left and the project ended in Fall 2012. The additional empirical material (see figure 1) consists of: A joint interview with a health counselor (from Copenhagen Municipality) and the sports coach (a private partner) immediately after the end of the project; participant observations and interviews with citizens in the exercise community in 2013, 2014 and

2018; a home visit and interview with two senior citizens in 2018; interview with the sports coach in 2018; interviews with a health counselor employed at Center for Health at Frederiksberg Municipality in 2020, and Head of Department of Welfare Innovation within Copenhagen Municipality in 2021. The people in the two last interviews were not part of the original initiative, but were interviewed to reflect on how practices have evolved in the two municipalities during the following years. The work has been documented via video, and audio recordings, and photographs. This empirical material has formed the base of the analyses in this paper.

PRACTICING A CO-PRODUCED SERVICE

In this section, we describe and discuss the continuation of the original ad-hoc exercise community as a co-produced social service including reflections on infrastructuring elements, and which concerns, and conflicts emerge as time evolves.

SHAPING A CITIZENS-DRIVEN SERVICE

The project ended late 2012 and the researchers withdrew at that time. Copenhagen Municipality hesitated with the continuation. Meanwhile, the community of seniors in Valbyparken continued on their own. They met every second Friday – and they formed the activities along their preferences, the weather, and the number of people. When the researchers left the project, the bench and the staircase tribune were removed from the park as the permission to have them in the park was temporary. However, the repertoire of tools for playful activities was continually expanded and stored in the shed between meetings. The seniors continued to develop their own everyday infrastructuring elements and practices, while the digital infrastructuring elements developed explicitly for the project gradually disappeared. “We know where and when to meet up so it is not necessary anymore,” they expressed in an interview (2018) about the mobile app and the website. Instead, they used a contact list, phone calls, and text messages. They also made new arrangements and routines. For instance, they started to sometimes go for lunch at a community center close by; and they arranged with the manned public playground in the park to drink coffee at their place. They paid a small amount of money for the coffee the personnel made for them. In the ad-hoc exercise community, a strong practice of looking after each other if some did not show up - or felt too ill to participate - also evolved.

To make the ad-hoc exercise community an integrated part of the infrastructure of the municipality’s service offers, the community was affiliated with the local Health Center as an exercise possibility for those who had ended a rehabilitation course at the center. Rehabilitation courses usually last 8-12 weeks, and the Health Center often lacked a possibility for continuing the training. This was a way to make the different services reciprocally benefit each other. So, the ad-hoc exercise community in the park became an open exercise offer for other seniors and once in a while new people attended. The seniors in the park welcomed the newcomers, but after a while doubt about the arrangement started to surface. The seniors felt that they were given a responsibility for sometimes ‘weaker’ seniors, which they were not comfortable with. One of the women explained that it seemed like those personnel at the Health Center were not aware of what they were sending their senior citizens out to (Yndigegn 2016).

DEVELOPING A ROBUST PUBLIC SERVICE?

Nine months after the project ended, Copenhagen Municipality decided to employ the sports coach in a half-time position to take care of the initiative and to manage a scaling of the ad-hoc exercise community concept to other parks in the city. According to the sports coach (interview 2018), Copenhagen Municipality was in charge of recruiting participants for the new communities while his responsibility was to make sure they showed up again as well as to register those who attended. In his new position, he returned to the exercise community in Valbyparken with the intention to make it a robust service offer and to recruit ambassadors for the scaling out to new parks. His plan was to renew and expand the community’s repertoire of games and playful activities to continue to be a service that appealed to a broader range of senior citizens. From his point of view, it was important to be able to recruit new participants. However, different conflicts and tensions emerged from the reunion. The exercise community in Valbyparken felt intimidated when the sports coach returned and wanted to introduce new games. They felt that he dominated and did not respect what the community had shaped on their own after the project ended (interview 2018). Also, they understood that the municipality wanted to know how many people participated from time to time, but they felt that it interrupted their social gatherings as they had to register their participation online every time (interview 2013).

DISCUSSION: MULTIPLE PRACTICES OF SCALING

In our discussion of practices of scaling, we explore the relation between a sustainable and a scalable social innovation. To analyze how scaling took place in our study, we follow Biørn-Hansen and Håkansson’s (2018) definitions of the different ways of scaling, where *sustaining* means internal organizational activities of establishing routines and practices; and *growing* defines the practices of expanding beyond the initial users and with that create a bigger impact on society. The seniors in Valbyparken made the ad-hoc exercise community sustainable by creating their own practice through changing some of the games, adding the coffee arrangement with the staff at the manned playground, and adding lunch to the routines of their community.

The value and quality of this community for the seniors is without doubt high as many of them have met each other every second week all year round for more than eight years now. Our study shows how the seniors took ownership of the initiative and in that sense fulfilled the idea of making the ad-hoc exercise community mainly citizens-driven. The sports coach (together with the municipality) on the other hand, worked to make this concept scalable by trying to broaden this one community for others to join - and recruiting ambassadors for new communities. Here, their work of scaling aims at *growing* by making the community more robust as a public service that can be offered to a broader range of citizens, and in that sense be integrated into the existing infrastructure of a variety of public services.

SECURITY OF SUPPLY – AND OWNERSHIP

Tensions emerged between the attempts of sustaining and of growing, which points to challenges that might arise when the public sector enters into collaboration with citizens – here, also the ideas of the private partner: the sports coach. The public and private partners wanted to establish something that the senior citizens take ownership of in order to run it themselves and is deeply rooted in the community of senior citizens. Still, it raised problems when the citizens shaped it too much and perhaps became too close, since it meant that the "service" turned out to be too narrow or exclusive to be part of the catalogue of services offered by the public sector and thus enabling newcomers to join. It means that the municipalities cannot always account and argue for supporting this kind of services (Siira et al. 2020).

An important challenge of co-production for Copenhagen Municipality is the concern regarding 'security of supply'. To be a service that Copenhagen Municipality can offer and claim to be part of their catalogue, there has to be some security of supply as Head of Welfare Innovation puts it (interview 2021). Despite being valuable to co-produce and try out new ideas on a small scale, it might be too uncertain in the longer run. She stresses that they do not want to put the citizens in a difficult situation, and they do not want to get complaints in this regard: "What if we, for instance, managed to activate citizens in an initiative about overcoming loneliness, and then we had finally got some [people] out of their homes, and then those who started it got interested in something else and it [the initiative] is gone." The example from the Head of Welfare Innovation shows how to scale and grow the socio-material infrastructure to enable more people to take part and that it requires a certain robustness that may not always be there - or that the municipality does not feel confident in when responsibilities are handed over to the citizens. Because it will often be the municipality that is held responsible if anything fails – even after the municipality's withdrawal from the initiative. These concerns challenge the concept of a horizontal service model. Though, in relation to the ad-hoc exercise community in Valbyparken the robustness measured in continuity over time seemed to be there. However, the seniors' own uneasiness in having to take responsibility for 'weaker seniors' illustrates a misalignment or lack of negotiation of the terms of condition and expectations for the growing of this citizens-driven public service - and in that sense an issue that could be an obstacle for the security of supply.

What we have pointed to here are some difficulties and obstacles when attempting to sustain but especially grow the community by allowing more citizens to join the exercise community in Valbyparken. From the engagement between the citizens, the municipality and the private partner, different challenges emerge and raise questions of ownership - or who owns the concept and the right to define what practices and routines to establish; responsibilities in relation to the citizens' role and whether they are supposed to be caretakers for others; and finally, the challenge between the citizens-driven part and the public institution in terms of the security in what is offered. This results in questions that point to a misalignment in how the continuation was imagined or practiced among the central partakers.

SCALING A SERVICE IN PRACTICE

In the following section, we describe and discuss a different attempt of scaling initiated by Copenhagen Municipality after engaging the sports coach to establish new ad-hoc exercise offers in five public parks in other parts of Copenhagen but also the spreading of the concept to another municipality initiated by the sports coach.

SCALING WITHIN THE SAME MUNICIPALITY

The first attempt of scaling to other public parks happened Summer 2013 - nine months after the project ended. Copenhagen Municipality created a new website for all the places and renamed the service offer to *Sammen om Motion* (together about exercise). Collaboration was established with several other Health Centers and counselors, to educate them in this way of running an ad-hoc exercise offer for senior citizens. By the end of 2013, the activities were running in six different parks in Copenhagen. The sports coach explained (interview 2018) how the original concept from The Living Lab Valbyparken was *adapted* to the different contexts. For instance, in one part of the city the focus was also on including people in wheelchairs, people using walkers, but also socially vulnerable citizens. The very different abilities of the participants made it necessary to adapt the various games to the people attending from time to time.

Different initiatives were taken to make this attempt of scaling viable. The project leader from Copenhagen Municipality in the SeniorInteraktion project promoted the idea internally also to the departments in charge of

running service offers for seniors. Civil servants tried to recruit new participants for the 'new ad-hoc exercise communities' - and the sports coach tried to make the seniors from Valbyparken be ambassadors and take part in promoting and establishing the new exercise communities. All these initiatives had cramped conditions. The seniors from Valbyparken were reluctant to travel to the other parks to be ambassadors because of practical transport issues (visit 2018). Thus, the sports coach did not succeed with including the seniors in the attempt of scaling to other parks. At some point, the project leader in the municipality left for another job, and the one who took over soon went on maternity leave. That happened with the person following her too, so after two to three years not much was happening with either the promotion of the service concept as such or in regard to recruitment of seniors. Without seniors attending the ad-hoc exercise communities, it was difficult for the sports coach to fulfill his part of the tasks, which according to him was to assist building up the new communities on site by establishing a repertoire of playful games that easily could be adapted to suit the people attending (interview 2018).

SCALING TO ANOTHER MUNICIPALITY

As the sports coach could not make a living at a half-time position, he reached out and offered the service concept to Frederiksberg Municipality. This smaller municipality was very interested, and employed him for a half-time position too. When *Sammen om Motion* were closed down in Copenhagen Municipality, the sports coach got a full-time position in Frederiksberg Municipality, where they had a greater success of getting this social service up and running. They integrated the communication of the new offering on their existing Health Center's website and built a number of boxes with equipment and instructions to be placed in three public parks with the help of the sports coach. They connected the new social services directly to the local Health Center, but this time with a greater emphasis on integrating it into other courses. In an interview (2020), the health counselor explains that visiting and taking part in the weekly event in the park in *Sammen om Motion* has been part of at least one class during the 8-12-week rehabilitation course for some years. In this way, the Health Center secures a try-out through active participation, which seems better for potential new participants making up their minds about if this is something to do in the future. Thus, the health counselors in Frederiksberg Municipality *now* have an integrated practice, where new seniors join and get introduced to the ad-hoc exercise community in the park to create awareness of the exercise offer and make it more accessible to the potential participants. Additionally, the health counselor said that one senior exercise community recently reached out in order to get inspiration for new playful activities (interview 2020). Thus, they succeeded in making it part of their public service infrastructure, which makes it sustainable and viable as part of the services the municipality offers.

DISCUSSION: TRANSFORMING ROLES AND RESPONSIBILITIES

What emerges from our analysis is scaling as different variations of *spreading*. Following Biørn-Hansen and Håkansson (2018), *spreading* means *replicating* the concept to other places or helping others to start up. Yet, *spreading* also includes *"*more abstract forms of growing that involve making ideas, skills, and knowledge available to others" (Biørn-Hansen and Håkansson 2018, p. 8). The question is what can be replicated – and spread?

In the replication of the ad-hoc exercise community, infrastructure elements (e.g., games, how to play, meeting times, and the sports coach) of this community were replicated to the other sites. Together with the development of a shared website and the idea of ambassadors, these elements should enable the spreading of the concept. However, in relation to replication, Manzini (2015) emphasizes that collaborative organizations are difficult to replicate, because they are so deeply rooted in a specific context and largely shared by the characteristics of their promoters. Manzini points here to aspects of social innovation that are not easily replicate-able. In present study, the idea of ambassadors as well as the sports coach to follow the new communities were steps taken towards spreading the fundamental aspects of the ad-hoc exercise community. However, this was not all successful in practice cf. the seniors as ambassadors.

Another aspect that emerges in scaling the concept of a horizontal service model, is the need for clarifying and distributing new roles and responsibilities. The municipality's role changed from being the direct provider of a senior course or service to citizens, to a role of supporting the citizens and the private partner in being the one organizing the ad-hoc exercise communities. It included integrating the local health centers and counselors to the new communities as well as recruiting seniors. The role of the sports coach changed from a private collaborator to an internal part of the public sector (an employee), where he was on 'accord salary' (based on whether the seniors returned) and at the same time, he had to fulfill the formal role of making sure that the participants registered their attendance. Finally, the seniors' roles were *expected* to change from seniors taking part in an exercise activity to seniors taking care of others and becoming ambassadors at the new places to support the public-private collaboration of spreading the concept. These changes in the different actors' practices point to a need for a more fundamental change.

TRANSFORMING ORGANIZATIONAL CHANGE

In our study, we observed scaling sometimes require transforming organizational change. For the horizontal service model to be a practically viable concept in the long run, there was a need for an organizational change including new roles, responsibilities, and practices. This way of scaling goes beyond replicating and spreading. Naber et al. (2017) describe this as *transformation*, which is how an initiative shapes a change at an institutional level as indicative of more qualitative changes. These changes of practices were actually central in the discussions in the SeniorInteraktion project group. Especially in relation to the public partner, where we engaged with various municipality employees at different times in the process. The focus was on getting them to be familiar with this new way of engaging citizens in service development as well as involving them in this kind of innovation of a service model.

However, what was mainly rehearsed in The Living Lab Valbyparken was the local practices among the citizens and the sports coach. When looking back and critically reflecting on the project, there is an important learning in how to create a transformation in the public organization, which also could have supported the sports coach's work. In retrospect, the project as such could have benefitted from even stronger presence by the design researchers in the municipality, e.g., supporting the project leader in spreading and grounding the horizontal service model in the organization through creating more infrastructuring elements by means of design (e.g., building on previous experiences of the DAIM toolbox, Halse et al. 2010). These initiatives and infrastructuring elements could have enabled a support for the organizational transformation.

The challenges of *spreading, replicating*, and *transforming* the horizontal services model are here contrasted with the accumulations of replicated practices within another Health Center and other municipal practices. Following Manzini's (2015) point, it is one of the strongest promoters (the sports coach), who had a central part in characterizing and developing the concept, who took the initiative for the spreading as in our study connecting to another organization. At the same time, our follow-up study also points to an organizational readiness in the Frederiksberg Municipality to adapt the concept. The ad-hoc exercise community becomes closely connected to the existing courses at the Health Center. This, together with more clear definitions of roles and responsibilities among the citizens, the sports coach, the health counselors, and in general, the municipality made the concept of the horizontal service model practically viable in a new municipality. It means that the spreading by replicating to other sites becomes more successful - and it might already have been tapping into an ongoing organizational transformation.

Relating to the question of transformation, Copenhagen Municipality made a large re-organisation in 2016. The Department of Welfare Innovation was established, and as something new it was within their mandate to make sure that successful social innovation projects were entrenched and implemented in full in collaboration with the departments which were to be responsible of the services in the long run. Head of Welfare Innovation (interview, 2021) stresses that this organizational change has been very important in relation to scaling and securing the establishment of more sustainable practices.

FINAL DISCUSSION

The focus in this study has been on what happens beyond a living lab, understood as an investigation of what unfolds after design researchers leave a social innovation project carried out in collaboration with the public sector, private partners, and citizens. In the Valbyparken Living Lab, the actors co-designed and co-produced a public horizontal service model where the public service provider supports an open ad-hoc exercise community of senior citizens. Overall, the horizontal service model contributes to a political agenda on improving quality of life and well-being as well as promoting self-organization and care among seniors.

BETWEEN FORMAL INSTITUTIONS AND THE INFORMAL CIVIC ENGAGEMENT

This horizontal service model blurs the roles and exchanges between the formal institutions and the informal civic engagement. We argue that the benefits of this new mode of collaboration is that the social innovation concept is mainly driven by the citizens themselves. It affords a new service-thinking where the citizens take ownership and shape the content of the playful gatherings in their own way, which supports democratic participation and civic agency. Thus, it dissolves the conventional one-fits-all public service offers. Our follow-up study shows that the blurring of the roles and exchanges between the formal institutions and the informal civic engagement is also what creates challenges and tensions in the different attempts of scaling the social innovation concept after the initial project ended.

The ambitions of the seniors contain a practice of *sustaining* as keeping and attracting members and resources (Biørn-Hansen and Håkansson 2018) to secure the continuation of their own local community. However, our study also showed that the formalization of the informal civic engagement made seniors into someone who took responsibility for others, more vulnerable seniors. Something that exceeded the limits of the seniors as they expressed to us. At the same time, in order to create better value of the initial effort, the Copenhagen Municipality's ambition is to make the

social design concept scalable, which includes institutionalizing practices. In our study, it means that *replicating* the social innovation concept of open ad-hoc exercise communities including the infrastructuring elements supporting these, are challenged by aims of formalizing procedures in order to make a robust service offer, to maintain security of supply and being able to evaluate the performances quantitatively and qualitatively. As addressed by Siira et al. (2020), it can be problematic for the public institution if a mainly citizens-driven social service becomes too narrow, so it cannot be offered to, or is excluding, a broader group of citizens. It means that the benefits slowly dissolve, and it becomes difficult for the public institution to argue for supporting the initiative. This is in line with Manzini who argues that in order for initiatives to be "truly effective and have the needed impact on the overall society, they should spread and drive changes at a larger scale" (Manzini 2015, p. 177).

In contrast, Biørn-Hansen and Håkansson (2018) argue that "there is a value in the small-scale and very local action, as it leads to other results that matter too, for example, the enjoyment and inspiration that keep people going. In addition, even the organizations or concepts that will not scale, contribute to a critical mass of people who want to see a change in society" (Biørn-Hansen and Håkansson 2018, p.10).

In relation to aims and ambitions of social innovation projects, we argue that there are two important implications from this study. Firstly, the very local actions are highly valued and not all actors are concerned with scaling. It would be a pity if social innovation initiatives and living lab experiments would never be initiated due to uncertainty about if scaling is possible or not. Decisions on scaling or not should be based on and evaluated from lived experiences. In line with Biørn-Hansen and Håkansson, we will argue that not all community-based services need to be scaled. Secondly, we will argue that there is a need for balancing the various actors' ambitions and efforts, so they reciprocally benefit each other - and that the one is not dominating the other.

SCALING PRESUPPOSES OWNERSHIP

Our analysis of what happened beyond The Living Lab, made it clear to us that scaling presupposes ownership. This is in accordance with Manzini's argument that social innovation "can only work if groups of dedicated people decide to adopt them and commit themselves to its implementation" (Manzini 2015, p. 18). Given this, our study shows that ownership means different things to different actors, which complicate scaling in practice. The citizens participate on a voluntary basis whereas the engagement by others is part of their work life. The senior citizens clearly take ownership of the initial community in Valbyparken. Most of them have gathered every two weeks for more than eight years and in their *sustaining* of the community they take responsibility for the continuation by meeting up on a regular basis, including welcoming newcomers. Some have also taken ownership by buying new equipment, acting as contact persons, visiting members if they fall ill or, for instance, suggesting additional activities like celebrating someone's birthday. It all illustrates sincere care for the community. The private partner (sports coach) also takes ownership. In his view, he invented the overall concept about creating open ad-hoc communities for physical interaction, which is not defined by a certain disability, diagnosis, or health issue. His dedicated commitment revolved around two issues. Firstly, he worked hard to develop a repertoire of playful activities that could easily be adapted in the situation depending on the participants' abilities, interests, and needs. At times, his sometimes-strong opinions created friction as the seniors did not necessarily agree. Secondly, his ambition was to make a living by *replicating* the physical and social service as widely as possible. In relation to adopting the idea and taking ownership, the commitment of Copenhagen Municipality has changed a lot over the years, which we argue is key in understanding both successful and failed scaling attempts.

The fact that it took nine months for the municipality to make a decision about if they wanted to adopt the concept beyond the running of the SeniorInteraktion project, can be interpreted in different ways: doubt about the value of the social innovation concept, long internal decision-making processes, finding funding for scaling, lack of personnel. In contrast to this, the municipality's commitment increased when they hired the sports coach, engaged the health counselors, recruited seniors - and spent money on making a dedicated website. Apart from this, the Copenhagen Municipality's dedicated commitment including the various actions succeeded in replicating the social innovation concept to five other parks in the city. However, other issues relate to discrepancies among hierarchical layers in organizations. Our study shows that Copenhagen Municipality, soon after the researchers left the project, was challenged by several shifts in personnel. Even though the leader of the department felt ownership, actual operations were hindered by sometimes not having an employee to do the work on the operational level. Knowledge about the social innovation concept was also mainly anchored within the people involved in the initial work so when they left, the hand-over was further challenged. In the interview with the Head of Welfare Innovation (2021), she highlights the importance of securing that the 'institutional memory' is built up and sustained. They have made procedures for this to ensure that things are not lost when passionate employees find a new job. Still. finding the best way of documenting and passing on this kind of experience and knowledge is not easy.

A key insight from our study is that ownership means different things to different actors. We argue that

ownership is needed on all levels in collaborative organizations to secure scaling in practice. However, it needs to be combined with negotiations of terms of condition in relation to commitment and responsibilities among all actors, including the citizens.

To summarize, in this paper we have deepened the understanding and conceptualization of notions describing scaling in different ways based on experiences from practices in and beyond The Living Lab Valbyparken in the SeniorInteraktion project. The aim has not been to suggest new concepts for scaling per se, but to acknowledge and relate to concepts presented by other scholars when analyzing our own research in order to share practice-based insights, which can be of value for future innovation projects. Still, we will propose the term 'ownership' as a short description for what Manzini (2015) points to with social innovation "can only work if groups of dedicated people decide to adopt them and commit themselves to its implementation". This term is easier to use in everyday language and practices.

The paper contributes to filling the gap mentioned by e.g., Tortzen (2018) that systematic empirical research on how co-production projects involving both the public sector and citizens evolve in practice is lacking. Her own research is based on 3-10 months of interviewing and making observations in top-down co-production projects initiated in three Danish municipalities. Our study is also carried out in a Danish context. It differs by being a local longitudinal study spanning 10 years in all and includes us researchers taking active part in developing the social innovation concept and doing follow-up studies. If the ambition of design research is to contribute to sustainable societal changes, we would like to encourage more design researchers to conduct longitudinal studies, as they are essential for contributing to understanding scaling better, including how infrastructuring process work and how various socio-material infrastructures evolve after the design researchers have left.

SCALING OUT AND UP

We initially introduced two forms of scale as defined by Westley and Antadze (2013) and Manzini (2015), as scaling out and scaling up, and how these forms of scaling strategies have led to identifications of different scaling practices, nuancing modes and patterns such as sustaining, growing, spreading, replicating, accumulating and transformation (Biørn-Hansen and Håkansson 2018, Naber 2017). They all point to the importance of the reflexive learnings that need to take place to challenge the existing institutions and bring in the systemic change that allows such organizational changes to happen. These reflexive discussions are important for the design community when evaluating our design practices and projects. We will argue that design researchers need to inquire and learn more about the gains of co-production of social innovation to improve both methods and processes of engagements, but there seem to be a general lack of long-term evaluations within design communities, as also pointed to by Bossen et. al. (2016).

Design researchers need to better understand the patterns of accumulation as *how* our design experiments and projects are linking to other public initiatives before and after we leave project collaboration.
And *if* or *when* organizational transformation shapes wider institutional change within the public sector. These reflexive learning processes of looking back and analyzing long-term retrospective studies and the implications thereof are as important to the design researchers as they are to our collaborating public and private partners as well as citizens. They have all come together in co-producing enhanced visions of how our shared welfare societies are able to progress within the everyday practices of both citizens lives and welfare systems. Even though these changes might seem as small as playing a game, sharing a walk and coffee in the park with peers during a period of eight years.

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IN SEARCH OF (ORGANIZATIONAL) LEARNING AND TRANSLATION IN PUBLIC INNOVATION LABS

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ABSTRACT

Public Innovation Labs are rapidly spreading with the aim of improving public sector responses to societal issues. However, labs are often struggling to embed their outcomes in ordinary activities. The article builds on the notions of *organizational learning* and *translation* and on the case of an innovation lab at the municipal level to articulate some of the challenges and limits of labs in relating to public organizations institutional dimension. It also describes possible formats and approaches to meaningfully engage with ordinary activities, structures and power dynamics within the public sector.

INTRODUCTION

The use of design in the public sector is rapidly growing mainly due to the increasing number of 'laboratories' (henceforth public innovation labs or PIL) developing at municipal, regional and national level in different countries (Tõnurist et al. 2017; Mc Gann et al. 2018). PILs can have different names (urban living labs, policy labs, public innovation labs, innovation platforms, etc.), but they tend to share a similar format. They are dedicated arenas that bring together different stakeholders (and thus different knowledge) for experimenting and learning about how to tackle societal issues. PILs are driven by the idea that, in order to face contemporary societal issues, there is the need to focus on experimentation and continuous learning by involving citizens and different actors in co-creation activities (Tõnurist et al. 2017). PILs are often framed as a matter of overcoming the limits of current management styles in the public sector (Criado et al. 2020), and they are seen as vehicles to introduce more participative and experimental governance (Kronsell and Mukhtar Landgren 2018; MCGann et al. 2018).

Strongly based on project logics (Fred 2018), PILs provide flexibility and freedom for experimentation; however, they tend to become isolated islands that lack the capacity to embed results in ordinary activities (Timeus and Gasco 2018). Referring to the theme of conference, PILs struggle with "scaling" their processes and outcomes, which, in turn, leads to legitimacy and accountability issues (Fred 2018; Mc Gann et al. 2018).

These issues are not new for the design research community, who has already highlighted the need for more critical and ad-hoc designerly approaches to engage with the public sector (Julier and Kimbell 2019). Attention should be given to current organizational cultures, routines within public organizations (Junginger 2015). In previous work, together with some colleagues, we focused on the importance of learning to articulate and engage with the relationship between worldviews and practices in public sector ordinary activities (Agger Eriksen et al. 2020). This article focuses on the challenges PIL faces in creating conditions for this kind of learning and for its "embedding" in ordinary activities (Scholl et al. 2017), i.e. *organizational learning* (Senge 1990; Crossan et al. 1999, 2001). By reflecting on the struggles of a municipal PIL, the article highlights how learning processes need to be paired with negotiations and mobilizations for learnings to be *translated* (Callon 1986; Czarniawska and Joerges 1995) within ordinary activities. It also identifies some limits of PILs as a format in supporting these efforts and calls attention to the need for developing forms for experimentation and translation with(in) ordinary activities.

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INNOVATION AND LABS IN THE PUBLIC SECTOR

PILs are often framed as a matter of promoting public sector innovation. Since the late 1980s, private sector management styles have been introduced in the public sector to respond to perceived shortcomings of traditional bureaucratic administration, such as inflexibility and economic inefficiency, but also poor responsiveness to citizens' and societal needs (Stoker 2006; O'Flynn 2007). There has also been a fascination for private sector capacity to continually reinvent itself to face emerging challenges and to develop new business opportunities i.e. being innovative (Parsons 2006).

Nowadays, the discourse around public sector innovation primarily focuses on overcoming the shortcomings that market approaches created in the public sector (De Vries 2016). Particularly, a focus on outputs and efficiency overlooked the importance of interdependencies across different domains in the delivery of public services and of equity, transparency and accountability (O'Flynn 2007). A focus on efficiency led to a more "skinny" public sector that tended to lack spaces and resources for being innovative (Parsons 2006). Recent framings of public sector innovation are thus focusing on questions of efficacy (rather than just efficiency), lifting the importance of citizens' experiences and of taking a holistic approach to complex societal issues (De Vries 2016). However, public sector innovation remains an ambiguous concept both in theory and in practice, which is entangled with private sector logics and tends to oversee the peculiarities of public sector context and action (ibid.). In particular, it has been argued that innovation in the public sector is rarely a matter of "creative destruction" (Schumpeter 1994), but rather an incremental and negotiating process in which new elements supplement rather than substitute older ones (Olsen 2009). These negotiations involve institutional aspects (laws, procedures, organizational and professional cultures) and individuals' views and actions (ibid.). This internal complexity is paired with the intractable nature of the issues the public sector is dealing with (Parsons 2006; Olsen 2009): they are problems that cannot be definitively solved and thus, rather than focusing on "finding new solutions", public sector should instead increase its own capacity for ongoing learning and adaption (ibid.) by fostering reflexivity in relation to institutional as well as external questions. This demands a preference for ongoing learning processes (Schön 1971), creating a movement *"from the periphery to the periphery and from the periphery to the centre"* (ibid. p. 166) with the aim of nurturing citizens, civil servants and other actors' capacity to drive *"their own continuing transformation"* (ibid. p.166). This capacity is, however, hindered by arrangements that are strongly focused on efficiency, since they tend to eliminate aslo time and resources for learning (Parsons 2006). Moreover, efficiency logics tend to see failures as a waste of resources, thus ruling out a key driver of learning (ibid.).

PILs are rooted in the tradition of Living Labs (Fölstad 2008), sustainable transition management (Loorbach 2007) and design (Selloni and Staszowski 2016). An underpinning principle of innovation labs is that of being niches in which to engage different actors, and thus different forms of knowledge, to experiment outside the influence and rigidity of prevailing regimes (Kemp et al. 1998). These engagements are often organized as projects, with temporal ad-hoc structures and resources to address specific issues (Fred 2018). It has been argued that through networking, the articulation of expectations and processes of social learning niches can gain momentum and challenge existing socio-technical regimes (Geels and Raven 2006). Learning is understood as a transformative activity (Mezirow 1997) aimed at changing ways of thinking and acting. In the public sector, these changes are also meant to address organisational and governance aspects (Castán Broto and Bulkeley 2013; Kronsell and Mukhtar Landgren 2018; MCGann et al. 2018).

PILs can be looked upon as a matter of creating space for experimentation and learning in a "skinny" public sector. However, it has been also highlighted that the principle of being a niche can lead to the creation of isolated islands that struggle to connect with ordinary activities (Timeus and Gasco 2018). The format of the "project" exacerbates this isolation (Fred 2018). The risk is that PIL become self-referential, or worse are used by limited networks of people or actors to drive their own agendas (Fred 2018) with evidence gained through experimentations staged and interpreted by experts overruling public accountability (MC Gann et al. 2018).

(ORGANIZATIONAL) LEARNING AND TRANSLATION

To further explore PIL challenges in nurturing innovation in the public sector, this section articulates, from a theoretical perspective, learning in PILs, *organizational learning* and organizational change.

Learning-by-doing and doing-by-learning are at the core of PILs (Frantzeskaki et al. 2012): joint projects provide opportunities to try out things together and, by collaboratively reflecting on and evaluating activities, to advance shared understandings that, in turn, can inform views and actions.

To further articulate what is learned about in PILs, it is possible to rely on Argyris and Schön (1974) and Reynolds (2014), who distinguish three possible learning levels emerging when reflecting in and on action. *Single loop learning* is based on detecting and

correcting errors by using established rules, procedures and actions (ibid.). The *single loop learning* process is shaped by the underlying question 'are things done right?' *Double loop learning* is based on the principle of error detection and correction and tracing back to the underlying causes of the problem (ibid.). It is most applicable to situations where the existing rules and procedures do not fit the new challenge, thus triggering the question of 'are we doing the right things?'. *Triple loop learning* is characterised by a reflection of the core values, purposes and principles, which serve as a context and foundation of processes through taking a deeper look at the question 'how do we decide what is right?' (ibid.). *Triple loop learning* articulates how the notion of 'right' is informed, i.e. it opens up for the role of values and power in shaping understandings and actions (Reynolds 2014). Learning loops can be used to articulate if learning is about concrete issues, contextual/organizational questions or, instead, power dynamics.

Another key question is who is learning. To embed learnings in organizations (Scholl et al. 2018), PIL should focus not only learning among participants but also on *organizational learning* (Senge 1990; Crossan et al. 1999, 2011). The concept of *organizational learning* is entangled with the idea of organizational change: it is about understanding how new ideas and practices emerge and can be supported in an organization, but also how new ideas and practices can transform structures and procedures (ibid.). It is essentially about creating opportunities within organizations for people to learn as well as to act upon such learning (Argyris and Schön, 1974). *Organizational learning* demands supporting single individuals and groups in embracing a more reflexive practice, which requires to overcome several defensive routines (Argyris 1990) and to recognize one's own and/or group's own bounded rationality (Simon 1991). It is a process that needs to consider institutional complexity (Olsen 2009), and thus the need to continuously adapt learning approaches and focuses. Moreover, there is also the issue that organizational structures and routines tend to rule out and discourage learning by providing little space for reflection and improvisation (Senge 1990).

In order to understand if and how learning moves in an organization and becomes change, it may be possible to use the notion of *translation*. Czarniawska and Joerges (1995) describe organizational change as a process of *translation* through which ideas materialize into procedures and objects, and by doing so allow (or neglect) space for specific ways of thinking and doing (ibid.). They understand organizational change as an organic process that often emerges as the result of multiple actions and intentions happening at different levels in the organization: it is not enough if an idea is promoted or pushed only by the management or by employees; rather, it needs to be recognized and promoted at the same time on different levels (ibid.). In this perspective, *translation* can be looked upon as the process that leads to the materialization of learning into actions, documents and procedures. Callon (1986) describes *translation* as a collaborative effort that entails interactions among different actors as well as material artifacts: through these interactions, ideas are mutually developed and appropriated, thus leading to change in relationships, understandings and practices (Freeman 2009). Callon (1986) identifies four phase in *translation*: (1) *problematization,* i.e. the formulation of an issue and the network of actors and objects around it; (2) *interessement,*i.e. the negotiation through which possible shared interests among actors are negotiated; (3) *enrolment*, i.e. the alliances that might emerge if interessement is successful; (4) *mobilization of allies*, i.e. the ability of the enrolled actors to introduce new ideas and practices in their own networks by mobilizing actors and objects and reworking given relationships among them.

…AND THE ROLE OF DESIGN

The connection between experimentation and learning is at the core of design (Schön 1984). Design can be understood as an inquiry process in which the designer learns about a specific situation (problem framing) and then, from this learning, she develops possible answers to it (problem solving). Moreover, the participatory design/co-design tradition (Simonsen and Robertson 2012) provides an understanding of how to support learning among different participants by looking at collaborative design processes as a matter of mutual learning (ibid.). While designing together, participants learn about each other and the issue at stake in the process. However, a question that still stands is what kind of approaches and formats are best suited to *translate* learnings developed in PIL in the involved organizations. Botero et al. (2020) have been using the notion of *translation* to lift and to articulate the kind of work of negotiation and alignment among mundane, strategic, methodological and contextual factors that are required to initiate and drive participatory design processes. Building on Czarniawska and Joerges (1995), *translation* appears to be key also in fostering the appropriation of PIL outcomes in ordinary activities. But what does *translation* look like in PILs? And what kind of formats might be used to support it?

A DESIGN INQUIRY INTO INNOVATION LABS

The focus on learning and *translation* is further developed through the case of an innovation lab at municipal level (for now on The City Lab), in which I engaged as a design researcher. In particular, the focus is on the Forum for Citizens Involvement (FCI) that I ran together with a civil servant in the frame of The City

Lab. FCI aimed at fostering *organizational learning* about citizens' participation.

Together with some colleagues, I collaborated with previous innovation labs in the same city. This meant that I had the connections with and trust from the civil servants to be able to advocate for initiate and co-run FCI.

Methodologically, I relied on design practice to generate knowledge (Dixon 2020). The engagement in The City Lab and the establishment of FCI were grounded in the question of how to support *organizational learning* about citizens' participation. The running of FCI not only generated insights about organizing citizens' participation, but also about the struggles of PIL in fostering learning and bringing about organizational change.

The data used for this article include notes, pictures and different kinds of materials generated by participants during the meetings, and the analysis produced by myself and the civil servant with whom I ran FCI. I integrated these data by interviewing the following: the civil servant responsible for participation at the planning department, who was very active in FCI; the project leader of a previous lab, who was engaged in the setting up of The City Lab and then ran one of its sub-projects; and the project leader of The City Lab, who was in charge of it for one and half year. The interviews were done individually one year after the conclusion of The City Lab. The official City Lab evaluation report about learning was also analysed.

THE CITY LAB AND THE FORUM FOR CITIZENS' INVOLVEMENT

The City Lab (September 2016- December 2019) was financed by European Structural Funds (ESF) and the National Innovation Agency (NIA). It had a budget of 7.3 MLN euros and was a significantly large project for the city. It focused on sustainable city development and the creation of new ways of working. Several departments of the city were involved in its activities and on its board.

The City Lab built upon a previous externally financed lab (2013-2015). The Previous Lab focused on peripheral neighbourhoods that present a number of socio-economic challenges and that are also in need of physical renovation. The Previous Lab was run by the environmental department and involved different city departments, property owners, energy companies, citizens and universities. It was financed by the NIA program for municipal innovation labs. The Previous Lab developed a number of experimental projects through which some key challenges[1] for the development of a sustainable city were identified. Among them were the need for creating a learning structure within the municipality and spreading ways of working based on citizens' and other actors' needs.

The City Lab was a continuation of the Previous Lab and had a clear focus on these challenges. The NIA program for municipal innovation labs included more cities, but less funding was available. Consequently, the environmental department decided to seek additional funding. The opportunity was found within an ESF program, of which several parts of the city were interested in. A fast-growing population and the political decision to densify the city placed pressure on several departments to deliver new planning processes and to engage with land and property owners for quickly building sustainable and affordable housing. Additionally, under 2017, because of an internal reorganization, local area departments would be dissolved. There was an interest to pursue funding for maintaining and disseminating local city platforms to facilitate the interaction between citizens and the city. Centrally[2] it was decided that these different interests had to be consolidated into one large project to be led by the environmental department. A couple of civil servants at the environmental department wrote the funding application in collaboration with the planning department, the city office, the work and social department, the building department and the south area department. The outcome was a huge and complex project focusing on the planning and creation of sustainable housing by experimenting with new ways of working, including alliances across sectors, citizens' participation and norm-critical approaches, and new models for measuring value. The project comprised a number of sub-projects: five planning processes in different areas; a thematic track on sharing economy; the maintenance and/or creation of six local platforms to facilitate interaction between city functions and citizens[3]; the creation of an innovation platform that, by supporting the other processes, would facilitate innovation processes driven by external actors and would develop a structure for innovation and learning within the city; an evaluation and learning track in collaboration with local universities; a network about

[1] The seven identified challenges as described in the ESF project application: 1. Innovations do not spread in the municipal organization; 2. Low engagement of property owners; 3. Those who have a need and those who innovate do not meet; 4. Financing models and value measure models with a holistic perspective are missing or are not used; 5. Learning structures are missing or are not used; 6. The lack of a norm-critical perspective means that competences are not valued, and needs are not fulfilled.

2 My informants could not recall exactly how that decision was taken, but it involved representatives from the City Office and its political board.

3 This activity of the project was eventually cancelled because after the dissolution of the local departments it became difficult to reallocate its responsibility.

housing access across city departments; and a trans-sectorial forum about sustainable and affordable housing.

At the start The City Lab lacked a project leader. The Previous Lab project leader refused to continue in that role: *"The project was too big, and I could not see the whole picture...We got lost in the money, unfortunately."* An external consultant, a former civil servant from the environmental department, acted as temporal project manager for six months, until a project manager was enrolled. She was new to the city, but had previously worked within the public sector with sustainability issues. She applied to the role because *"The City Lab seemed to have the resources and mandate to actually bring about the change needed to create a sustainable city."* When she started, some of the sub-projects were still missing a project leader. Because of a chronic lack of personnel within the departments and the logics of external financing, new people were hired to drive the sub-projects, rather than use internal staff. Though these new personnel were passionate about their work, they often lacked an understanding of the organization's structures and logics. The project leader emphasized how it was difficult even for her, as a newcomer, to navigate relationships across the departments.

Despite the collaboration with the writing of the application, issues related to the mandate and understanding of the lab emerged at the onset of The City Lab. According to the project leader, *"it took half of the project time to get the different departments' directors* (sitting on The City Lab board) *to discuss not only the 'what', but also the 'why' of The City Lab."* A number of middle managers from the various departments had reservations about the project. It was *"seen as something coming from the side"* and thus not being prioritized (or worse considered a threat). According to the project leader, a main issue was the lab's positioning: *"I think the choice of placing the leadership at the environmental department was wrong. Given the themes and ambitions, we should have been placed centrally at the City Office."*

Another issue was the size of the project, which included around 60 people. Ordinary management activities did not leave the project leader and the leading group much time for developing relationships with ordinary activities. Moreover, the administrative work required by the financing body was very time consuming.

I joined The City Lab as a researcher in September 2017, one year after its commencement, and I was part of the learning track. Together with the secretary of The City Lab, we took the initiative for the Forum for Citizens' Involvement (FCI). The goal was to support learning across departments and between The City Lab and ordinary activities regarding citizens' participation and norm-critical perspectives. Initially, the leading group wanted FCI to focus primarily on The City Lab sub-projects and staff. However, we managed to open it up for all civil servants of the city by arguing for the need to connect with ordinary activities and to learn from previous experiences.

The idea of FCI came from the Previous Lab. Some civil servants, with whom I collaborated with at that time, underlined the need for learning about citizens' participation across the city departments. Though one of them initiated such an arena some years before, it soon fizzled out as her manager questioned why she was organizing activities for people from other departments. While working with FCI, we also learned about another arena for citizens' participation that was active in the city between 2008 and 2010. It was run by the head of a library who worked extensively with citizens' involvement. She initiated the arena as it was of great interest to many other civil servants that wanted to work with this topic. Unfortunately, the endeavour ended a couple of years after due to a lack of support from the organization and politicians.

FCI held two-hour meetings monthly. We relied on co-design approaches, and the encounters were structured as workshops in which civil servants were mapping, brainstorming and reflecting together. The point of departure was always a concrete experience: current projects which were in need of some peer support and/or previous experiences which the participants discussed and analysed jointly. One of the meetings was dedicated to mapping participants' own practice in order to identify shared issues. The City Lab secretary and I took care of analysing the outcomes of each session. The analyses were used to build an understanding of current issues in relation to citizens' participation within the city, which was an understanding that we continuously discussed with the participants.

The forum was active for 9 months (Oct 2017-July 2018) and had a total of 7 meetings, engaging 37 participants from the planning department, the environmental department, the city office, the buildings and streets departments, the work and social department, the service department, the waste handling department and some sub-project leaders of The City Lab. The participants were all working with and being passionate about citizens' participation.

FCI did support learning among participants: the new people found it highly fruitful to meet more experienced colleagues and to delve into old projects. The more experienced civil servants found it interesting to learn about peers' situations and identify common struggles across departments. In particular, it materialised that the main challenge was not the lack of methods; rather, it was the lack of an 'infrastructure' to integrate citizens' input in ordinary activities. The experienced civil servants highlighted how – despite the political will of

working with participation – there was a lack of mandate, resources and routines in practice. FCI participants saw the necessity of engaging managers and politicians in discussions concerning resource allocation and structures for participation. The person responsible for participation at the planning office highlighted that *"It was the time when the local area departments were dissolved. People from different departments had the same concern: how do we do now to reach out citizens? In planning and development processes, we don't have time and resources to build local networks. I think FCI supported us in discussing this and in developing a shared formulation, that we* (i.e., the participating civil servants from the technical departments) *could bring back to the city office investigations about citizens' participation ...."* While FCI was running, the city office started an investigation into how to coordinate citizens' participation efforts across the technical departments: some civil servants active in FCI were giving input to this work. The leader of the investigation also participated in some FCI meetings. The investigation became the main vehicle to bring forward the outcomes of FCI: among other things, it suggested the creation of a permanent learning arena regarding citizens' participation and the necessity of having a further investigation concerning how to support local involvement after the dissolution of local area departments. The person responsible for participation at the planning office also forged ahead with some topics that were discussed within FCI. Particularly, she connected a planning process with another city initiative that creates local networks between schools, associations and citizens with a focus on youth. She used one of these local networks to get in contact with local people to gather input for a local planning process.

In summer 2018, while planning the meetings with managers and politicians, FCI was interrupted. Because of the difficulties in running The City Lab, the project leader and other members of the leading group resigned. This necessitated a reorganisation of activities. The priority was to support the sub-projects focusing on planning efforts and the project deliverables.. I took responsibility for writing the deliverable about citizens' participation which was planned to be a set of methodological guidelines. By connecting the learnings from FCI to the planning sub-projects findings and challenges, I shifted the focus of the guidelines from methods to the organization of an infrastructure for participation across departments and rooted in local areas. The hope was that the guidelines would also disseminate FCI outcomes. However, the guidelines remained just a project delivery.

The external evaluation report on learning[4] highlights how The City Lab developed learning in the sub-projects and, to some extent, drove learning activities (like FCI). However, it also points out that without the creation of a permanent learning structure it is difficult to harvest the outcomes of the sub-projects and to ensure continuity in learning. The same conclusion was also reached by The Previous Lab.

(ORGANIZATIONAL) LEARNING AT FCI AND THE CITY LAB

This section analyses what kind of learning emerged in FCI and the limits of FCI and The City Lab in supporting *organizational learning.*

FCI relied on designerly and co-designerly approaches to support collective reflection-on-action (Schön 1984) on ongoing and previous cases. By staging collaborative activities for analysis and reflection in small groups, it was possible to create a constructive and welcoming environment that fostered mutual learning (Simonsen and Robertson 2012) among participants.

Past projects triggered learning much more than current ones. Defensive mechanisms (Argyris 1990) were less strong in discussing old experiences, thereby allowing for *double loop learning* to emerge (Argyris and Schön 1974). Different approaches could be confronted to resonate their strengths and weaknesses. Instead current City Lab sub-projects were often in their early stages and focusing on 'doing things right' (*single loop learning*) and were only partially opening up for 'what is the right thing to do' (*double loop learning*) (Argyris and Schön 1974). The pressure of having to deliver within a given time frame (Fred 2018) and the lack of knowledge about the context made it difficult for some sub-projects leaders to critically reflect on their own processes. Moreover, it was possible to trace *organizational learning* by looking at the legacy of some of the past experiences. It materialized that despite 'successful' results most of these experiences did not impact ordinary activities. The discussion focused increasingly on structures, mandate and power dynamics within and across departments, rather than on methods (i.e., *triple loop learning*) (Reynolds 2014). An organizational focus on participation was also present in the frame of the City Office investigation (formulated by politicians and focusing on cross-departmental coordination) and clearly in the outcomes of the investigation, which also highlighted the importance of

[4] To ensure confidentiality these reports are not referenced in the paper but can be provided to the reader upon request to the author.

learning structures across departments concerning this topic.

FCI did support learning at 'the periphery' (Schön 1971) among civil servants that were passionate about and worked with participation. A weakness was the lack of critical voices. We unsuccessfully tried to engage civil servants that saw participation as one of the many issues that city planning and development needed to deal with. Their participation would have helped in positioning participation work in relation to other issues. We also failed to support learning at 'the centre' (Schön 1971). Though we planned to involve managers and politicians, we were without a means to reach out to them. Overall, FCI lacked the legitimacy to engage people in learning – a legitimacy that was supposed to be ensured by the City Lab.

The City Lab was originally conceived for, among other things, creating learning structures. However, the running of the subprojects, the managing of a rather large organization and the heavy reporting work required by the financing body left little or no resources and space to engage with this issue. According to project leader, "*We would have need to be a much smaller team with some people having a deep understanding of dynamics across departments. We should have been focusing only on the challenges and have had more time."* Notwithstanding practical issues, learning was hindered because The City Lab struggled to be recognized as a support for learning and innovation. The project leader underlined that its leadership should have been positioned more centrally in the organization. Though a more central position might have helped with the formal legitimacy of the City Lab, it probably would not be enough to ensure a successful *translation*.

TRANSLATION AT THE CITY LAB AND FCI

This section articulates *translation* at The City Lab and FCI through the lenses of Callon's (1986) four phases: (1) *problematization,* i.e. the formulation of an issue and the network of actors and objects around it; (2) *interessement,* i.e. the negotiation through which possible shared interests among actors are negotiated; (3) *enrolment*, i.e. the alliances that might emerge if interessement is successful; (4) *mobilization of allies*, i.e. the ability of the enrolled actors to introduce new ideas and practices in their own networks by mobilizing actors and objects and by reworking given relationships among them.

The project leader reflects, *"I felt we weren't prepared and didn't have the tools to deal with the fact that the city is structured in different departments that have different political boards and thus different goals."* The lack of knowledge about the organization and approaches to deal with its nature made it difficult to identify people, objects and questions that could trigger shared *problematization* and *interessement* about learning. The involvement of different departments during the application phase focused on resources to run activities. Learning ambitions required a new shared *problematization*, which took almost half of the project time, leaving little time and resources to actually work with learning. Moreover, The City Lab's predefined sub-projects and goals implied a lack of flexibility to adapt to different contingent needs and situations within the departments.

Within FCI, we partially managed to *translate* some of the learnings, thanks to the engagement of the person responsible for participation at the planning office and the civil servant running the investigation about coordinating participation work. A shared *problematization* (i.e. organizational aspects of participation work) led to a partial *enrolment* of both these people. With FCI, we focused on understanding the background and conditions of their roles and tasks and frame FCI activities (and outcomes), so that they could be useful for their activities(*interessement*). This negotiation led to a quite stable alliance with the person responsible for participation at the planning office and a more fragile one with the person running the investigation (*enrolment*). It was only at the very end that we knew if and how the outcomes of FCI were integrated in the investigation.

The *enrolment* of the city planning participation's responsible led to a missed *mobilization*. Because of the interruption of FCI, we missed the opportunity to support her experimentation within ordinary activities, which was a unique opportunity to develop *organizational learning* about participation in the planning department. The integration of some FCI outcomes in the investigation can be considered as a partial *mobilization* It lifted the importance of further work on infrastructures for local participation. However, due its limited time and focus it didn't provide any indication on the characteristics of these infrastructures nor on how the further work should be carried out.

LIMITS OF PROJECTS AND LABS AS A FORMAT

Some of the struggles of The City Lab in supporting *organizational learning* and *translation* relate to the fact that it was organized and financed as a project.

Projects as temporal ad-hoc efforts organized outside ordinary activities have been already criticised for being unable to foster change in public sector ordinary activities (Fred 2018). Predefined activities (and deliverables) made it difficult to develop ad-hoc *organizational learning* efforts and to drive the negotiations that *translation* required. External financing worsened the situation (Fred 2018) because it

entailed two different commitments: towards the city and towards the financing body. The commitment to the financing body, with its rules and procedures for reporting and controlling the advancement of the project, was not compatible with and tended to override the commitment to the local and contingent needs that emerged along the way. Moreover, external project funding gave freedom to The City Lab, but it also implied a lack of regular interactions with the departments and their political boards.

In addition, traditional formats for anchoring were not sufficient for driving *translation*. A formal mandate and a board with different departmental representatives did not ensure the actual legitimacy of The City Lab to mobilize people and procedures in the departments in experimental and reflective activities. FCI was unsuccessful in this mobilization, despite the fact that it had a bottom-up legitimacy. Czarniawska and Joerges (1995) remind us that the possibility (and impossibility) of organizational change is not ensured by a formal top-down mandate nor by a bottom-up legitimation, but rather by a continuous process of mobilization and negotiation of ideas, practices and relationships across different levels.

In addition to issues related to the project format, the struggles of The City Lab reveal some limits of PIL as a format. The idea of the lab as "an innovation milieu" (Tõnurist et al. 2017) turned out to be problematic. With FCI, we had to argue for using older cases and to open up for participation beyond former City Lab members. These two choices were key in fostering more in-depth learning and connecting to ordinary activities. Yet, they also challenged the identity (and idea) of The City Lab as the context where innovation takes place and with the people who have the capacity and mandate to do that. More generally, the case highlights how the idea of the innovation lab as a protected niche (Kemp et al. 2008) can be detrimental in a context that requires an ongoing engagement with ordinary activities (Schön 197; Parsons 2006; Olsen 2009).

Moreover, there is an issue with how experimentation and learning are generally framed in PILs. Most of The City Lab sub-projects were focusing on experimenting with developing new methods and solutions together with external actors. According to a learning-by-doing philosophy, they were seen as a pre-requisite to be able to drive *organizational learning*. However, as mentioned, this left little time and resources to actually engage with ordinary activities. Despite its ambition to systematically improve procedures and embed results in ordinary activities, The City Lab delivered, yet again, ideas and methods about ways of working. This discrepancy resonates with the fact that PILs are mostly taking inspiration from ideas, methods and environments developed for commercial innovation, which aims at fostering processes of creative destruction (Schumpeter 1994) for the development of new solutions. This idea encourages bold and explorative experimentation in which learning is instrumental to the creation of new products, services and/or ways of working. According to this perspective, existing structures, procedures and cultures are something to trespass, rather than to engage with.

All in all, The City Lab points at how the PIL format needs to be advanced to embrace the nature of public sector innovation as an evolutionary, rather than disruptive, process (Schön 1971; Parsons 2006; Olsen 2009) in which learning needs to be instrumental to create the capacity to adapt besides to image new possibilities. On the whole, PILs need to develop ways to engage with ordinary activities – an engagement that is as complex as the one with societal challenges (Olson 2009) and that requires specific approaches.

EXPERIMENTING, LEARNING AND TRANSLATING WITH(IN) ORDINARY ACTIVITIES

Learning is confirmed as a central topic for fruitfully engaging with institutional complexity (Agger Eriksen et al. 2020). PILs' activities should systematically focus on *single, double and triple loop learning* (Argyris and Schön 1974; Reynolds 2014): that is, addressing concrete questions about methods and ways of doing, considering contextual and organizational aspects, and unravelling how views and power dynamics are shaping organizational structures and allowing for or neglecting certain practices in order to identify opportunities and hinders for *translation.*

There is also the need to advance "traditional" formats for experimentation and learning in PILs to explore how to engage with(in) ordinary activities on the side of driving more cutting-edge activities outside regular structures. This demands light and adaptable formats that can be easily integrated into ordinary procedures of planning, executing and reporting activities. Priority should be given to be as close as possible to ordinary activities, with a focus on fostering experiments and reflection that can actually be carried out within ordinary activities. It is important also not to forget the value of previous experiences (like previous attempts at integrating experiments outcomes) in fostering learning.

PILs need both bottom-up and top-down anchoring to have the mandate and trust to engage with ordinary activities (Czarniawska and Joerges 1995). There is the need to recognize *translation* as its own process: one that requires dedicated approaches and resources. To act within ordinary activities demands not only a deep understanding of current institutional settings but also supporting organizations in recognizing, identifying and formulating learning needs (i.e., *problematization*). This means identify questions that are relevant from an

ordinary activities' perspective, unravelling them in relation to methods, organizational and power dynamics aspects (Argyris and Schön 1974), and finding a way to express them so that they trigger possible experimental activities outside or within ordinary activities. This demands active *enrolment, interessement* and *mobilization* of people and objects. Besides this initial effort (Botero et al. 2020), *translation* needs to be continuously sustained as a matter of fruitfully engaging with situated organizational cultures and power dynamics to *problematize* experiments and their outcomes in ways that *enrol* people and objects and lead to their *interessement,*and provide them with the capacity to mobilize others further.

On the whole, this entails a humbler way of operating that relies on the action of people within ordinary activities. In this perspective, PILs become a support to others' doing rather than the milieu and people that drive action.

An engagement with(in) ordinary activities also entails a stronger connection to political steering. This would help to avoid possible risks of PILs becoming a technocratic instrument serving the interests of the few (McGann et al.2018). A tighter engagement with political steering and bodies opens up for exploring the potential of collaborative experimental processes as a complement to traditional investigations in delivering input to political boards to decide about different questions.

A focus on *experimentation*, *learning* and *translation* with(in) ordinary activities should complement rather than substitute more "traditional" cutting-edge experimentation outside ordinary activities. Further research is needed to identify which questions and local conditions are better treated outside or with(in) ordinary activities, or with a mix both.

CONCLUSION

Innovation in the public sector has been recognized as a process that requires opportunities for ongoing learning to address institutional complexity and the intractability of many societal issues (Schön 1971; Parsons 2006). PILs primarily focus on addressing societal issues, and they tend to lack understandings and approaches to engage with *organizational learning* (Senge 1990; Crossan et al. 1999, 2011) and *translation* (Czarniawska and Bernward 1995).

By building on insights from The City Lab and on theory on public sector innovation, the article describes some of PILs' limits in engaging with *organizational learning* and *translation*. It suggests to integrate current approaches with efforts for experimenting, learning and *translating* with(in) ordinary activities. These efforts require dedicated approaches, formats and resources to engage with people, objects and procedures in ordinary activities and with the political dimension of public organizations.

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NORDES 2021

Paper Session 5

Weavings

Session Chair | Karen Marie Hasling

Fibre, Fabric, and Form: Embedding Transformative Three-Dimensionality in Weaving
Kathryn Walters (F)

Between Yarns and Electrons: A Method for Designing Textural Expressions in Electromagnetic Smart Textiles
Erin Lewis (F)

Prototyping Scales of Knitwear Design for Sustainability
Louise Ravnløkke (F)

NORDES 2021

FIBRE, FABRIC, AND FORM: EMBEDDING TRANSFORMATIVE THREE-DIMENSIONALITY IN WEAVING

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ABSTRACT

Textiles, and textile objects, no matter their scale, retain traces within their expression of the fine-scale fibre or yarn from which they are formed. Woven textile forms are typically constructed using hierarchical cut-and-assemble techniques, where the expression at the fibre-scale may be subsumed by that of the dominant form expression. Through experimental design research, a framework for designing non-hierarchical woven textiles has been developed, which navigates between 2D and 3D thinking and micro- and macro-scale design elements. This framework is contextualised through three methods for embedding three-dimensional form in a textile as it is woven: Catenary Structure, Tension Folds, and Expanding Layers. An example is presented for each method, and the design of these multimorphic textile-forms is discussed, alongside the variable nature of scale in the digital textile design process. The framework exposes the multimorphic nature of woven textile-forms, and provides a lens for understanding their design process.

INTRODUCTION

Woven textiles can be viewed through different scales: the micro-scale of fibre, yarn, and structure, and the macro-scales of fabric and form (Castán Cabrero, 2019, p.17; McQuillan, 2020, p.354). The micro-scale is that at which weave bindings are designed: the intricate interlacement of warp and weft. Textile design also occurs at the scale of the fabric, where patterning and texture emerge. This fabric scale is inextricably tied to the method of production, and so it is also the scale of the loom.

TEXTILE FORM ...

Textiles are both objects of design, and material for design. As material for design – fabrics – they are treated as formless materials: "filler[s] of form" (Oxman, 2010, p.78). This hierarchical design process – the "formal approach" (Heimdal et al., 2012, p.1) – treats form and material as two distinct entities (Landahl, 2015, p.9), in which textile design and object design occur sequentially. In the formal approach, the structure or form is designed before "defining materials requirements" (van Bezooyen, 2014, p.282) in which an existing textile is selected. The fabric is transformed through cut and assembly methods, integrated as form into the structure of the new design. Its materiality – the form and structure of the textile as object of design – is subordinated to its role as 'skin' (Nilsson, 2015). Thus the formal, hierarchical approach produces a façade, and in doing so conceals its structure (Semper, 1989, cited in Jeffries and Conroy, 2006, p.235).

However, a non-hierarchical approach – "formgiving" (Heimdal et al., 2012, p.1) – provides an alternative. Writing on the relationship between form and function in architecture, Behne describes a progression from façade to "shaped space" and "designed reality" (1923/1926, cited in Smith, 2014, p.57). He writes of a building, that it "was an indivisible, unbroken whole… The building was itself form, it needed no forms" (p.59). With similar effect, textile design may produce three-dimensional form through a non-hierarchical process. In this process, material and form are produced simultaneously (Landahl, 2015), creating a 'textile-form' (McQuillan, 2020, p.19). This is common in

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knitwear, through whole-garment and fully-fashioned knitting. Underwood (2009) and Kalyanji (2020) have researched a wide range of knitted non-garment three-dimensional morphologies.

Harvey et al. (2019) describe the design and production process for weaving textile-forms on a specialised 3D loom. Their 'library of tendencies' is analogous to Underwood and Kalyanji's morphology research, demonstrating basic possible behaviours or forms through this technique. Such 3D looms are set-up specifically for production of multilayer structures, and shuttle weft insertion enables partial row weaving. These looms are, however, rare, limited to narrow weaving widths, and the design process is complex.

Research in weaving textile-forms on conventional (2D) looms has primarily been carried out in textile technology and engineering, and is focused on preforms for composite manufacturing (e.g. Mountasir et al., 2015; Geerinck et al., 2019). These take the form of geometrically-shaped hollow spaces running in either weft or warp direction throughout the textile, producing deep honeycomb or grid structures.

This geometry, characterised by architectonic morphologies based on the rectilinear logic of warp and weft (Smith, 2011), also occurs in non-garment textile-forms in art and design, as in Lucy McMullen's Maelstrom (in Hemmings, 2012). Whole-garment weaving approaches such as those of Issey Miyake and Dai Fujiwara's A-POC Queen Textile (1997) and Jacqueline Leffert's Gestalt Process (2016) break away from the grid of the loom, and create simple two-layer pockets, relying on the enclosed body to provide form to the textile. However, methods for generating more organic morphologies in three-dimensional loom-woven textile-forms is under-researched.

... AND SCALE

In hierarchical design processes, the scale of the form may be vastly different from that of fabric or fibre (Heimdal et al., 2012). From tiny doll clothes to huge architectural and geo-textile applications, textile objects encompass a wide range of sizes and scales. Through the hierarchical design process, which transforms the materiality of textiles into façade, the scales of fibre and fabric are subsumed in the dominance of form. But in non-hierarchical textile-forms, as fibre interlaces to build fabric, it simultaneously creates form. Thus, the scales of fibre, fabric, and form are linked.

This intertwinement of scales requires multimorphic thinking during the design of woven textile-forms. Multimorphic objects can be "read and understood at many scales, axis [sic], and dimensions simultaneously" (McQuillan, 2020, p.352). During the design process, weave structures must be developed that enable the unfolding and transformation of the textile from 2D to 3D. Flat artwork files encode multiple layers in the textile-to-be, while digital design tools dissolve senses of scale and materiality (Oxman, 2010). During the design process, a textile-form occupies the scales of fibre, fabric, and form, all at once. Thus there is a need for methods in textile design that consider and unify the disparate scales.

Through experimental design research, a framework has been developed for woven textile-form design which integrates the micro- to macro-scale elements in the design process. To contextualise this framework, this paper presents and discusses three examples, each representing a different method for producing three-dimensional woven textile-forms. They embody multimorphic thinking, demonstrating the relationship between fibre, fabric, and form. Their transformations from 2D to 3D reveal time as a critical element in textile-form design.

RESEARCH PROGRAMS AND EXPERIMENTAL WEAVING

Binder and Redström describe a research program as a "provisional knowledge regime… a hypothetical worldview" (2006, p.4) against which the results of research are assessed. As Redström (2011) describes, the design research program and its experiments evolve together, influencing, challenging and transforming each other. Thus theory and knowledge in experimental design research are derived through the interaction between the experiments and a design research program. Theory is brought in to the research program to contextualise the experiments, and findings are expressed through experimental examples, or exemplars (Bang and Eriksen, 2014; Krogh et al., 2015). The framework and three methods presented in this paper form a set of such exemplars.

The ongoing design research program which gave rise to the experiments seeks to develop new morphologies and behaviours in woven textile-forms. In this context, textiles are viewed as systems consisting of fibre/yarn material/s, properties relating to their construction (weave bindings, layer structures, density, etc.), and the effects of finishing techniques. The textile as system has behaviour and form that are the result of the combination and interaction of its component elements (Tandler, 2016).

The textile-form system requires a multimorphic design process, as changes to any one element has consequences for the whole system. This gestalt property (Rawlins, 1953, p.49) necessitates that the design process for woven textile-forms constantly shifts between 2D and 3D thinking, and between micro- and macro-scales. Figure 1 illustrates a framework for woven textile-form design.

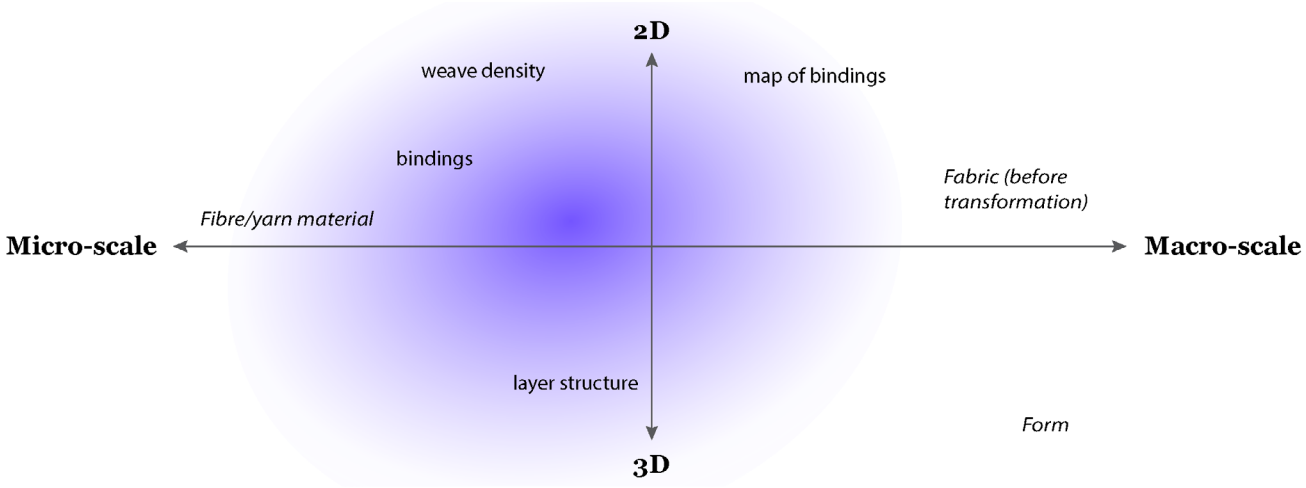

Figure 1: A framework for the design process for woven textile-forms. It shifts between elements at micro- and macro-scales, and between 2D and 3D thinking. There is no linear path between design elements, as changes to one have flow-on effects for the whole. This multimorphic design process is represented by the zone of colour, with its focus between layer structure and bindings, the elements manipulated during the digital design stage.

The research program is conducted through experimental weaving. This method uses CAD/CAM (computer-aided design/manufacturing) in the form of digital weaving software (ScotWeave) for programming, and computer-controlled jacquard power looms for the weaving of experiments.

Each experiment begins with an idea, perhaps about a combination of materials, or a particular structure. This is developed through quick sketches, diagrams, and notes. These provide the bulk of the information required to program the design in software. During the programming stage, these plans may be adjusted as the process reveals or suggests changes. Once a loom-ready file has been produced, a few notes on technical elements (weave density, weft selectors) are all that is required to produce the textile. Even during weaving, changes may be made, for example, density may be adjusted, or yarns exchanged, as the weaving process itself provides new information on the experiment while it develops.

DIGITAL DESIGN AND THE DISSOLUTION OF SCALE

CAD tools such as weaving software may offer shortcuts, technical assistance, and simulations, but they can also impose specific processes and procedures requiring certain ways of thinking (Dormer, 1997, p.146). As tools designed to aid hierarchical design processes, they act to dissolve senses of scale and materiality (Oxman, 2010). In weaving software, bindings are programmed in draft notation (Figure 2). Layers may be programmed separately, while the software does the work of integrating them. But the square grid, representing intersections between warp and weft, does so without consideration of material or scale. The relationship between draft and woven fabric – the textile system – is dematerialised. This dematerialisation is not unique to digital design, occurring when drafting by hand as well. But design processes involving direct interaction with the material, such as yarn wrapping and sampling, remain distanced from digital design, separated by the barrier of the screen.

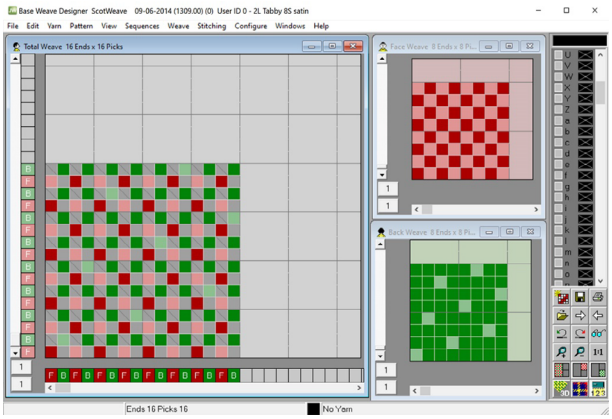

Figure 2: Screenshot from ScotWeave jacquard base weave module showing the design screen for double-weave binding, with face and back layers designed separately.

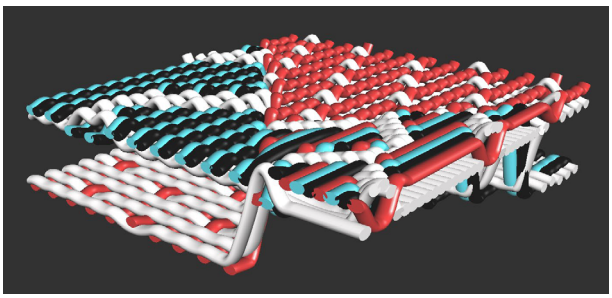

Figure 3: Screenshot from ScotWeave jacquard design module showing a 3D yarn path simulation in a jacquard design in a section with weave transition from single- to double-layer.

The software compiles the bindings into a design file when combined with the weave artwork or "map of bindings" (McQuillan, 2020) – a 2D plan in which each colour indicates a different weave structure. ScotWeave offers a 3D view at this stage, in which small sections of the design may be viewed as yarn interlacements (Figure 3). This view enables confirmation of structure and yarn sequence. However, these 'yarns' are plastic, interlacing and separating perfectly. Once again, the materiality of the textile is absent. Furthermore, the lack of reference dissolves all sense of scale. When enlarged on the monitor, it can be easy to forget that a section being viewed may occupy less than a centimetre once woven. Meanwhile the plasticity of the simulation distorts and misrepresents the relationship between layers.

CAD software may enable complexity in design, but in doing so it strips away the materiality and scale that actually make up the textile. The complex behaviour that enables transformativity in flat-woven textile-forms cannot be reproduced in these hierarchical design environments. Instead, they must be made tangible in their specific materials and scales, embodied through weaving.

RESULTS: 3 METHODS FOR WOVEN TEXTILE-FORM DESIGN

CATENARY STRUCTURE

This first example, shown in Figure 5, was developed as part of a series of experiments combining paper-tape yarn with wool yarn, to explore the effect of fibre and finishing on textile behaviour and form. It was designed as a two-layer pocket, closed on all sides by a single-layer binding. The bottom layer was woven with a wool yarn weft, in a loose satin binding. The top layer was woven with linen and paper-tape yarn wefts, in a circular pattern of satin bindings from loose in the centre to tighter near the edges. It was woven on a jacquard loom with a cotton warp and four 40cm repeats across the loom width. The repeats were separated into four samples in order to test different treatments. One sample was put through a 95°C machine wash cycle, and left to dry hanging upside down, fixed to a board by the four corners. Figure 5 shows the design elements of this example mapped against the framework presented above.

This form-making method works by creating a surface that is first pliable and shaped by hanging, then hardens to support the form. In this example, the felting caused by the washing process shapes both layers differently due to their different fibres and fabric structures. The interaction between the reshaped layers affects the specific three-dimensional form at the small-scale, meeting and combining with the gravity-induced arch at the large-scale.

There is a continuity between the micro- and macro-scales in the way they both build and express the form. While the potential for form is encoded in the micro-scale of fibre, yarn, and structure as it is woven into the macro-scale of fabric, this form is only latent until the fabric is finished through the washing and drying process. As it is the interaction at fibre and fabric scales that enable the three-dimensional form, the form retains traces of both scales in its expression (Figure 4).

Figure 4: Form and expression at the micro-scale of the fibre.

This expression reveals the relationship between the scales of fibre, fabric, and form. While the wool felted evenly across the width of the two-layer area, the paper yarn only partly felted, and pulled out of the binding in areas with looser interlacement. These traces expose the construction of the fabric, while the crumpled surface at the front of the form reveals its origin in the flatness of fabric. This intertwinement of scales is intrinsic to the woven textile-form, yet the digital design process deals only with the small-scale.

Thus the three-dimensional form is a result of the interaction of the fibre properties, the fabric (weave structures), and the two finishing processes. Interaction between these elements occurs at both fibre and fabric/form scales, such that changing any one element would result in a different form. The precise expression of the textile is an emergent property because of this interaction across scales. Repeating the same process with one of the other samples would likely have produced a similar three-dimensional shape, but the specific clumps and tufts of paper, texture, and fabric folds would have been quite different. It is an example of what Foote describes as "certain, repeatable processes leading to uncertain, non-repeatable outcomes" (2017, p.18).

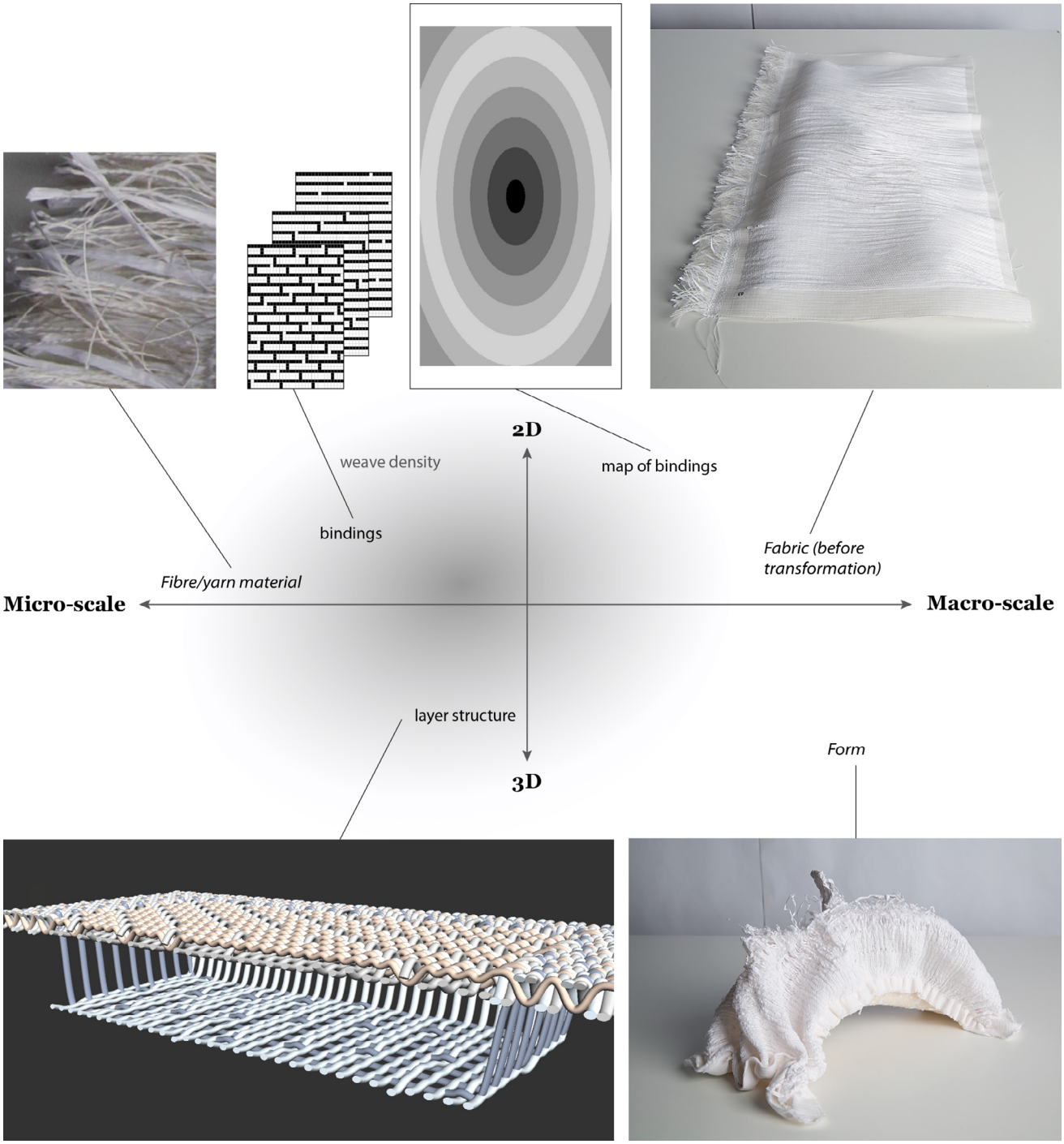

Figure 5: The design elements of the Catenary Structure mapped against the design framework.

TENSION FOLDS

The second example (Figure 6) resulted from a more developed set of experiments, exploring the potential for the paper yarn to support three-dimensional form without wet-finishing. It was designed as two-layer tubes, with crossed patterns of folds, separated by vertical bands of a single-layer binding. This piece was woven on the same cotton-warped loom, but the repeats were not separated. The bottom layer was woven in a loose compound satin, with elastic on the bottom and polyamide (blue) on the inside. The top layer was woven in compound bindings, with paper-tape yarn on the face and the same polyamide on the inside. Folds were created through paper yarn floats – on the outside for mountain folds, and on the inside for valley folds. The valley folds can be seen on the outside of the textile-form as blue lines. Figure 6 shows the design elements of this example mapped against the framework presented above.

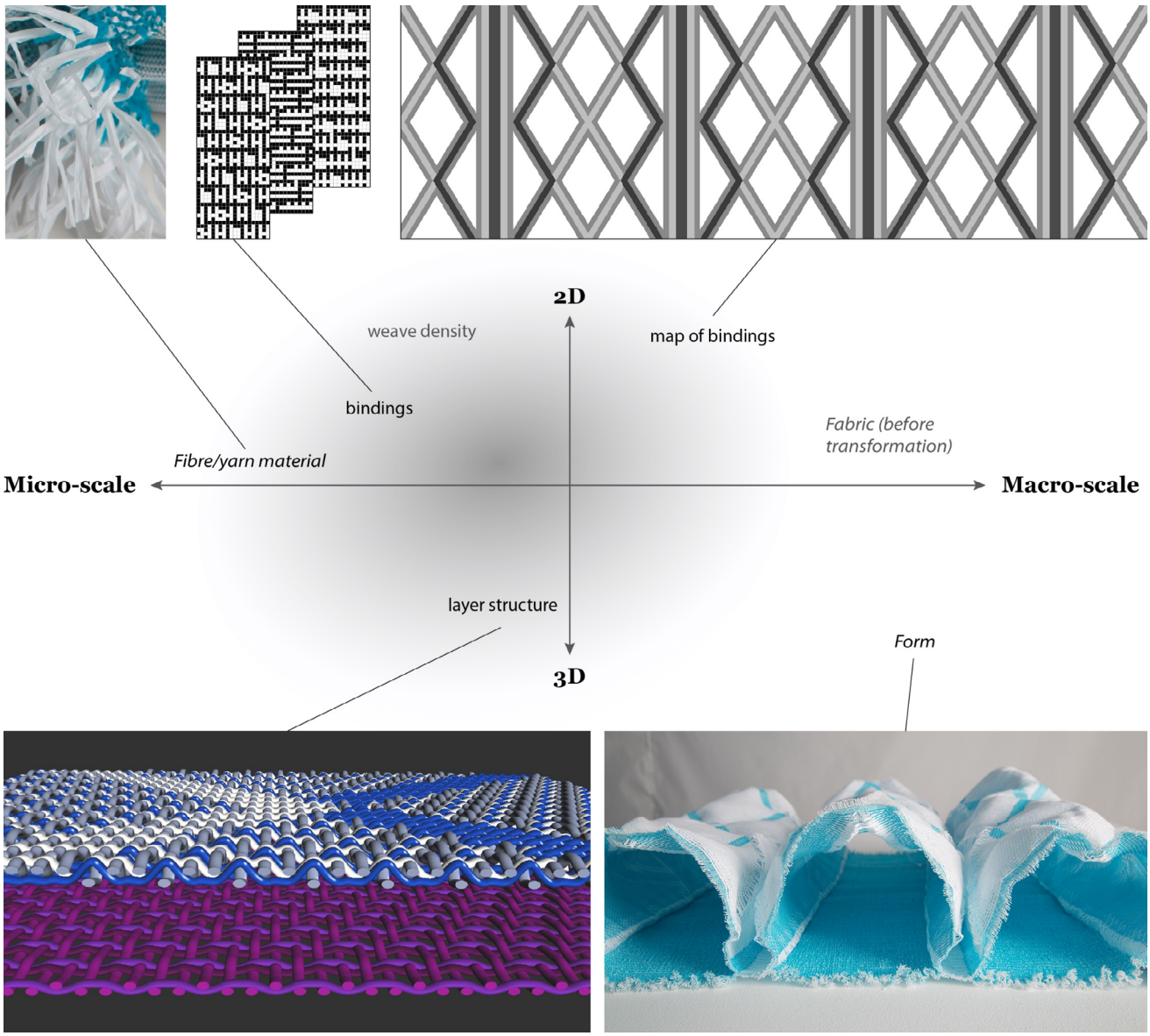

Figure 6: The design elements of the Tension Folds example mapped against the design framework. There is no 'fabric' element, as the elastic begins to shrink and the textile to form even while on the loom, as the tension holding it flat reduces.

This form-making method is reliant on the stiffness of the paper yarn folding under tension. The fold lines designed into the structure of the fabric guide the release of tension selectively, shaping the form. In this example, tension is provided by the elastic lower layer. The intersecting diamond fold structure provides self-reinforcing stability.

There is a sharp division between the way the micro- and macro-scale elements are expressed in this example. All the elements that build the form have been embedded at the fibre and structure micro-scale, at the design stage. The fabric and the form are constructed simultaneously, as the elastic begins to shrink even before the textile is removed from the loom (thus there is no 'fabric' element shown in Figure 6). This results in the subordination of the fibre-scale expression in the textile-form, which remains only as colour and texture in the macro-scale fabric.

Therefore there is a discontinuity of expression between fibre and fabric scales: The dominant expression is of the fabric and form. This expression is interrupted at the mountain folds, where the paper yarn breaks from the fabric surface. As the fold occurs at slightly different locations on each weft, a visual disjunction is created. This effect is dependent on the specific scale of the paper-tape yarn, which is significantly larger than the other yarns in the textile-form, making it closer in scale to the fabric surface it disrupts.

Similarly to the previous example, the transformation of this textile-form from 2D to 3D is the result of the interaction between elements at the scale of fibre and fabric. The use of elastic yarn removes the need for finishing as a transformative technique. While steaming encourages the elastic and polyamide yarns to shrink fully, the textile-form exhibits three-dimensionality as soon as it is cut from the loom.

EXPANDING LAYERS

In contrast to the previous two methods for creating three-dimensional form in woven textiles, the Expanding Layers method requires cutting the textile-form in order to release three-dimensionality through unfolding layers. This method is exemplified here by the Feldspar Dress (Figure 7), developed during a collaborative project with fashion design researchers Holly McQuillan and Karin Peterson (the project is described in full in McQuillan et al., 2021).

The Feldspar Dress was woven on a single-repeat jacquard loom with a fine polyester warp, and polyester and heat-activated shrinking yarn weft. It was designed as a single piece of woven fabric, with areas of two, three, and four layers. Some layers allowed it to be cut and separated into a front and two backs (separating as shown in the map of bindings in Figure 7). Other layers were cut to open up the 12 godet pleats in the skirt (see paper model in Figure 7).

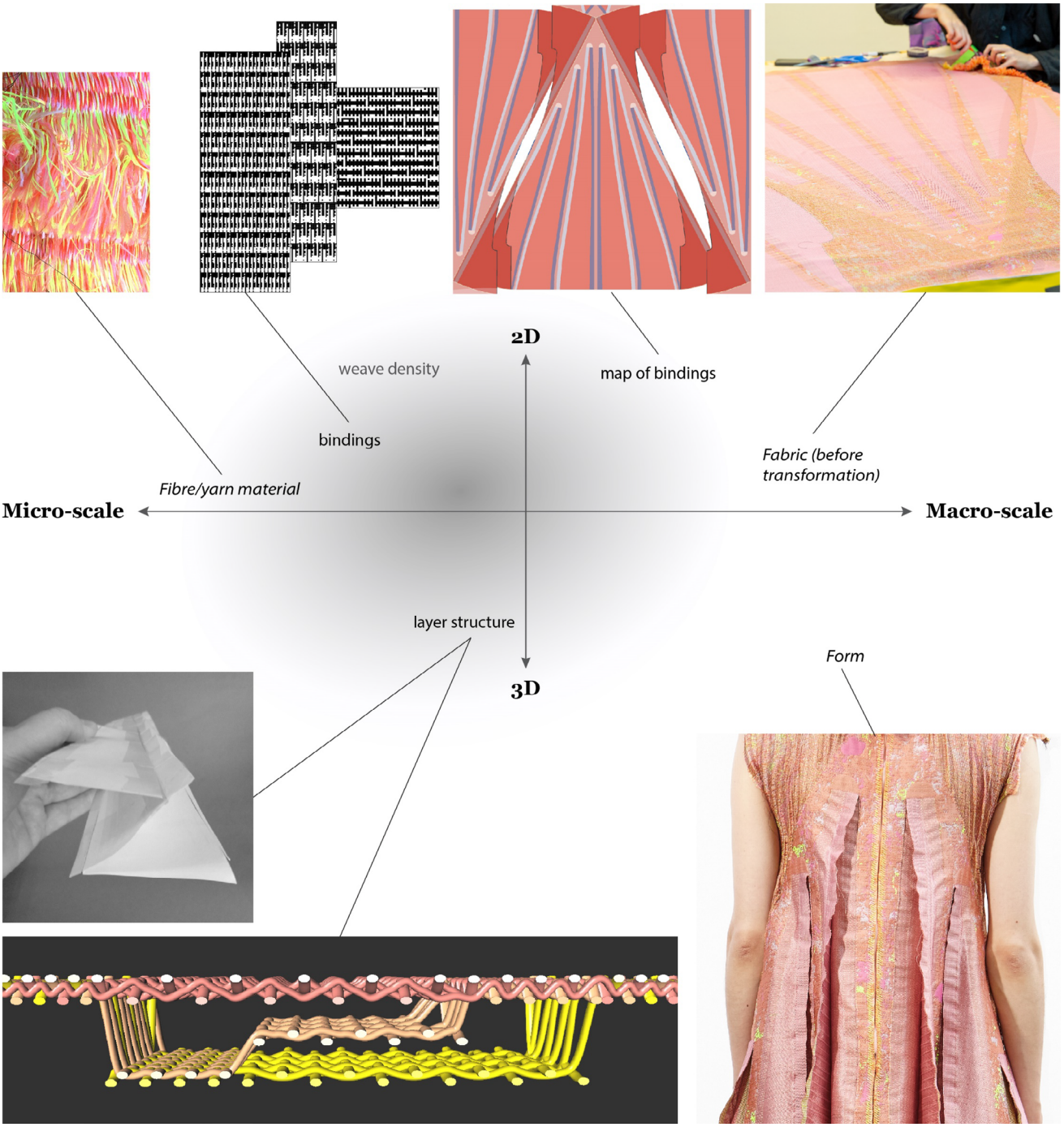

Figure 7: The design elements of the Feldspar Dress mapped against the design framework.

The previous form-making methods combined fibre and fabric scale effects. Conversely, the Feldspar Dress pleat structure works by opening up the fabric of the textile, enabling linked layers to expand. Here, the transformation is focused at the fabric scale, more like the hierarchically designed forms it is modelled on. Yet it is enabled by the weave structure – interlacement patterns at the yarn scale.

The transformation from fabric to form is activated through the act of cutting woven 'seams' to expand the layers and thereby release the form. Cutting creates vulnerability; it is "the very act which is potentially ruinous to the fabric" (Sutton and Sheehan, 1989, p.29). Thus it was critical that the seams, which join layers, and where cuts are made, were robust enough to minimise fraying, and stable enough to withstand the tension of layers being pulled in opposing directions. As a result, the pleat seams, where the layers join, were much stiffer, almost sharp, in comparison to the soft drape of the pleat fabric. This rigidity is a trace that reveals the interwoven relationship between fibre, fabric, and form. The multilayered fabric, built from intricately interlaced fibre, shapes the form, which retains imprints of its origins in the woven rectangle.

The inclusion of shrinking yarn along with the expanding layer structure enables both continuous and discontinuous expressions of scale in the Feldspar Dress. In the pleat seams, the expression is discontinuous, as the form derives from micro-scale effects, similarly to the Tension Folds example. Yet, in the bodice, where the shrinking yarn has been activated, the form is constructed from both micro- and macro-scales in the fibre, structure, and fabric. It is a more subtle effect than that seen in the Catenary Structure example. If the shrinking yarn in the skirt pleats were activated, the two expressions – continuous and discontinuous – would be juxtaposed.

FIBRE, FABRIC, FORM... AND TIME

Through experimental design research, a framework for non-hierarchical woven textile design has been developed. This new approach for weaving design is a nonlinear process which reflects the multimorphic thinking required when designing involves working between 2D and 3D and across micro- and macro-scales.

Additionally, three methods for producing three-dimensional woven textile-forms have been explored – Catenary Structure, Tension Folds, and Expanding Layers. These provide a context for the framework. The expression in each of these textile-forms emerges from the interaction of micro-scale elements – fibre, yarn, and structure – and macro-scale elements – fabric and form. The specific expression of each textile-form is either continuous or discontinuous across these scales. Where the form outcome is solely a result of design decisions at the micro-scale, these micro-scale elements are suppressed in the macro-scale expression. However, where a finishing process is used to develop form through manipulating the textile-form at the macro-scale of the fabric, the expression of the micro-scale elements is retained alongside the macro-scale elements in a continuous expression.

The experimental design research presented in this paper is carried out through a method that Heimdal et al. call "the formgiving approach" (2012, p.1) in which different ways of processing or treating a material is explored. However, here, the formgiving approach is applied not to individual materials, but to combinations of materials. The materials are 'processed' through weaving, where different structures and material combinations have been explored. These woven textiles have then been 'treated' through different finishing techniques where needed to activate the transformation from 2D to 3D.

Working digitally in CAD, scale is thought of primarily in terms of proportions – relationships between elements. The pattern in the artwork directly corresponds to the desired number of weave bindings, and bindings are judged by the length of yarn floats in the woven fabric. An estimated weft density is used to rescale (shorten or elongate) the artwork, which directly relates to the physical scale of the yarn and the bindings, but for now it is thought of solely as a number. This abstraction may be emphasised in early experiments, in which precision is considered less important.

Nevertheless, scale is implicit in weaving, even when disguised by the digital environment. The design is prepared for a specific loom, with the number of warp ends in the repeat converted to pixels, indicating an exact width. The weft density is directly related to weft yarn width, tightness of the bindings, and the warp density and weight. When weaving begins, this weft density number becomes embodied not only in the fabric, but also in the haptics of the loom. Is it too tight, or too loose? The answer is felt through the hand on the cloth, and the sound of the reed hitting the fell. It remains just a number, to be raised or lowered, or recorded for future reference as just right. But the decisions made in the scale-less digital environment are realised as fibre and yarn become fabric. Therefore, the framework functions to link the digital design process with the physical making process and its outcome.

A key difference between the Feldspar Dress and the earlier examples is that its form is very precisely designed. In contrast, the forms of the Catenary Structure and Tension Folds examples arose during the experimental design and making process. This has enabled unrepeatable – emergent – form-making behaviour. In the Catenary Structure example this behaviour is driven by the same mechanism as Frei

Otto's yarn-based "material machine" described by Spuybroek (2005, p.7). In the material machine wool threads in a geometric arrangement are loosened and felted, creating an "optimized path system" (p.10). In the shrinking structure textile-form, the geometric arrangement is the woven fabric, which already contains the necessary looseness as it is constructed. Instead of producing paths, the transformative felting process releases the three-dimensional form potential of the two-layer textile. Spuybroek goes on to state that "the geometry does not follow the event, geometry coevolves with materiality" (p.11) – qualities characteristic of non-hierarchical processes.

As experiments in formgiving, neither Catenary Structure nor Tension Folds have been considered in relation to an application. However, as they were woven on an industrial jacquard loom and transformed through common finishing treatments (machine washing and steaming respectively), both methods are open to industrial processing and product applications. With respect to Expanding Layers, McQuillan's (2020) research demonstrates the applicability of this method in fashion, and it could equally be applied in other fields such as furniture or product design. She also suggests the use of computer-controlled laser cutting to automate the transformation process.

Each example in this paper expresses the relationship between fibre, fabric, and form differently. While the fibre scale is an equal part of the expression of the Catenary Structure – a continuity of expression across multiple scales – fabric and form are dominant in Tension Folds – a discontinuity of expression. The Feldspar Dress contains both continuous and discontinuous expressions, due to its combination of form designed through micro-scale alone, and through micro- and macro-scale together.

A final scale that plays out in woven textile-form design is time. The transformation from 2D weave to 3D textile-form relies on changeability – embodied in fibre behaviour and fabric structure. Whether this occurs as the textile is removed from the loom, or requires intervention through finishing techniques, textile-forms are objects in time (McQuillan, 2020, p.354). The element of time is not identified in the framework; it remains implicit in the space between fabric and form.

These three methods for creating morphologies in three-dimensional loom-woven textile-forms demonstrate the potential of the framework as a new approach to weaving design, creating new expressions. Further research is planned to explore the Expanding Layers method in active yarns (those with shrinking and resisting behaviour), to explore how the fibre properties interact with the fabric and form expression. Future research could explore these micro- and macro-scale elements in relation to time, different scales of fabric and form, other fibre qualities, or alternative form-making methods. This is a field with a wide range of possibilities, of which the examples presented in this paper are only a few.

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BETWEEN YARNS AND ELECTRONS: A METHOD FOR DESIGNING TEXTURAL EXPRESSIONS IN ELECTROMAGNETIC SMART TEXTILES

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ABSTRACT

The design of smart textiles presents a discrepancy of scale where the designer works at the level of structural textile design while facets of the material express at scales beyond one's senses. Without methods to narrow this gap, certain expressional domains of the textile are closed off from design possibilities. The aim of the research has been to design a method for observing, visualizing, and describing expressions of electromagnetism in textiles. Through a method of textile surface scanning, one can produce a visualization of its electromagnetic field. Woven textile samples observed through this method reveal a textural quality that exists within the electron flow – an *electromagnetic texture*, which emerges at the intersection of woven design and electromagnetic domain variables. The design variables field strength, diffusion, and field shape contribute in narrowing the gap that presents when one designs simultaneously at the scale of textile structure and electron flow in yarns.

INTRODUCTION

In artistic fields such as media art, sound art, and installation art, the use of electromagnetism as a material has been widely demonstrated, for example by conceptual artist Robert Barry's interactive electronic objects (MOMA, n.d.) in the 1960's, Joyce Hinterding's room-scale antenna installations in the 1990's to current day (Joyce Hinterding, n.d), and Christina Kubisch's electrical sound walks and electromagnetic installations in the 1980's to current day (Kubisch, n.d.). These and other artists have shown that engagement with this intangible material reveals to us qualities of a world that we are immersed in and yet cannot sense; that there is an "abstract everywhere" (Milutis, 2006) that can be drawn on for artistic purposes. This suggests that conductive textiles might serve to express more than simply power and signal transmission, and that with further exploration new electromagnetic smart textile expressions can be designed.

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Yet, the use of electromagnetism as a material in the smart textile design field is under-represented, in part due to a lack of methods for how to access and design with its extra-sensory and intangible qualities. While methods of sensing are available within practices of science and engineering, they often involve specialized laboratory tools and, further, the skills of how to use them and interpret their outputs (Dunne, 2005, p.7). These tools and skills can be beyond the reach of the textile designer working in the area of smart textiles. There is therefore a need for sensing methods that are "agile, visual, and adaptable" (Mikkonen and Townsend, 2019) for designers to be able to engage directly with the properties of the phenomenon.

This paper proposes an experimental method that has been developed for textile designers, and which can be used within their design process to enable the exploration of the electromagnetic qualities of conductive structural textiles. This method, called *textile surface scanning* visually communicates the presence and form resulting from the electromagnetic field generated by current carrying yarns in a structure. The method outputs a graphical plot that illustrates a textural quality derived from the placement of conductive yarns in a textile structure. It has accessible tool requirements and does not demand specialized knowledge or skills to interpret the results. It is conducted using a smartphone, a smartphone app, and a DC (direct-current) power supply. Multiple sensor readings can be taken and joined together in software to produce a visualization of the textile's electromagnetic expression. Further, it introduces the textile design notion of *electromagnetic texture*. That electromagnetic expressions reside within a textile at the yarn level suggests that decisions regarding textile design variables for example technique, structure, density, scale, and overall formal qualities, will subsequently affect the electromagnetic textural quality. As a sensing method, it opens a space for textile designers to design with electromagnetic textures by exploring the relationship of material, structure, and dynamic expressions, thereby broadening the range of design possibilities of smart textiles.

SCALES OF SMART TEXTILE DESIGN: FROM TEXTILES TO YARNS TO ELECTRONS

In structural textile design, designers must simultaneously regard the broader expression of the textile while addressing nuances at the scale of yarns. Expressions of texture, surface, and visual aesthetics (e.g. colour and patterning) are determined by yarn properties such as fibre type, yarn thickness, yarn number, and twist. For smart textile designers, the design variables increase. While the focus on structure, material, and expression are maintained, further variables are introduced: time-based, state-changing, and recurrent behaviours (Worbin, 2010; Kettley, 2016; Heinzel and Hinestroza, 2020). These active and dynamic qualities in smart textiles move towards Ishii's vision of "radical atoms": physical materials that "*transform* [their] shape to reflect underlying computational states and user input; *conform* to constraints imposed by environment and user input; *Inform* users of its transformational capabilities (as dynamic affordances)" (Ishii, Lakatos, Bonanni and Labrune, 2012, p.45). Electromagnetic smart textiles can be seen as radical materials given that they *transform* in multidimensional ways, yet they are *conformed* to the physics of their textile structure. Through observation methods such as the visualizations illustrated in this paper, they *inform* users of their transformation. Smart textile designers manage these multi-layered and multi-scaled approaches to design, and therefore work in a highly complex and "entangled" space with "technological compositions", and must do so "without ever losing sight of the expressive potential of the work" (Kettley, ibid., p.145).

Designers working with electromagnetic expressions in textiles are few, and works produced have been mainly focused on frequency-based electromagnetism (e.g. sound and radio-based works). However, design researchers Ebru Kurbak and Irene Posch have designed a non-frequency embroidered electromagnetic textile that functions as an 8-bit computer (Kurbak and Posch in Kurbak, 2018). The textile contains a matrix of magnetite beads encircled by the ornate stitches of embroidered conductive thread. A gold coil relay switch is attached to the magnetite bead, and when an electromagnetic field is generated in the yarns, the relay coil flips its position, thereby expressing different logic structures. Participants are invited to program this textile computer and witness the different logic structures expressed through the textile materials. In this work, the two have greatly enlarged the scale of matrixial computational logic gates, visually revealing the basic material interactions that are normally intangible, miniaturized, and embedded within integrated circuits.

Kurbak has also worked with So Kanno to design a magnetic yarn voice recorder (Kanno and Kurbak in Kurbak, ibid.). Using this recorder, a participant is able to record their voice on a single thread of conductive yarn. Soundwaves of one's voice are passed to the yarn while turning a spindle. The yarn is guided through a recording head where the yarn is magnetized with the magnetic order of the voice recording. The yarn can then be played back by winding the yarn spindle to listen to the recording. This work uses the effect of mechanical magnetic recording as used in cassette players of previous decades. Here, the pair reveal an overlooked quality of conductive yarns: their ability to store and transmit data in their magnetic field. Across both examples, the two work closely with the material properties of electromagnetism and invite participants to

engage with their works and bear witness to the secret properties of conductive yarns.

Working with frequency-based electromagnetic expressions, Afroditi Psarra explores satellite transmission data as a material for textile design. In *Listening Space* (2019), Psarra uses software-defined radio (SDR) to record satellite positions in proximity to her listening station. These transmissions are translated to audio waveforms that then become patterns for machine knitting. Electromagnetic waves are represented through changes in textile structure, material and patterning, using symbolism to balance the scales of design between yarns and electrons. In addition, she uses "low-cost methodologies" and "digital crafting" combined with textile design processes (Psarra, ibid.). This assists in opening textile designers to electromagnetism as material, particularly where it can be accessed through materials that textile designers are already engaged with, and are intimately familiar with.

Yet thinking at the scale of electrons is not commonplace in design, and is an issue that Dunne attributes in part to the obscuring and miniaturization of electronic components, making them increasingly out of reach from designers (Dunne, 2005). He identifies the lack of methods and tools as a contributing factor, resulting in a missed opportunity for designers: "[electromagnetism's] modernist poetry, based on truth to materials, is lost" (Dunne, ibid., p.9). However, in smart textiles, conductive yarns are no longer a novelty. Accessing the electromagnetic domain that is already within the textiles being designed simply requires methods and tools to open smart textile designers to the expressive potential of the material. Smart textile designers balance a vast array of design variables when in the forming process, zooming between the scales of yarns and textile. Perhaps to design between scales of textiles, yarns, *and electrons*, is not at all farfetched.

METHOD

The example of experimental design research presented here explores electromagnetic textile expressions through a smart textile design practice. To observe the formation of electromagnetic fields, digital sensing tools were used. The use of a magnetometer as sensor provided a high resolution of sensor data wherein nuances of the electromagnetic fields could be observed. A decision was made to use the magnetometer contained within a smartphone. This was based on designer's anticipated ease of access for tools to conduct technical measurements, where most designers would conceivably be in possession of this tool already. Further, the processing power of a smartphone greatly outweighs that of common microcontrollers such as Arduino. As a result, the read-rate of the sensor is higher, and therefore provides greater resolution of data, allowing one to observe the electromagnetic fields with greater detail.

The analysis of the sensor data was conducted with the textile design expression in focus rather than the numeric values. The sensor data was evaluated for the overall field shape expressed across the surface of the textile, and was further examined for its likeness to the structural qualities of the textile design. This analysis required knowledge of the direction of current flow, where conductive yarns were positioned in the textile structure, and whether dielectric yarns (conventional textile yarns e.g. cotton, linen, wool) interlace on the surface of the textile between conductive yarns and the sensor. Correlation could then be made between the peaks and valleys of the graphical plot, the areas within the textile structure where field strength was increased or decreased due to proximity of conductive yarns to one another, and the vertical layering of yarns in the woven construction.

The basic structures of twill, waffle, and honeycomb were selected for their clarity in illustrating the electromagnetic field shape in relation to the textile structure. The textile samples used a conductive enameled copper yarn (0.16mm) with an electrical resistance of 0.89 Ohms per meter. This yarn is ideal for weaving as it is fine and flexible, yet strong, and not subject to breaking under tension. The dielectric warp materials were cotton yarns (30/2). All samples were woven on 24-shaft computerized ARM looms. The warp density on these looms were 24 EPC (ends-per centimeter) for the twill and honeycomb samples, and 12 EPC for the waffle weave sample. Each sample was woven with conductive yarn ends exiting the textile on left and right selvedge at intervals of 1cm to provide access points to electrical connections.

TEXTILE SURFACE SCANNING METHOD

The *textile surface scanning* method provides a way for smart textile designers to observe the electromagnetic field expression of a current-carrying textile. It produces a visualization of the electromagnetic field shape expressed on one surface of the textile. The method is comprised of a smartphone app, a physical setup, a sliding technique, and visualization approach. The sensor data output contains magnitude readings as Teslas (μT) expressed by the textile. The textile samples were placed antiparallel to the Earth to avoid sensor data being affected by the earth's electromagnetic field.

MAGNETOMETER SMARTPHONE APP

The Android smartphone app "Magnetic Field Sensor" by SMF Apps GbR was used. Through this app one can access the data from the magnetometer sensor in the smartphone. The app formats the output data as a 2D graphical plot of magnetic field strength (as Teslas)

mapped over time. It stores within the smartphone memory as a text file that contains XYZ positional data, Teslas, timestamps. This allows the text file to be imported into a variety of software capable of plotting and visualizing data sets.

PHYSICAL SETUP

Figure 1 Full setup, sensing position (top left); Detail sensing position (top right); Textile suspension (bottom left); two tripods separated (bottom right)

The physical setup of smartphone holder, tripods, and a plastic planar surface (Figure 1, top left and bottom right). A sliding camera mount was modified by attaching a smartphone holder (Figure 1, top right). This allowing one to smoothly move the smartphone vertically over the surface of the textile during sensor reading. The slider was placed vertical to the Earth. A textile sample was positioned vertically a plastic board facing the smartphone (Figure 1, bottom left). Power and ground electrical connections were made to the textile via conductive yarns at the selvedge, and 1A of electrical current was applied. Variation to this physical setup is possible based on the tools and materials one has available to them, however a key parameter is that the sliding movement must be made antiparallel to the Earth.

The sensing technique is the physical motion of vertically sliding the smartphone across the surface of the textile sample. The textile sample was placed vertically on the plastic board and the smartphone scanned the surface over 10 seconds moving from top to bottom, selvedge to selvedge. This duration provided the clearest visual impression of the field shape. The use of an external timer assisted in timing the movement. The sensor reads an approximate 1cm wide band of the textile. Multiple readings across the textile surface then need to be shifted by 1cm to the left or right in order to make additional readings across the textile surface.

VISUALIZATION

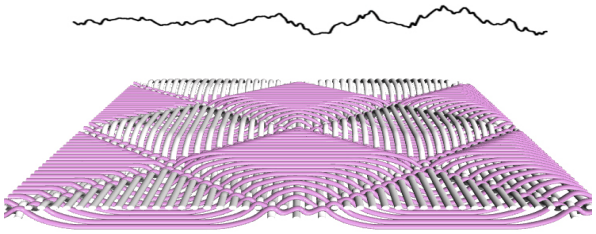

Figure 2 Single line visualization of electromagnetic field expression placed atop of waffle weave structural visualization

The sensor data can be imported for use in a variety of software capable of plotting 2D datasets (e.g. Python, P5.js, Processing, MathWorks, Excel, etc.). The image output from the app can be used in image software (e.g. Photoshop, Illustrator) to isolate the line from its background in order to produce a single line representation of the texture (Figure 2). The image and data can also be imported into 3D software (e.g. Blender, Fusion 360) to construct 3-dimensional surface visualizations, such as the ones in this paper. The openness of the visual representation of the data is a strength in the method, where one is able begin with either the image or the dataset, and within the style and software of one's choosing.

EXPERIMENT 1: STRIPED TWILL

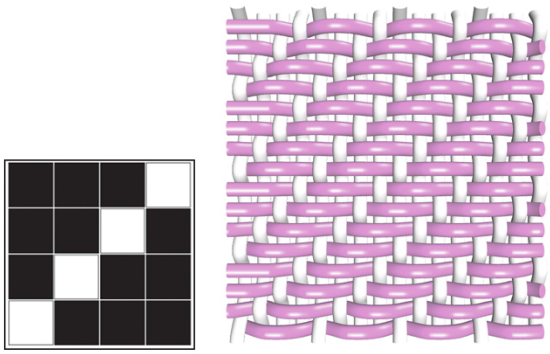

Figure 3 Weft-faced twill weave draft (left) and structural visualization (right)

Figure 4 Striped twill textile

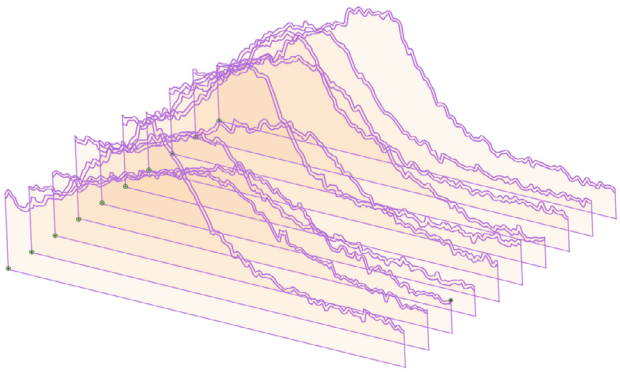

Figure 5 Electromagnetic texture of striped twill textile

Twill is a basic weave structure that involves the weft passing over one and under three warp threads (Figure 3). Each weft pass progresses the interlacement one step, resulting in the diagonal lines that characterize the twill structure (Sinclair, 2014, p.272). Twills are dense textile structures, as the progressive offset of the interlacement allows weft threads to pack more densely together. This allows for the dense placement of conductive and dielectric yarns in a textile structure. The woven textile is a weft-faced twill (6cm x 10cm) with a striped pattern that alternates sections of dielectric cotton weft with conductive copper yarn weft. The conductive stripes become progressively thinner towards the bottom of the textile sample (Figure 4).

Using the *textile surface scanning* method, 10 sequential sensor readings were made and panelized using 3D software. The textile was scanned from top to bottom over the course of 9 seconds. The electromagnetic field extends approximately 3-4mm from the textile surface. The resulting visualization of the electromagnetic texture is presented in Figure 5.

This example illustrates the discrepancy that emerges between the tangible textural qualities of a textile and electromagnetic textural qualities that arise. The visual, tangible surface of the textile in Figure 4 is flat and smooth with minimal textural qualities. However, the field strength is strongest over the widest conductive copper stripe at the top of the textile, resulting in a strong visual peak in the electromagnetic field. The peak tapers off towards the bottom of the textile as the conductive bands get progressively smaller. This resulting in a unique electromagnetic textural expression that appears only within the textile's hidden domain of the electromagnetic field.

EXPERIMENT 2: WAFFLE WEAVE

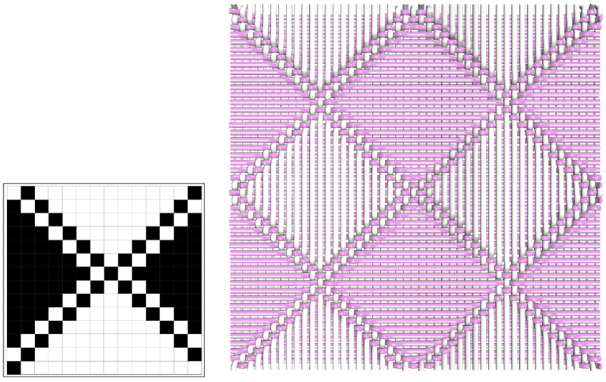

Figure 6 Waffle weave draft (left) and structural visualization (right)

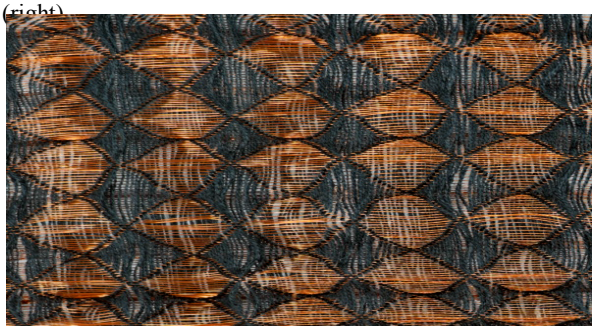

Figure 7 Waffle weave textile

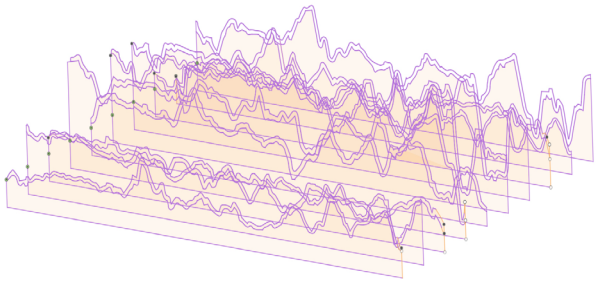

Figure 8 Visualization of electromagnetic texture of waffle weave structure

Waffle weave structure consists of a matrix of cells that form peaks and valleys on both sides of the textile (Figure 6). Warp and weft threads float on both surfaces, and the result is a textile of high volume and density where the peaks and valleys give dramatic visual effect dependent on scale and material selection (Sinclair, ibid., p.278). The combination of floating conductive and dielectric yarns in this structure can provide dramatic fluctuations in the electromagnetic field shape.

The textile is woven with a dielectric cotton warp and conductive copper yarn weft (10cm x 25cm) (Figure 7). Using the textile surface scanning method, 10 sequential sensor readings were made and a visualization of the electromagnetic field across the surface of the textile is presented in Figure 8. The textile was scanned horizontally over the course of 15 seconds. The visualization reveals strong variations in the electromagnetic field, where density changes in the conductive yarns are expressed as changing electromagnetic field strength across the surface of the textile. The electromagnetic field extends approximately 5-6 mm from the textile surface.

In this structure, field strength is increased in areas where there are long floats of copper yarns. Floats are yarns that are not tightly bound into the structure, and are left to move freely between two points. This allows parallel copper yarns to sit closer together than if they were bound in a structure, and which couples the electromagnetic fields across several yarns. This

increases the electromagnetic field strength in those particular areas. Therefore, the use of parallel floats with conductive yarns is one technique to increase the electromagnetic field strength within a conductive uniform, voluminous texture, while the electromagnetic texture reveals irregular peaks and valleys due to the random coupling of floating conductive yarns. The electromagnetic texture is not a direct reflection of the tangible texture, rather it is a unique energetic expression of the textile structure.

EXPERIMENT 3: HONEYCOMB

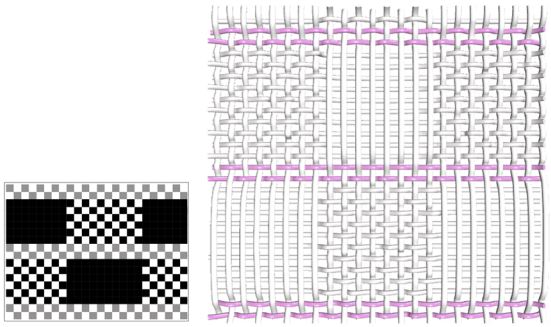

Figure 9 Honeycomb weave draft (left) and structural visualization (right)

Figure 10 Honeycomb textile

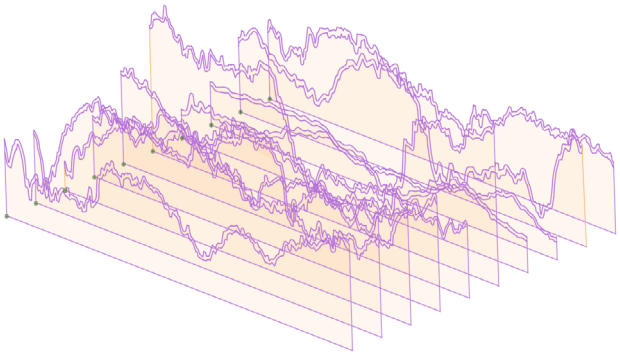

Figure 11 Visualization of electromagnetic texture of honeycomb structure

The honeycomb structure is characterized by an undulating weft that circles sections of plain weave in the ground layer (Sinclair, ibid., p.283). Honeycomb cells are designed as alternating blocks of larger and smaller size (Figure 9), and cell shapes are defined through contrasting yarn thicknesses between the ground and secondary wefts. The qualities of the yarns in combination with the tension of the bindings causes cells to condense and relax alternatingly throughout the structure, giving rise to the characteristic cellular matrix (Figure 10). By using a thick conductive weft that is made of multiple twist copper strands, an exaggeration of the cell shapes can be made in the electromagnetic field shape.

The textile is woven using a dielectric cotton primary ground weft, and 16 copper yarns twisted together as a conductive, secondary weft on a dielectric cotton warp (10cm x 25cm). Using the *textile surface scanning* method, 10 sequential sensor readings were made and a visualization of the electromagnetic field across the surface of the textile is presented in Figure 11. The textile was scanned horizontally over the course of 15 seconds. The electromagnetic field extends approximately 5-6 mm from the textile surface. In this structure, the thick copper weft yarn encircles the ground layer cells. The secondary weft generates a strong electromagnetic field that presents in the visualization as broad peaks. The broad peaks are strongest when four conductive weft yarns move close together at the top and bottom of each cell (Figure 10), and diffuses into wide valleys where the dielectric ground weft dominates. The honeycomb structure can be used to design field shapes with strong contrasts and broad peaks and valleys rather than steep inclines. Additionally, using multiple conductive wefts in a single pass assists in increasing contrasts in the field shape by increasing field strength along those passes.

ELECTROMAGNETIC TEXTURAL EXPRESSIONS IN SMART TEXTILES

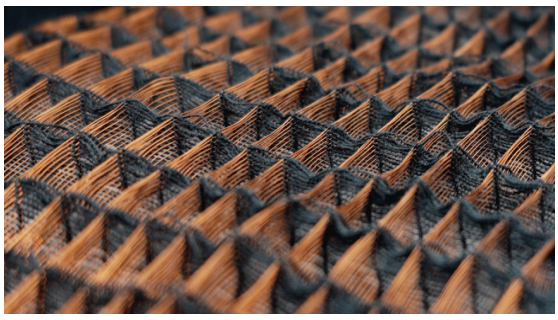

Figure 12 Copper and cotton yarn floats in a waffle weave

Figure 13 Diffusion of the electromagnetic field strength through patterning

Through a combination of method and materials, an extra-sensory textural quality can be found in the space surrounding a conductive smart textile. This hidden layer reveals an impression of the textile structure and material properties through its textural quality. It has been the work of conducting and analyzing the experiments that has guided the process of defining new design variables, and that enrich the methods of textile design.

The introduction of an *electromagnetic texture* offers a new notion for the design of textural qualities that expands the textile convention of visual and tactile sense. Moreover, it allows one to design expressions within the space of yarns and electrons, which present as two disparate material scales. Much like the conventional quality of texture in textiles, *electromagnetic texture* is dependent on the structural and material selections of the textile, yet it is both designed and expressed in different ways.

Electromagnetic texture is designed through variations in the placement and density of conductive yarns through variables of *field strength, diffusion*, and *field shape*.

Field strength is the rising intensity of the electromagnetic field which is represented by peaks in the graphical plot of the sensor data. It can be designed through the strategic placement of conductive yarns in the structure, where field strength increases when conductive yarns sit closer to the surface, are more densely set in the structure, or are free to float, allowing them to move closer together than when they are bound in a structure.

Diffusion is the decreasing intensity of the electromagnetic field as it becomes obscured by dielectric materials, or where conductive yarns are spaced apart in the textile structure. It is marked by valleys in the graphical plot. Diffusion occurs when dielectric yarns pass over or between conductive yarns, diminishing the field strength before it reaches the outer surface of the textile (where it is sensed by the magnetometer), or spacing conductive yarns apart in the structure so that the electromagnetic fields cannot couple, resulting in lesser field strength.

Field shape is the contouring of field strength and diffusion qualities in the textile structure. A field shape is designed as a result of the balance between these two variables, and leads to the overall expression of electromagnetic texture.

Notably, *electromagnetic texture* may contradict the conventional textural quality of a textile. A textile with a visually smooth surface and little tactile texture may express a highly textural and nuanced electromagnetic field as the result of the placement of conductive and dielectric yarns in the structure. This is evident in Experiment 1: Twill Stripes, where a conventionally flat and smooth textile reveals a high peak and long slope as the field strength decreases over the dense dielectric area. Similarly, in Experiment 2 the uniformity of waffle weave peaks in the tangible textile are expressed electromagnetically as being highly irregular. This discrepancy between expressional domains is what

makes *electromagnetic texture* an intriguing textile design notion – it follows its own expressional way of being, and that may be inverse to our perception of the tangible textural expression of the textile.

The scale of textile design refers to the layering of perspectives in the designer's process: the zooming in and out of textile properties, from fibre to yarn, yarn to structure, to the gestalt of the textile as its broadest expression. The scale of electron flow allows designers to work deeper with this non-visual, non-tangible, domain hidden within the fibres of conductive yarns. As textile designers move fluidly between scales of smart textile design, they can use the methods, notions and variables presented here to design with electromagnetic expressions in mind.

DISCUSSION

The result of this paper is the presentation of an experimental method for observing, visualizing and describing electromagnetic fields in conductive smart textile designs. It responds to the call for new methods, techniques, and terminologies for working with smart textiles and materials (Hallnäs, 2008; Worbin, 2010; Kettley, 2016; Ishii et. al, 2012). As smart textile design is an interdisciplinary practice, this method may also benefit those in intersecting fields such as interaction design and textile engineering, when forming a collaborative design.

Notably, the experimental method of *textile surface scanning* has led a textile design notion of *electromagnetic texture*, and the design variables that define it within the textile structure. In addition to a novel understanding of the scales of textile design, a deeper scale of smart textile design has been identified: design at the scale of electron flow. The reach of the smart textile designer can now extend from the minutiae of electron flow outwards towards the scale of textile interactions in the environment. The expansion of this design space is simultaneously a narrowing of the gap identified by Dunne (2005, p.7) and Ishii whereby expanding upon the scales of textile design allow designers to move in closer range to the phenomena of electromagnetism, perhaps towards designing at the scale of *radical electrons* (Ishii et. al., ibid.).

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NORDES 2021

PROTOTYPING SCALES OF KNITWEAR DESIGN FOR SUSTAINABILITY

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ABSTRACT

This paper explores how the physical presence of prototypes substantiates research at various scales of design. Working with sustainable change challenges us to stand in the open and act towards a future that we do not know the full picture of. Here I propose to turn our attention to the traditional design method of prototyping to unfold how to influence various scales of design.

The paper begins outlining the scope of the experimental and practice-based research within knitwear design, and discuss prototyping as a means to investigate the role of the designer in an industry in search of sustainable development. The presented design experiments show, how applying the knitted prototypes contributed to a research program which both holds the details, and at the same time makes it possible to assess the broader perspective of design practice when making changes of the existing fashion system.

INTRODUCTION

Working with sustainable change in fashion challenges us to stand in the open and act towards a future that we do not know the full picture of – and most importantly, we have a possibility to contribute to the transition. This paper discusses prototyping as a means to investigate the role of the designer in an industry in search of sustainable development. Here I propose to turn our attention to the traditional design method of prototyping to unfold how to influence product design and design practice.

The insights presented in this paper builds on research from my experimental and practice-based PhD Design of Knitted Jumpers for Longevity about the designer's role in contributing to sustainable development within the shift of paradigm that the fashion industry faces (Fletcher & Tham, 2019). This study started with an interest in understanding how the textile designer can bring professional competency into play and make for changes of the existing fashion system. Throughout the PhD, the importance of the prototypes that I made and used in design experiments stood out. This paper explores how the physical presence of prototypes substantiate research at various scales of knitwear design.

BACKGROUND

The research presented here, is based on industrial knitwear manufacturing applying newer digital machinery and computer software, as these newer technological developments makes it possible to produce knitwear on-demand while customising each knitted garment. I have used the technology as a framework to explore what potentials this gives. As a business model, on-demand production can minimise deadstock of garments which most often end up for incineration (Klepp et al., 2015).

From a design perspective, I explore and unfold the influences it has on the design of knitted jumpers as well as designing them. Applying an approach of on-demand manufacturing gives the designer a chance to flip the design process and engage with user while also challenge professional skill sets alongside technology and strategies for sustainable change. The newer

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development in knitwear technology makes it possible to adjust personal demands of size and aesthetics which are factors that may determine whether garments are being used or not (Laitala et al., 2015; Niinimäki, 2011). Issues with size and fit are one of the most common reasons for garments to be disposed of (Laitala et al., 2015). Especially for women, since standard sizing used in ready-to-wear clothing is not adapted to the various female body shapes (Laitala et al., 2011). Employing user involvement at the stage of production allows for the designer to also open the design process for aesthetic choices of the individual garment. This way of engaging with users and take their perspective into account, at the same time, acknowledge the need for a wider diversity in the fashion industry (Fletcher & Tham, 2019; Tham, 2016), where the use phase is seen as central in the transition to more sustainable behaviour wearing and caring for clothes (Fletcher, 2012; Laitala et al., 2015; Niinimäki, 2011).

Customisation at industrial scale is still a newer initiative within fashion. In this study I have combined the concept of customisation with elements of theories and design strategies to test and challenge these in practice. I therefore set out to explore how this effect the role of the designer and the designer's own process (Ravnløkke, 2019).

RESEARCH APPROACH

To fully understand the implications in an open and user involving design process, I used my own design practice and engagement in the research by applying an empirical approach with involvement of participants. In doing so, I prototyped a construction of scenarios and artefacts that allowed me to investigate how one design strategy and change of methodology affects other parts and processes. The research is therefore undertaken as a programmatic exploration (Brandt et al., 2011) where various experiments support the assumptions about the research (Redström, 2017).

The knitted prototypes that have been developed and used as a part of this research are manufactured on a digital flat bed knitting machine in the workshop at Design School Kolding.

PROTOTYPING THE PROGRAM

To describe the field I operate in, as well as the relationship between the various experiments, I lean towards Redström's (2017) spectrum of, what he calls, *a design space* (see figure 1).

Figure 1: The illustration shows Redström's spectrum "a design space" (a reproduction of Redström, 2017, p. 39).

The space within this spectrum sketches the field of design that concerns the singular product as well as the matter of designing. Both perspectives are highly relevant when working with this complex set up of overlapping strategies of design for sustainability.

Here I use the spectrum to illustrate and bring forward the different scales of engaging with knitwear and design practice. The illustration shows the construction of the prototyped research program consisting of customised knitted jumpers, a design concept for user involvement, involvement of insights from the use phase, and an open design process (see figure 2).

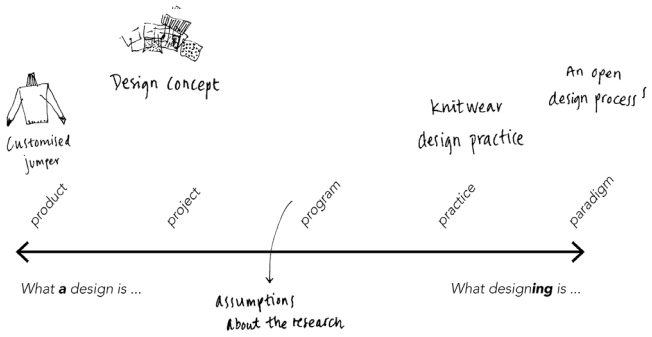

Figure 2: Prototyping scales of knitwear design. Application of Redström's (2017) spectrum *a design space*.

In this paper, I discuss the different prototypes and ways of prototyping scenarios used to build the program, as they have been essential to challenge, study and understand how the textile designer through professional competency can influence changes of the existing fashion system.

As it is with the typical design process, the process of my research experimentation is not linear (Sanders & Stappers, 2008) neither if it appears so when listing the different elements. However, I discuss this research from the assessment and insights of the elements included in its "design space": knitwear design practice, a design concept for customisation, personalised jumpers, and an open design process. Before going into the design experiments and the different applied prototypes, I will explain the assumptions about the research program, as this describes the elements of theories and design strategies which are tested and challenged in practice.

USER INVOLVEMENT

Involvement of insights from the use phase is a part of the program. It implies a study of users' practice in relation to knitwear and how these insights are used as inspiration for the design process of developing a concept of knitted jumpers for customisation.

The idea is hereby to design for the user's experience of the garments (Niinimäki, 2011). As "making a garment last is very different to making a long-lasting garment" (Fletcher, 2012), it is for sure possible to extend the durability of garments through resistant materials and the construction of them, but if the garment is only used a few times, and then replaced with new ones, its lifespan is not very long. It can therefore be argued that the difference between durability and longevity is associated with the use of clothing (Laitala et al., 2018).

By incorporating knowledge about the use phase, the designer has the opportunity to, consciously, work to increase satisfaction with clothing and prolong garments' lifetime (Niinimäki, 2011). From a perspective of sustainability, it is an advantage to, not only postpone the stage of disposal, but at the same time increase the use activity of clothing (Laitala et al., 2015). In other words, it is important to distinguish between clothes that are in active use and clothes that are passively stored. I am interested in how we as designers can support sustainability in the use phase. Therefore, I find it relevant to study how fit, material qualities and aesthetic preferences influence how often knitwear is used.

KNITWEAR DESIGN PRACTICE

Other fields of design have for long employed user-centred approaches to differentiate on a certain marked or to develop products based on user experiences (Sanders & Stappers, 2008). This is not common practice in fashion design. Even though wearing clothes is a part of our daily life, most people are not used to put into words their experiences and considerations related to it (Ravnløkke, 2019). Therefore, involvement of use practice and experiences requires new methodologies to explore and unfold knitwear design at this scale.

Studying user's practices of knitwear, I had set up a design experiment to do in-depth interviews with female participants. This study concerned women, as I wanted to obtain insights on their perspectives of possible issues related to size and fit, as this newer technology in knitwear makes it possible to meet users' need for personal fit. To guide the dialogue in a semi-structured way, I used knitted prototypes (Ravnløkke & Bang, 2016). At the same time, I used a combined version of a wardrobe method (Fletcher & Klepp, 2017) and the Repertory Grid interview technique (Fransella et al., 2004). I did this to create the framework for a dialogue that embraces and exemplifies both everyday use (wardrobe method) and sensory experience (Repertory Grid) of knitwear. The intention was hereby to support the participants in expressing themselves about knitwear, based on quality, appearance, touch, shape, fit, details, usability, and function, and thereby put into words personal preferences and experiences, using knitwear.

The interviews took place in the participants own homes which made it possible to involve their wardrobe as well. I brought a variation of knitted prototypes in order to direct the conversation to their experiences with knitwear, and tacit knowledge associated with use. The prototypes comprised of a selection of knitted textile samples and knitwear which played a central role in the interview. Additionally, the participants' knitted wardrobe was also included to evoke both personal and social aspects of the use of clothing (Klepp & Bjerck, 2014). The materiality of the knitted prototypes and garments acted as a catalyst for articulation and dialogue, as well as creating a common basis for an in-depth conversation about the participants' experiences with the use of knitwear.

The Repertory Grid technique is based on ranking and assessment of convergence and contrasts (Fransella et al., 2004). It is therefore essential that the selection of the knitted prototypes represent various elements that can be used in bipolar constructions (Bang, 2013). The knitted textile samples and jumpers, that I brought for the interview, were therefore developed and selected from a scope of different types of constructions. For example, the opposition between a tight and a loose knitted textile, as well as the experience of a tight-fitting or loose-fitting jumper.

PROTOTYPING KNITTED TEXTILE SAMPLES

The textile samples make two triads, each consisting of three different knitted textile samples with the intention that these form the basis for the conversation about tactile and visual experience of structures, patterns and colours. In order to sharpen the focus on the tactile and visual properties of the textile samples, the samples are of a suitable size to be able to touch them with both hands – they measure 34x26 cm. The textile samples are made to give a great variety to allow for a detailed dialogue (see figure 3):

Figure 3: Overview of the knitted textile samples. The samples are folded so both sides are visible.

The triads are divided so that one consists of neutral shades of grey and black, while the other represents colours: such as turquoise, peach and ochre. These are carefully selected in order to have the participant describe their own preferences for colours. Therefore, I have deliberately chosen midtoned colours, and combinations of colours that can provoke to a greater or lesser extent, and thus produce a detailed dialogue.

PROTOTYPING KNITTED JUMPERS

The knitted jumpers were used in the dialogue to focus on shape, fit and details. The reason for choosing the jumper over other types of clothing, is to limit the experiment to one type of garment. In addition, a jumper is familiar to most people, and therefore easy to recognize and read.

The knitted jumpers were also divided into two triads, based on embracing a wide range of experiences with different types of garment (see figure 4):

Figure 4: Overview of the knitted jumpers.

To represent different expressions, types and qualities of jumpers, they are selected based on the price ranges: low, medium and exclusive. In addition, the triads are composed on the basis of the style of the jumper, the shape, and details.

As I wanted insights into the participants' experiences of quality and durability, jumper 7, 8, and 9 show signs of peeling, discoloration, holes/run stitches and shrinkage after washing. My aim was for the participants to include experiences with wear and tear, and also elaborate on these experiences in the review of their own wardrobe.

USE OF KNITTED PROTOTYPES

The participants examined the knitted prototypes and described their experience with the different textile samples and jumpers (see figure 5) – some dealing with haptic and visual perception, other focusing on the participants' experiences with fit, cut, decoration and other details, in order to gain an insight into the participant's personal preferences associated with use.

Figure 5: Participant study of the knitted prototypes.

The third part deals with the daily choices and use of knitwear. It allows the participants to tell about their own knitted garments, while the individual garments can be touched and seen close up. Going through the garments, the participants were asked to categorise their wardrobe into three piles of their favourites, those worn occasionally, and those that they rarely or never worn (see figure 6). At the same time as the division, the participants were asked to describe the different garments, and the reason for placing these in the respective piles. The participants' stories about the garments, and this hierarchy division, gave the participants the opportunity to elaborate on personal experiences.

Figure 6: Participant's categorisation of own knitted garments.

In the interplay between conversation, and the involvement of knitted prototypes, I could use my own senses to gain an empathic understanding of the participants' narrative. The physical representation of knitted textiles and jumpers, as well as the participants' own wardrobe, acted as a catalyst for the participants' experiences with knitwear. Furthermore, they enabled participants to tell about their use practices and elaborate on their own preferences. It was thus both the verbal description and the physical artifacts that provided insights and knowledge about use:

"I really use this one a lot. Even though it is a bit simple – maybe the simplest piece of clothing in my wardrobe: I think it's made of wool. Yes, it is. That was also why I bought it. Because it was simple and made of wool. It has kept really well. I like this at the bottom – that it goes up like this (pointing to hem with a roll detail). Then, there is a little detail. And then it has some sleeves that tighten a little (showing the area of the forearm" (see figure 7)

Figure 7: Image of the knitted jumper described in the above example.

The example shows how the physical exemplar from the participant's wardrobe supported her in expressing why she like the garment, and yet also in telling about her more general knowledge of material quality and personal preferences of style.

In that way, the materiality of the prototypes was central to obtain insights of the use phase, which made it possible to study the users' preferences, what they like, and what works for them in daily use situations; keeping in mind active use and longevity.

A DESIGN CONCEPT FOR CUSTOMISATION

The empirical approach offered a detailed insight into use situations and use frequency. The first design experiment showed a coherency between aspects of satisfaction with garments and how often these were used. As a part of the research, I incorporated these insights into development of a theoretical business concept for design of knitted jumpers to be customised and produced on-demand at industrial scale.

The user insights were grouped and divided into categories of visual expression, style of the jumper, proportions and fit, and material tactility. These were further used to inform and create relevant parameters for customisation of aesthetic preferences and individual size (see table 1).

Table 1: Overview of how user insights have been transformed into development of the design concept.

	Design parameters for customisation	**Textile means**
Visual expression	Neutral and complex expressions (variation of colours, structures, patterns and details)	- Small-patterned structure - Combinations of colours and structures - Details of hemlines and details of colour
Style of jumper, proportions and fit	Variations of style and fit	- Manufacturing on the basis of individual body measures - Varieties of the style and the length of the jumper
Material tactility	Variations of thickness and surface	- Small-patterned structures - Use of single and double knitting technique

The user insights showed, for example, that tactility of the material and details are important means for the experience of using knitwear. To offer a range of different tactile experiences of the knitted textile, I employed a technique of small-patterned structures, and additionally, use single and double qualities: two variations of the knitted construction, which give a thinner or thicker fabric, respectively, knitting with one or two threads at the same time.

The design concept was developed in a physical form, to be included in the second design experiments as a prototype of the business concept. In this way, the concept was an example and a test of how the textile designer can contribute to sustainable product development. The prototype of the design concept provided thus a practical and tangible experience with design strategies with a sustainable objective.

The design concept comprises of material artefacts representing the different choices which can be made when selecting a personal jumper. In second design experiment, the design concept was used to examine users' experience of being involved in the design process. It is used in connection with workshops, and is thus used to create a tangible scenario of what such a purchasing situation might look like (Koskinen et al., 2011; Stappers & Giaccardi, 2017). This makes it possible to observe the participants' experience, and interview them about their considerations, associated with the design choices they make.

Figure 8 shows examples of artefacts, including knitted prototypes, colour samples and working drawings of jumper style. Engaging with the design concept, the user will initially make design choices about the jumper itself: (1) style of jumper, (2) knit (material quality and stitch pattern) and (3) colour. Next, there is the option of choosing details: (4) sleeve detail, and (5) detail colour. The user can also choose to be surprised and the designer suggests a combination. Then the knitted jumper can be made. The relatively few options, provides 97,200 variations of jumpers, which is an extremely large collection giving wide range of options for customisation in relation to personal aesthetic preferences and fit.

Figure 8: Examples of the knitted prototypes, colour samples and working drawings of jumper style.

Overall, the second design experiment concluded that the 46 female participants, in the total of six workshops, selected their favourite knitted jumper from personal choices, which showed that the participants understood the design concept and that they wanted to get involved in the design process. The participants had the skills, the courage and the desire to make these design choices.

The more particular insight, exposed how the participants interacted with the design concept, and here I became aware of the importance of its physical artifacts.

The knitted prototypes were used as narratives, for how different choices would come to look. It thus became clear that the knitted prototypes, to a great extent, support the participants' selection process. Figure 9 shows how the surface of the knitted prototypes are explored by touch, and held against the body to consider choices. The prototypes were examined by stretching to assess elasticity and dimensional stability, and the colours were compared, by placing them next to each other. The participants interaction with the knitted prototypes, illuminated the *tacit knowledge* connected to use of garments: the experience of textiles and garments against body and skin.

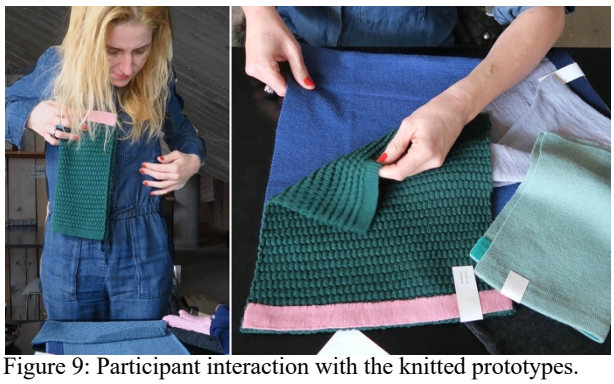

Figure 9: Participant interaction with the knitted prototypes.

The participant described their choices of the jumper as it had already been produced for them. They revealed

considerations of how they would use the jumper and what other garments they would combine it with. Exemplified here by one of the participants in dialogue with another participant:

"Wow, this one would fit perfectly with the top you have – the one with pattern, and then with a pair of jeans. It will be smart. Or also with /... / It will be just your style"

Throughout the second design experiment, the prototypes showed not only as a tool to explore user involvement in designing knitwear and to establish a dialogue with users about this, the prototypes also turned out to become a reference point for the participants to discuss preferences and considerations with each other.

The tangible elements of the knitted prototypes show to be vital to support the participants imagination. Which also emphasises the importance of the participants imagination when engaging in the design process.

In addition to examining the user-involved design process, the second design experiment contributed with insights used in the subsequent design experiment, in which participants were given a personalised knitted jumper made based on their choice.

A PERSONALISED JUMPER

The aim of the third design experiment was to investigate how 3 participants use their personalised knitted jumper (see figure 10). In addition, I wanted to explore possible effects of the participants' involvement in the design process – could that, for example, give them satisfaction in the use phase? And how does the personalised knitted jumper live up to the individual participant's expectations, needs and aesthetic preferences? In that way, the knitted jumpers acted as prototypes for carrying out the research.

Figure 10: Personalised knitted jumpers chosen by the 3 participants.

A knitted jumper is used together with other clothes, thereby creating a so-called silhouette or an outfit. Therefore, I was interested in gaining insight into how the participants would combine the personalised jumper with other garments in their existing wardrobe. The intention was to investigate how it would be included with the rest of the participant's wardrobe, and whether it would be used equally to other clothes.

In the third design experiment, I used a participatory wardrobe method, inspired by design probes, which allowed for the participants contributing in their own words and pictures describing their usage practices (Fletcher & Klepp, 2017). By applying the personalised knitted jumpers as design probes, I had the opportunity to follow the participants' way of using them, without even being present (Mattelmäki, 2006). I wanted the participants' experiences with the jumper to be as realistic as possible. Therefore, I left it up to the participants how they used their jumper, and made no demands on how often they should use it.

When handing over the personalised jumper, I encouraged the participants to take a picture of themselves when wearing it. I asked them to send the picture, via their cell phone. Possibly, with a brief description of the use of their jumper, and on what occasion.

The third design experiment lasted one year. During the time, I made individual semi-structured interviews with each participant based on their personalised jumper and their documentation – first interview after six months, and second, closing interview, after the entire year. The participants' self-documentation was used as a guide to the in-depth conversation about use of the personalised knitted jumper. I brought these pictures to evoke memories of how the jumper had been used in different situations, and in varying ways, as well as the participants' satisfaction with using it (see figure 11). Here I used the subdivision of the three piles: favourites, occasionally worn, and rarely or never worn.

Figure 11: Participant's self-documentation used to elaborate on use experiences with the personalised knitted jumper.

The participants adopted their knitted jumper, and they had each found their personal way of using the jumper, by styling it and integrating it with their other wardrobe. They showed how to add their own "design parameters", and even further adapt the jumper to their preferences and needs. Within the one year of the design

experiment, one of the participants often used a brooch to close her cardigan when she thought it's was too cold, to have it open. At the same time, she experienced how it, to her, gives a distinctive character that makes it more personal – as she could shape the cardigan around the body, by putting the brooch in (see figure 12).

Figure 12: Brooch as a closure of the cardigan. The participant show how she highlights her body figure by closing her cardigan by putting on a brooch

This was neither something I had planned, nor anticipated. The insight emphasises how using the knitted jumpers as prototypes provided detailed insights of specific use situations, as well as unfolding the participants' experiences with using a garment they had taken part in designing.

At another level, the prototypes contributed to more general insights of functional and aesthetic character. The third design experiment showed, for example, that the participants found joy and satisfaction, with the design choices of their jumper. They described how this in particular related to the colour choices, as the colour(s) of their jumper was easily matched with other garments from their wardrobe. In relation to colour, another insight was that neutral and classic colours; Not given are the ones that are used most frequently. Although neutral colours are typically considered to fit in many contexts, it is not a given that they are used more. Two of the knitted jumper prototypes are examples of alternative colours, and colour combinations being used frequently. This was due to the fact that it was easy for the participants to make combinations with other clothes, and therefore was used more often. One participant expressed it in this way:

"What I like about it (the jumper) is the colours: the combination of the pink colour and then the orange in the collar. It makes it a little more unique - so playful, somehow. And then clearly the pattern. It's such a combination of it all. /../ And I think it (the jumper) fits in so many situations, both with a pair of nice pants, so for, not, to make them too pretty at work. Or when I attend something more important, or if I go for a bike ride, and just hang out."

Gaining these types of insights are fruitful for the designer when working with design for customisation. The example emphasises that the development of the colour scheme is important. It is a balance to create a wide scheme of colours that embrace the preferences of most users, while allowing all the colours to be used crisscross. Therefore, the colour scheme is developed to make all colours match; with the intention that users would not end up with a disharmonious combination of colours.

For the participants, it was not just the user-involved design process that was fun and different. They had also found joy and satisfaction with the use. At the beginning of the design experiment the participants were paying extra attention to their personalised knitted jumper, but over time it became more and more part of their other wardrobe. The knitted jumper prototypes succeeded in that way in providing in-depth and rich insights of the use phase.

AN OPEN DESIGN PROCESS

Looking back at the design experiments presented here, I see how the different knitted prototypes not only provided insights for the individual purpose. Making and using the knitted prototypes allowed me to explore various scales of design: Making the prototypes, I have studied design of knitwear up close by challenging the technology and unfolding the potential textile means to let these meet in strategies for sustainable product design. At the same time, prototyping the coherent set up of the design experiments gave me a personal experience of what significance it may have to open the design process for user involvement. By employing this approach of an open design process, I experienced how my role in knitwear design was expanded. Influenced by Redström's (2017) spectrum of *a design* space, the open design process I have explored here, has challenged the traditional understanding of "what designing knitwear is" not only from the perspective of the designer, but including users as well.

Prototyping the design concept gave an example of how the users were required to engage by making choices of the final design of their jumper before it was produced. Within the same scenario, the designer must take into account a user-involved design approach, as well as the way in which users are involved. In this context, the designer has a role as a stylist, which facilitates that users can engage in the design process.

My own design process of designing became extraordinary complex. For example, in relation to product development. Developing knitwear for customisation, the designer does not only develop one singular jumper at the time, but develops the parameters for users to be make choices in design. In that way, the designer has to think of the many possible outcomes from the given parameters; which requires for the design to adopt systemic thinking in product

development. I think the number of 97,200 variations of jumpers, which the design concept can provide, draws an image of the complexity the designer has to deal with in designing user-involving concepts like this one.

PROTOTYPING SCALES OF KNITWEAR DESIGN

Throughout the programmatic approach to this research, prototyping has provided a tangible exploration at the different scales of design presented in this paper. In relation to this, I will return to Redström's *a design space* (2017) which I have applied to illustrate in which way the knitted prototypes have generated knowledge to inform the different scales of knitwear design; On the spectrum of customised knitted jumper, design concept, knitwear design practice, and an open design process (see figure 12).

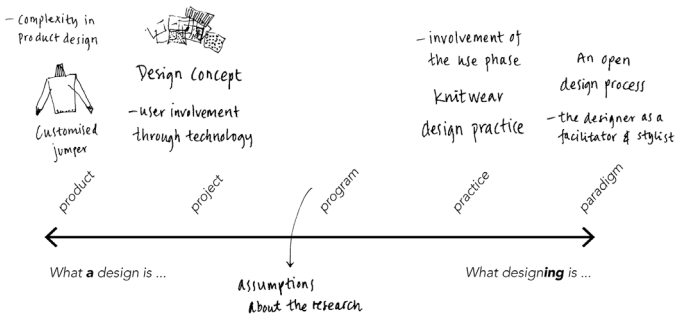

Figure 12: Prototyping scales of design. Application of Redström's (2017) spectrum *a design space*.

Applying the knitted prototypes contributed to a research program that holds the details, and at the same time makes it possible to assess the wider scope; Both equally essential to challenge, study, and come to an understanding of how textile designers can bring their professional competency into play and influence changes of the existing fashion system.

CONCLUDING REMARKS

To work with a complex topic as fashion and sustainability it is essential to think systemically and to address more aspects at the same time (Fletcher & Tham, 2019). I found that employing the different prototypes in this programmatic and experimental research set-up made it possible for me to take a systemic approach in which the detail of the different scales of engagement also generated knowledge as a whole.

To give an example of this, the physical appearance of the prototypes materialised a common reference point for discussion and knowledge generation. Moreover, the prototypes also helped to mature the conversations with the users. As use situations are a private affair, most often we are not used to speak of these with others. By bringing forward the physical exemplars of the prototypes, the participants became more confident to share their narratives:

When I contacted the participants for the first design experiment, and asked if they wanted to be part of the project, they were unsure of what knowledge they would be able to contribute with to a research project. Use of the knitted prototypes and the questioning technique functioned as a "game" where the participants could experience that no answer was perceived correctly or incorrectly. At the same time, it made them familiar with what kind of knowledge they have – knowledge about use. I thus experienced that the prototypes helped to warm up the participants by giving them a vocabulary.

In that sense, prototyping and employment of the prototypes showed to be valuable in carrying out the research. What I find essential within this research, is the overall generated insights and examples which displays how design researchers can approach and challenge sustainable strategies in practice by using traditional skills of narrating futures by prototyping. Sometimes, these professional design engagements are forgotten compared to the enthusiasm for technological development and material innovation. This research demonstrates interplay between technological development in knitwear production and designing knitted jumpers which exemplifies how practice and disciplinary competencies can facilitate new directions that may change dominating practices into more sustainable ones.

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Paper Session 5

Proximities

Session Chair | Brendon Clark

Critical Proximities
Henrik Oxvig (F)

Living World Dynamics - or what Brian Eno can Teach us About Knowing in a Complex World
Connie Svabo (F)

Tracing Matters of Scale by Walking with Minerals
Petra Lilja (F)

NORDES 2021

CRITICAL PROXIMITIES

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ABSTRACT

In the field of architecture work with scale has traditionally been used to suppress the importance of size. Axes have been planned with a birds eye view such as is given by a plan on a drawing board. Today this 'god trick' is challenged by the awareness that we must work from within the material world, not upon it. We must create situated knowledge – and situated architecture – in what is called *The Critical Zone* and which we can only experience, understand and work with embedded, immanently. This article presents and elaborates on the challenges outlined to suggest how we – with an awareness that everything changes with size – can involve the concept of scale in our analytical and creative work with art and architecture in *The Critical Zone*.

INTRODUCTION

As a concept and tool, scale is often used to suppress the meaning of size: With the Renaissance and the development of the drawing techniques that promoted the notion that it was possible to complete a building on the drawing board, scale was used to ensure the identity between the drawing and the building. The identity was secured by emphasizing the importance of proportions, which are precisely independent of size and therefore possible to transfer by scaling without alterations from drawing to building.

Already Galileo Galilei (1564-1642) became aware that size makes a crucial difference. He understood that a physical cube that is 10 in each side does not weigh 10, but a thousand times more than a cube, made of the same material, but which is 1 in each side. This fact can be neglected if the cube is a drawing. The two cubes are proportionally identical. In the physical world, however, it can be ignored but not denied. That was what Galileo experienced and acknowledged. He discovered that everything changes with size and thus came into conflict with contemporary dogmas of what an epistemological true understanding of ontology is. Galileo's experience challenged the then sacred significance attached to proportions. He was placed under house arrest by the church and banned from publishing his findings.

Even today the understanding of scale and proportions related to the Renaissance seems to be prevalent. In fact, the Renaissance's understanding of the relationship between drawing and building seems to have been strengthened with the introduction of the computer medium in the design studio. As Michael Tavel Clarke and David Wittenberg point out in their 'Introduction' to *Scale in Literature and Culture* (2017) "CAD tends to privilege architecture freed from its site-contextual considerations" which means "a strange, virtual subversion of Galileo's founding insight that engineering must obey the physical constraints on scale determined by the properties of materials" (Clarke and Wittenberg, 2017:16).

With this paper, I will first briefly present the architectural understanding of the Renaissance and point out how its premises today are challenged by different theoretical approaches with renewed attention to the material world, including to all that of the world that is not conditioned by what man intends. On this background and with reference to art that has stepped down the pedestal to involve 'site-contextual considerations' I will – with an emphasis on issues of size and scale – consider challenges and opportunities in developing a conceptual dialogue with this art. It will be central to this conceptual dialogue to break with the notion that the goal is to establish identity between epistemology and ontology, which was a presupposed norm of the Renaissance and still seems to be prevalent. In other words, it will be central to this paper to show that recognition that epistemology and ontology are not identical is the precondition for a conceptual dialogue – including a dialogue

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engaging the concept of scale – with what we experience in working with forces we do not master but must inhabit.

THE RENAISSANCE UNDERSTANDING OF SCALE: NEGLECT OF SIZE AND RELATIONS THAT MATTERS

The question of scale has since the Renaissance been related to the notion that man can truly recognize an essential identity between a larger and a smaller form and that size therefore makes no relevant difference. This understanding is characteristic of and explicitly articulated with every architectural treaty from the Renaissance. Instead of examining the differences between what we experience when working at a small and a large scale respectively, the identification and articulation of what forms of different sizes share was an overarching ideal for Renaissance treaty writers.

In continuation of the Platonic understanding of geometry – and of proportionality between the elements of geometry – as the tool to secure identity between epistemology and ontology, Renaissance theorists prioritized the importance of proportional relations exactly because proportions, independent of size, can serve to determine what is identical in shapes at different scales. It is with this attention Leon Battista Alberti rhetorically asks "if (as the philosophers maintain) the city is like a large house, and the house in turn like some small city, cannot the various parts of the house – atria, xysti, dining rooms, porticos and so on – be considered miniature buildings?" (Alberti, 1988:23). For Alberti architecture was a concern of the mind and "it is quite possible", he wrote, "to project whole forms in the mind without any recourse to the material" (Alberti, 1988:7).

According to the anthropologist Tim Ingold, Alberti's normative architectural thinking is exemplary of the *hylomorphism* that – rooted in the thinking of Plato and Aristotle – has characterized the Western World for the past two millennia. Ingold emphasizes that this *hylomorphism* is characterized by "an ontological claim, namely that things are constituted in the rational and rule-governed transposition of preconceived form onto inert substance" (Ingold, 2010:93).

CRITIQUE OF THE OLD HYLOMORPHIC MATERIALISM

Bruno Latour often addresses the question of scale. Unlike the *hylomorphic* tradition, Latour argues that we use scale attention to create understanding of the differences, rather than the identities of what we experience at different levels of reality. Latour is explicitly critical of the understanding of zoom, which in one sliding motion makes us neglect the differences between different scales. He insists, that "it cannot be said that the small or the short lie within the large or the long, in the sense that the largest or the longest contain them but with fewer details" (Latour, 2017:94).

Latour has inspired the so-called *New Materialism* and the *Object Oriented Ontology* (OOO) which insists that what we create from knowledge of the object is *not* identical with the object. An object is always more than we know. Our knowledge is limited even about what we ourselves create. While Latour has told it was liberating for his thinking, when he in his work on the significance of Pasteur's discoveries of microbes acknowledged that "nothing can be reduced to anything else, nothing can be deduced from anything else, everything may be allied to everything else" (Latour, 1988:163) one encounters among new materialists an insistence that "epistemological questions should be kept separate from ontological ones" (DeLanda/Harman, 2017:91).

In their dialogue on New Materialism, assemblage theory and OOO, Manuel DeLanda and Graham Harman agree that there are aspects of ontology that epistemology will never be able to determine and identify and that will thus remain untouched by epistemology. However, this does not mean that we must give up either the work of science or philosophy, including the work of involving – and reflecting on – for example mathematics and geometry in our creative work with the world. While Harman points out that there is a difference between "real dogs and trees and perfect mathematical models of them", DeLanda states: "Math models are never of actual objects. (…) A math model captures dependencies between the way properties change (that is a piece of information worth having), but to do so they must simplify enormously the phenomena they model" (Delanda/Harman, 2017:102).

It is my opinion that DeLanda and Harman despite various disagreements, point out that the knowledge we create must be aware that it is situated. But I at the same time agree with Ingold, who has pointed out that neither Harman's 'object thinking' nor DeLandas 'assembly thinking' is aware that the world consists not only of objects – or of assembled objects and what Ingold calls 'containers' – but also of relations and connections – lines – between the objects. According to Ingold our understanding of the world depends on our ability to describe and work with relations and forces between containers (see Ingold, 2015:7,16).

Ingold marks a similar critique in his dialogue with Latour. Ingold acknowledges that Latour has tried to "rebalance the hylomorphic model" and have insisted that "the material world is not passively subservient to human design" (Ingold, 2009:95). But it is at the same time Ingold's view that Latour in his attempt to "move beyond (…) the polarization of subject and object, remain trapped within a language of causation (…) that can conceive of action only as an effect set in train by an agent" (Ingold, 2010:96). According to Ingold, Latour does not grasp that the world we are to inhabit is not "made of subjects and objects" (Ingold, 2010:96), but by forces that carry, weigh and draw on what we have called subjects and objects. We, our objects and containers exist in a world of forces.

It is my view that Latour increasingly has become aware of what Ingold is pointing to. With his attention to what he calls *Gaia* and thus to mappings of what happens between

organisms – and with his resent work with *The Critical Zone* – Latour's work testifies that he is *in line with* Ingold's critique of "Western ontology (…) that *denies* that meaning does lie in the relational context of the perceiver's involvement in the world" (Ingold, 1992:51). In other words, it is my view that Latour is in line with Ingold's insistence that we should "work from within the material world, not upon it" (Ingold, 1994:68).

SITUATED KNOWLEDGE

Inspired by Donna Haraway in particular, Latour is aware that the notion that it should be possible from a position above and outside to describe the world we live in is both erroneous and limiting. We must instead show that our always limited perspective immanent in matter is richer, more realistic, less limited than perspectives laid from outside. But it is not only Latour's realization that our knowledge is situated that is inspired by Haraway. To me, she has also been a crucial inspiration for how Latour with the concept of scale seeks to point to possibilities for creating objective and productive knowledge about an ontology we do not know in itself.

It has thus inspired Latour that Haraway has insisted on not giving up the possibilities of creating objective knowledge even though she emphasizes that this knowledge must recognize that it will always be situated: "So objectivity turns out to be about particular and specific embodiment and definitely not about the false vision promising transcendence of all limits and responsibility. The moral is simple: only partial perspective promises objective vision. (…) Feminist objectivity is about limited location and situated knowledge" (Haraway, 1988:582/83).

It is with this understanding that Haraway calls "the view of infinite vision", linked to all sorts of visual techniques that give us the impression of being able to see through everything in one sweeping zoom for "an illusion, a god trick" (Haraway, 1988:582). We can use a map to orient ourselves in the world, but the map created with the investment of different knowledge does not resemble the world as it has been customary to imagine since the Renaissance. The map does not mimic the world but can be involved in a motivated strategic study of the world, as Latour has highlighted (Latour, 2010). This realization – i.e. the movement *from* the notion that the map mimics or resembles the world *to* the understanding that the world is neither an image nor a map – is a crucial inspiration for ongoing mappings of *The Critical Zone* and its life: "They [the maps] produce situated, embodied knowledge" (Aït-Touati, 2020:11 (my translation)), write Frédérique Aït-Touati, Alexandre Arènes and Axelle Grégoire with reference to both Haraway and Latour in *Terra Forma*, which is a manual for potential mappings of *Gaia*.

Latour is in line with Haraway's awareness that knowledge is situated and states: "It's very odd to present a city from above. I mean, who is seeing cities from above? One never actually sees the city. (….) One never sees a building as a whole. You do not see it when it is not there, and once it is made, you do not see it because it is just opaque. So the opacity of a building is a very interesting thing" (Latour, 2008:127).

In *Staying with the trouble* (2016) Haraway argues that "it matters what relations relate relations" (Haraway, 2016:35). In my reading, Haraway herby points out that it makes a difference whether we – "with a birds eye's view such as is given by a plan on a drawing board" (Le Corbusier, 1986:177) – *relate relations* with emphasis on proportions and thus disregard the meaning of size, or whether we *relate relations* without neglecting that we are embedded in a material world of forces were everything changes with size. It makes a difference if we acknowledge that in actual fact axes are "seen from the ground, the beholder standing up and looking in front of him" (Le Corbusier, 1986:177).

The challenge then becomes whether we can name relationships with the concept of scale that the hylomorphic tradition has used the very same concept to neglect? It is my contention that it is this possibility that Latour seeks to affirm, stating that "scale is what is produced, not what you should have as your own meta language to describe it" (Latour, 2008:129).

SCALE DOES NOT EXIST

With Philippe Boudon – who has influenced Latour via the architectural theoretician, Albena Yaneva (Yaneva, 2005; Yaneva/Boudon, 2008; Latour, 2008:127) – one can point out that "scale does not exist" (Boudon, 2009). Scale is what we produce when we carefully relate – and name – different relations. "If *scale* does not exist, there must exist *scales* instead." (Boudon, 2009). It is Boudon's – and Latour's – understanding that the way we measure size depends on a choice and that the choice of measure relates to – is motivated by – what we find relevant.

Everything changes with size, but the world does not have measures in itself, and what and how we measure depends on what we choose as relevant. The choice of measure – and the reflection on what is relevant to measure – is linked to creation, and it is the relation between 1) size, 2) measure and 3) relevance Boudon and Latour name with the word 'scale'. That is why scale is not a meta concept, but what we concretely produce; the concept of scale becomes qualified with the relationship the concept concretely denotes, thus for instance relationships between knowledge invested in a strategic map and reality (*cartographic scale*) or the relationship between a building and its neighboring building (*neighboring scale*). And we can name what I see from the ground looking in front of me – that is, the relationship between my vision and what I see – *perception scale*, when we are concerned with what size (length) this relationship has.

Inspired by Boudon, we can link this three-part relationship between 1) size, 2) chosen measure, and 3) naming with emphasis on the 'relevance' of the relationship between 1) and 2) to the semiotics of Charles Sanders Peirce (see Boudon, 1999). Peirce distinguishes between *firstness* – which

characterizes our as yet indeterminate encounter with ontology; *secondness* – which seek to determine our relation to what we do not know in itself, but nevertheless experience; and *thirdness* – which names the relationship between firstness and secondness with a concept. Scale – the name of different relationships with emphasis on relevant measures – thus becomes an aspect of a creative process that for instance may involve an assemblage of materials and therefore an awareness that in a world of forces everything changes with the size. But the creative process has as its goal more than we can name, and scales are – as Latour points out – not a meta concept, but what is produced. Or with the architect Louis Kahn: "A great building must begin with the unmeasurable, must go through measurable means when it is being designed and in the end must be unmeasurable" (Kahn, 1991).

The Norwegian philosopher Arnfinn Bø-Rygg has commented on *The Nordic Pavillion* in Venice created by Sverre Fehn, who was a student of Kahn: "What Fehn did was to scale the material, the space, the light, the shadow to each other" (Bø-Ryg, 2013). With a reference to Hölderlin and Heidegger Bø-Rygg stresses that Fehns architecture gives measure to a world in which everything changes with size but have no measure in itself. Heidegger doesn't talk about *The Critical Zone* but "calls the space between the earth and sky (or heaven) the 'dimension'", Bø-Rygg writes. He continues: "All forms of art and architecture are a means to measure this Between, the dimension. To dwell poetically, to create art, is to take measure. 'Is there a measure on earth?' Hölderlin asks. To which he answers: 'There is None.' (…) It is not something that can be pre-determined. Heidegger is far from associating our measure to the familiar and safe, to what we can control. To measure the dimension is then to dwell in the open, in what Hölderlin calls 'the Unknown" (Bø-Rygg, 2013).

We hereby respect the realization that was emphasized by DeLanda and Harman in their dialogue: "Epistemological questions should be kept separate from ontological ones." But we are also moving beyond the New Materialism and OOO insofar as we examine the relationships and forces between objects. With reference to Ingold and his critique of the hylomorphic tradition, we are aware that it is a problem when design only takes places in our consciousness without recourse to the material world as was the ideal of Alberti. Our work must involve a continued recognition that we are working within the world and its forces.

With Ingold we go further than both DeLanda, Harman and OOO that still only pay attention to objects and do not acknowledge that a life is unfolding between the objects – and between the objects and us – and that we have to work with an awareness of these relations even if it can't be via a god trick from an imaginary elevated position. Ingold points out that we should not just name the objects "as nouns, but as verbs, as ongoings" (Ingold, 2015:16) in order to become aware of how they relate to each other. Instead of attaching ourselves to hylomorphism's notions of matter as dead, Ingold encourages us to be aware of the life of matter and thus of how matter creates knots of relationships in which we can participate and live: "The world of things, I propose, is a world of knots, a *world without objects*, or in short, a WWO" (Ingold, 2015:16).

It is my view that Latour shares Ingold's attention when he points out that the challenge today is to understand how we can live "with myriads of viruses, bacteria, animals and other life forms." The challenge is not how we "indicate a distance from the situations that require judgement", but how we with critical attention strive to "gain a new proximity with the situations we have to live in" (Latour/Weibel, 2020:9).

Frédérique Aît-Touati and Emanuele Coccia have highlighted what they experience as "an extremely coherent approach in the intellectual path" (Aït-Touati, 2021:5 (my translation)) which runs between Latour's early work on Pasteur and his later work on *Gaia* and *The Critical Zone*. As already stated in connection with his work on Pasteur's discoveries, Latour emphasized that his - Latour's – ambition was neither to explain anything *with* nor reduce anything *to* something else. The aim was rather to relate what may be relevant to relate. The ambition was *not* to explain anything with the microorganisms that Pasteur discovered, but to understand how the microorganisms via Pasteur's discovery became an actor we could relate to and, for example, involve in the planning of our cities, as the attention to the microorganisms' existence and movements could motivate sewerage in cities burdened by various bacterial related diseases: "It was not a question of moving from a world without microbes to a world populated by microbes, but to allow the transition to a political scene where microbes are recognized as having the capacity to act and therefore to exist as social actors, just like humans or institutions" (Aït-Touati, 2021:5).

The crucial thing about the discovery of the microbes was not that we could thereby explain something on a larger scale with something on a smaller scale. The crucial thing was whether we could involve what we epistemologically experience from and understand by different big and small lives in the planning of, for example, our cities. The question that is raised today with attention to *Gaia*, that is, with the understanding that the many forms of life continuously create their own environment, is whether we can, for example, plan our cities so that lives of different sizes - and which surround us everywhere - may cooperate in an appropriate manner. The question is whether we can find out to inhabit *The Critical Zone* with respect for the life forms that is the prerequisite for and environment of our own life.

SITE-CONTEXTUAL CONSIDERATIONS

In his essay on his own site-specific work, *Spiral Jetty* (1972), Robert Smithson (1938-73) writes that "size determines an object, but scale determines art" (Smithson, 1996:147). This consideration has for some time – and with a traditional understanding of scale – been misunderstood to the point that it should mean that with art there is no decisive difference between image, text and physical work: "There is no pure *Spiral Jetty*, no work uncontaminated by language or other supposedly nonsculptural media," (Shapiro, 1995:7) Gary

Shapiro writes in his comprehensive book on Smithsons art, *Eartwards, Robert Smithson and art after Babel*, which has been of great importance to the Smithson reception. Photographs of *The Spiral Jetty* are somehow identical to the physical work, and scale is used to suppress attention to differences instead of promoting it.

The sculptor Richard Serra – who helped Smithson with the realization of *Spiral Jetty* – has in oppositions to Shapiro's understanding stated, that "what most people know of Smithson's *Spiral Jetty* is an image shot from a helicopter. When you actually see the work, it has none of that purely graphic character. (…) If you reduce sculpture to the flat plane of the photograph you are denying the temporal experience of the work, you're not only reducing the sculpture to a different scale for the purpose of consumption, but you're denying the real content of the work" (Serra, 1994:129).

Smithson died shortly after completing *Spiral Jetty*. But Serra has continued to work in accordance with Smithson's understanding that works of art that "came of the pedestal" are "in exactly the same behavioral space, that you are in", which is why one must work with the sculpture "in relation to time and space, and not as something removed you deal with as a kind of icon or worship" (Serra, 2001). For Serra, everything changes with size and the work with sculpture involves what I with Boudon and Latour have called scale, that is, an awareness of relationships that does not neglect but affirm the importance of size. This is why Smithson states that "size determines and object, but scale determines art." About his work with the sculptural installation *Weight and Measure* (1992) – which was a temporary site-specific work of two rectangular steel volumes of different sizes in Tate Museums *Duveen Gallerie*, designed by architect John Russell Pope in 1939 – Serra has stated: "Scale in relation to place has to be worked out with mock-ups *in situ*. One has little retention for scale relationships. The problem of scale cannot be solved through design solutions; you cannot preconceive scale and draw it up in graph paper" (Serra, 1994:275).

Art historian Richard Shiff has pointed out how Serra works with a sense of what we with Peirce has called our *firstness* relationship with the world and which relates to the fact that we are embedded in and cannot control it from an elevated position (Shiff, 2015). For Serra, it is crucial that what we experience when we move in one direction is different from what we experience when moving in the opposite direction. The order of the factors *does* matter. It is this indefinite *firstness* experience – which relates to any encounter with sculpture and architecture that is not just an image or an container – Serra gives measures and thus relates to with awareness of different relations, such as the sculptures relationship to its surroundings (neighboring scale) and to the perceiving person (perception scale). The work *Weight and Measure* relates to the spatiality in which it is placed and thus crates another spatiality in its site. And it is conceived with attention to the viewer's movement and thus to the fact that it is only by virtue of movement in time and space that one experiences that the two rectangular volumes that Serra has placed in Popes classical architecture and which immediately – from where one enters – appear identical, have both different sizes and different weight.

While Pope's architecture is created in compliance with the proportional theories of classical architecture, which ignore the scale of architecture and thus the significance of its concrete size (Oxvig, 2013), Serra with his cubes creates an understanding of what Galileo became aware of: Everything – also the weight – changes with the size. Serra makes us sense the size of Pope's space by using his cubes to draw attention to the importance of size and weight, first by the cubes and then by their surroundings.

Serra works with and awareness of what we can determine by objective measures and name with different scales, but which we at the same time have been accustomed to neglecting by the notion that there is no difference between epistemology and ontology. With his sculptures, Serra gives us experiences of what it means that the work – and matter – is more, not less than we can overlook, understand and control. With his works, Serra is in close dialogue with insights, which today are involved in studies, mappings and descriptions of *The Critical Zone* and thus with what it involves when Latour encourages us to 'land on Earth' to critically work with a new proximity: with that which is close to and surrounds us.

In other words, the ambition of this paper has been to point out that the theoretical work that Anna Tsing calls for, when she in accordance with Galileo, points out that "scalability is not an ordinary feature of nature" (Tsing, 2015: 38), can advantageously be unfolded through a conceptual dialogue with, what art that stepped down the pedestal and into the world has given us the opportunity to experience. The ambition has been to point to a possible – and necessary – collaboration between philosophy, science and art in a situation where, in Tsing's words, "it is time to turn attention to the nonscalable, not only as objects for description but also as incitements to theory" (Tsing, 2015: 38).

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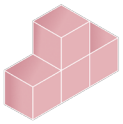

LIVING WORLD DYNAMICS – OR WHAT BRIAN ENO CAN TEACH US ABOUT KNOWING IN A COMPLEX WORLD

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ABSTRACT

In questioning how we come to know the world, we have to maintain the insight that things can hang together in many ways and that the world always exceeds our modeling attempts, regardless of scale, weight and representation. Multiple orders are at play in the world and perhaps the best way to get a measure of a lively world is to move with it in performance. Modelling knowledge on endlessly unfolding and endlessly changing performance provides a way of researching the world in a lively manner: beyond static specification and blue-print simplifications. This generates a new relationship between world, knowledge and performance in the enactment of a dynamic model of knowing

We live in an interconnected and dynamic world. At a global level, we are faced by the unwarranted environmental effects of the output of our current modes of consumption and production, as well as by unpredictable and high-risk phenomena such as illness, poverty and political instability. Everyday lives are subject to and dependent upon large-scale technological, infrastructural, industrial, political, economic and social systems. On an individual level, the combined pressure of interconnectivity and complexity shows itself in everyday lives strung out between large scale systems and infrastructures. Ordering is ever present, but if one link in the interconnected chain fails, the edge of chaos emerges. Complex phenomena challenge order, trust and reliability as principles governing the everyday, and furthermore make it evident that we need new models of knowing.

DESIGN BROADENS SYSTEM BORDERS

Phenomena in the world are not necessarily knowable in any kind of linear, simple or predictable sense. It is not always possible to develop valuable 'blue-prints' for action, detached, distanced, delimited.

Instead of dealing in reductionist, representational relationships, where codified knowledge holds truth, there is a need to explore interconnectivity, multiplicity and other muddled ways in which world and knowing can cohere.

The need to address and understand open, complex, dynamic and networked problems in society has led to a keen interest in design (Dorst 2015, 24). Dorst talks about design practitioners broadening the "system border": "design contains a process of thinking around the paradox rather than confronting it head-on." (Dorst 2015, 26)

Design-based working potentially involves 'playing around', coming up with ideas and possibilities, and 'trying things out': "in expert design practice, the design problem is not fixed before the search begins for a satisfactory solution concept. Expert design is more a matter of developing and refining both the formulation of a problem and ideas for a solution in concert, in a process of 'co-evolution' (Dorst 2015, 24)

Particularly worth highlighting here is the temporality of this process: it is not a sequential model, where you first define a problem and then find the solution. On the contrary, the problem-and-solution space are interconnected and emerge together, in coherence and incoherence.

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WEIGHING THEORY AND PRACTICE

Design and problem solving are ongoing processes: there is no absolute security and predictability to the efficiency and ultimate desirability of designs. Designs have unpredictable effects: solutions create new problems.

Design research - and other practice-based research - has the potential to trouble the often enacted linear sequentiality between theory and practice (where theory is presented as coming *before* practice. This addresses the relationship between research and practice, which also involves questions of how to mitigate between various forms of knowing. How can professional and practical experience be integrated as legitimate and relevant knowledge in academic scholarship? How may practice-based knowing be accounted for academically?

DESIGN ARGUES

Design researchers Rolf Hughes and Katja Grillner draw attention to the importance of authorial voice and the creative possibilities in discursive exploration of design and architecture (Grillner 2005, Hughes 2007), as well as sketching that there are many forms of knowing: knowing can be described and communicated through action (e.g. caring); representation (architecture design, writing); conversation (dialogues); materials and physical designs.

Design researcher Richard Buchanan models design knowledge on the persuasive qualities of rhetoric and communication, arguing that design, rhetoric and communication are closely related. Buchanan connects design with rhetoric and communication because design implicitly or explicitly is a mode of argument.Design conceives, plans and implements and it does so on the basis of values. It makes cases for certain realities and changes lives, for better or worse. Design addresses matters of concern, deals in the complex and contextual challenges of converging and social, technical and environmental systems. It is not controversial to say that design is world-making practice (Svabo & Bønnelycke 2020).

DESIGN IMPROVISES

Design researcher Johan Redström, building on science historian Ian Jacking, critiques such an ordering sequence (Redström 2017: 102). On the basis of examples from the natural sciences Hacking shows that there is reason to reject this assumption. Redström argues that the same is the case for design: asserting that it is simply not correct that design theory (in Redströms vocabulary in the form of programs) precede experimentation. The relationship between theory and practice is much more dynamic and complex. The design experiment does not just materialize an already given idea. Just as often the ordering sequence goes the other way around, starting with experiments long before any sort of general theoretical framing is articulated. A ‘blue-print approach’ where ideal / concept / theory comes before matter / design / experiment is too limited. It is not sufficiently sensitive to design process and the dynamics interrelationship between theory and practice. The theory - practice sequence of events is much more muddled.

Redström points out that a variant of the problematic of sequentiality is present in design when struggling to formulate a research question to guide and define design experimentation and when written accounts of design research place theory first - even when the practice, design and experimentation come before the concepts and ideas (2017: 103). Redström substantiates this with an example from industrial design - showing that the Bauhaus wasn’t a clear, preformulated program, where research grounds (comes before) design. There was much muddling around and a great deal oof searching in various directions and from all sides. The precise formulation emerges over time through ideas, concepts and manifestos, but also through making and experimentation. This involves amateurish playing with materials - experimentation - in an environment where making and ideas emerge together (Redström 2017, 103).

Considerable agency takes place in the midst of things, in situations of incomplete understanding, in situations without large-scale overview, based on assessments and incomplete information.

Open-ended and dynamic performance is a good ’thinking tool’ for exploring the dynamic qualities of design process, design research process, designers and users (see bibliography for various references).

There is a clear lineage for this kind of research in design where terms such as theatre, post-dramatic theatre, scenario, improvisation and performance have been used over the last three decades, with one of the first works being Ehn and Sjögrens 1991 exploration of the value of theatrical metaphor for collaborative engagements between users and designers.

WORLD UNKNOWABILITY

The foundations of scientific knowledge have been shown to be provisional and open to negotiation.

“Knowledge is embodied or enacted in the ever-unfolding choreography of action within the universe. Stated bluntly, the truth isn’t out there. Nor however, is the truth ‘in here’. […] what is known is acted out in what is done, and what is done contributes to the unfolding of the cosmos.” (Davis & Sumara 2006:70)

One example practice where the provisionality and temporary character of research-based knowledge, indeed of scientific fact, is modeling practice. Modeling is a key epistemic practice in the natural and technical

sciences and models are key epistemic technologies with strong creative, aesthetic and visual dimensions. Much knowledge of the world is built through modelling. These models are socially and historically contingent. They change. They develop over time. They are approximations, visualizations, reductions. They are designs with agentic effects on our understanding of the world. They are provisional and performative designs.

Models highlight particular understandings of the world, but they are not the world. The world always exceeds the model.

Complexity thinking makes manifest the limits to ways of thinking about the world which are founded on knowability, on the assumption that it is possible to fully describe the world and to make predictions about the course of events determined by relationships of causation.

According to systems thinking and non-linear dynamics, it is hardly possible to attain complete knowledge; to exhaustively know something. There is a fundamental 'unknowability' to the world, alongside features of 'knowability'.

A feature of complex systems is that they can be neither completely defined nor can their behaviors be predicted.

ONTOLOGICAL THEATRE

Any representation will always be provisional. This is well established by science studies from the last half century - through the interrogation of science in the making. In a fascinating history of British cybernetics, physicist and science and technology scholar Andrew Pickering provides 'sketches of another future', through a revitalization of cybernetics as 'ontological theater'.

Pickering unfolds the limits to representational, blue-print understanding. According to Pickering, performance is what we need to care about.

Knowing, modelled on Pickerings version of cybernetics, "stages for us a vision of the world in which fluid and dynamic entities evolve together in a decentered fashion, exploring each other's properties in a performative back-and-forth agency." (Pickering 2010, 106)

Pickering removes *knowledge* from the center of the model and replaces it with *performance*.

This takes inspiration from the 60ies/70ies operations management guru cybernetician and tantric practitioner Stafford Beer, whose work has influenced amongst others, the musician Brian Eno.

Eno unfolds how cybernetics inspired his approach to music, by referring to a particular phrase, which he picked up from Stafford Beer: *"instead of specifying it in full detail; you ride on the dynamics of the system in the direction you want to go."*

This became Eno's working method: *riding the dynamics of the system - in the direction you want to go*. This models performance beyond the control of the performer and gives us an idea about creative knowledge work, which emerges from interaction and engagement with elements beyond the person's control. Based on this model, knowing in and with the world is about engaging in open-ended and dynamic interplays, where randomness and unpredictability play their part. These engagements do not consist of control - it is not possible to predict, let alone control, the course of events. It is however, possible to interact and engage and through this to infrastructure and influence.

ENDLESSLY CHANGING, ENDLESS MUSIC

Brian Eno's music provides a model of engagement beyond static specification and reductionist, representational, blue-print simplifications. The music conjures up a lively performance; a generative audio-visual algorithm which continually is capable of generating new performances. Eno's musical worlds exhibit unpredictable, emergent becomings. Modeling knowledge on this kind of performance conjures up a lively world, a world continually capable of generating novel performances (Pickering 2007, 304).

This is particularly clear in Eno's app 'REFLECTION' (which has been playing incessantly, endlessly playing, endlessly changing for as long as this conference paper has been on its way).

Eno says: "My original intention with Ambient music was to make endless music, music that would be there as long as you wanted it to be. I wanted also that this music would unfold differently all the time - 'like sitting by a river': it's always the same river, but it's always changing. But recordings - whether vinyl, cassette or CD - are limited in length, and replay identically each time you listen to them. So in the past I was limited to making the systems which make the music, but then recording 30 minutes or an hour and releasing that. […] But the app by which REFLECTION is produced is not restricted: it creates an endless and endlessly changing version of the piece of music." (Brian Eno Reflection application, accessible for purchase in Appstore).

KNOWLEDGE

Does knowledge move? Transversally emerge in provisional performances? Endlessly change?

Do we envision knowledge as bounded, taking place in delimited territories, demarcated fields of knowledge?

These questions address research methodology.

In research methodology, the world is approached, modelled, represented, performed, scaled, enacted.

It matters with what models we model the world (paraphrasing Haraway, paraphrasing Strathern).

Methodology is important because it is the territory where what counts as knowledge is negotiated.

Methodology is where theory and practice are scaled and weighed up against each other. What counts? What does research-based knowledge look like? Which form does it have? With which rhythm or voice can it be articulated?

COHERENCY

Things that seemingly are far apart, can be close.

Philosopher Michel Serres accounts for this with his crumpled handkerchief. Serres in a conversation with Latour, says: "If you take a handkerchief and spread it out in order to iron it, you can see in it certain fixed distances and proximities. If you sketch a circle in one area, you can mark out nearby points and measure far-off distances. Then take the same handkerchief and crumple it, by putting it in your pocket. Two distant points suddenly are close, even superimposed." (1995, p.60)

According to science and technology scholar and empirical philosopher Anne-Marie Mol, this is one of the important contributions of the notion of the network: it is about *relational agencies and associations*. The network questions the singular spatiality of Euclidean territory – typically our default way of understanding space. This is a major insight offered by actor-network theory and other performative, relational and mediational approaches: things can hang together in many ways and things that seemingly are far apart, can be close.

"Latour dissolves the power of logical coherence by arguing that in as far as the world hangs together this is a matter of practical associations. How far these associations reach isn't given with the birth of a new configuration. Unlike epistèmes, networks are open. The elements within a network may link up with other elements, outside the network. But such external links are not different from internal links. They're all associations. Each new and successful association makes a network larger."(Mol & Law, 2002: 1).

The notion of the network has unsettled the hegemonic spatiality of Euclidean space, of thinking of space in terms of areas and regions. Network thinking has pointed out that space may also be contemplated in terms of networked relations (Mol & Law, 1994: 643).

Can we transfer this to knowledge practices? What happens if we think of knowledge not in terms of bodies, areas, territories of knowledge, but in terms of networks, relations and multiple orders?

"When investigators start to discover a variety of orders – modes of ordering, logics, frames, styles, repertoires, discourses – then the dichotomy between simple and complex starts to dissolve. […] we discover that we are living in two or more neighbouring worlds, worlds that overlap and coexist. Multiplicity is thus about coexistences at a single moment. To make sense of multiplicity, we need to think and write in topological ways, discovering methods for laying out spaces, and defining paths to walk through these." (Mol & Law 2002: 7f).

Multiplicity is an ontological premise: multiple orders are at play in the world. The central idea of multiplicity is to look for multiple orders, multiple patterns – and to find ways to move within them.

SHIFTING ALLOWS MOVEMENT

The concept of *shifting* may be helpful in finding ways to move between different scales, multiple orders, patterns and practices. Shifting is a spatial, temporal and actorial transportation. In semiotics, shifting is a way of conceptualizing translocations and transformations; moves across character, time and space. The 'I' in the here and now may be moved – shifted - into another character, another time and another space (Latour 1993: 13). This suggests that time and space may be considered as properties which are enacted along with an actor; that a 'character' comes with a characteristic spatiality and temporality. When a character emerges, a characteristic space and time also emerge. In material semiotics actor, space and time go together.

This mediation resembles what Star and Ruhleder, and Star and Bowker, based on information system research, call *infrastructuring* - as pointed out by Bjögvinsson, Ehn and Hillgren (2012, 108) *:* "Infrastructuring entangles and intertwines activities at project time (e.g., selection, design, development, deployment, and enactment) with everyday professional activities at use time (e.g., mediation, interpretation, and articulation), as well as with further design in use (e.g. adaptation, appropriation, tailoring, re-design, and maintenance)."

Importantly, infrastructuring simultaneously works with how existing infrastructures shape use, while at the same time leaving space for the unanticipated. This leaves space and time for multiplicity, heterogeneity. "As such, they are more like creative design activities than rational decision-making processes." (Bjögvinsson, Ehn and Hillgren 2012,109)

What we see enacted here is a dynamic relationship between world, performance and knowledge. (A relationship where it is not possible to obtain the distant

onlookers exhaustive overview.) (The observer can not predict or exhaustively know the system, let alone the dynamic interactions of multiple systems.)

The ontology which we see enacted is "world as a multiplicity of exceedingly complex systems, performatively interfering with and open-endedly adapting to one another." says Pickering 2010, 205 in relation to computer science – asserting that there essentially is no way to work out what the system will do – at least not by any procedure that takes less computational effort than 'just running the system and seeing what happens.' This, according to Pickering, following computer scientist Wolfram, is the starting point for 'a new kind of science' (2010, 169) in which knowledge is superseded by performance and where knowing is about riding system dynamics in the direction we want to go.

CONCLUSION

What Brian Eno can teach us about knowing in a complex world: his music provides a model of engagement beyond static specification and reductionist, representational, blue-print simplifications.

The article provides an account of knowledge as dynamic, open-ended process by bringing together design, culture, and science and technology studies.

Research and knowledge creation are modeled on open-ended, endlessly unfolding performance. This offers a 'thinking tool' for exploring the dynamic qualities of design. There is a clear lineage of previous work of this kind in design research, where terms such as theatre, post-dramatic theatre, scenario, improvisation and performance have been used for the past three decades to explore design process, design research, designers and users.

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NORDES 2021

TRACING MATTERS OF SCALE BY WALKING WITH MINERALS

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ABSTRACT

Most practices of design are dependent on materials, and an anthropocentric way of thinking matter as mere resource ready to exploit, dominates. This text attempts to counteract that mode of thinking *about* matter, by walking and thinking-*with* stones, minerals and fossils in a disused limestone quarry in southern Sweden. The text is folding together thoughts from philosophy of science and vital materialism with insights from the lithic, spatio-temporal scales of sedimented fossil archives of the quarry and situated experiential explorations taking place there. What emerged from the learnings of the minerals, and what this text contributes with, is a proposal for a performative multi-scalar type of thinking that challenges linear, humancentric timescales, binaries and dualisms and instead opens up for more entangled understandings of, and care for, human-matter relations.

> I believe that encounters with lively matter can chasten my fantasies of human mastery, highlight the common materiality of all that is, expose a wider distribution of agency, and reshape the self and its interests.
>
> – Jane Bennett, 2010

> The present is both a reckoning of what we are ceasing to be but also the seed of what we are becoming.
>
> – Rosi Braidotti, 2020b

INTRODUCTION

Recently, scientists were able to study a dying star that exploded and understood for the first time, the vast amounts of calcium that is released into the universe in that process. Therefore, even the smallest pebble is, on deeper reflection, a link to a dynamic cosmos of inhuman forces and materialities that extend to the most remote parts of the galaxy, connecting it to all living bodies of animals, plants and water.

Walking-with minerals is an ongoing and in-progress exploration, and part of my PhD-project within design, titled Cultivating Caring Coexistence – Designing Anthropodecentric Futures, where I am continuously exploring the following question: How do the ways in which we think matter, predetermine, limit, or enable the way we then construct our relations to place, to environments, to objects as well as communities of human and more-than-human earth-others? Guidance comes from a theoretical framework of critical and feminist posthumanism and new materialism and concepts like *vibrant matter* (Bennett, 2010) that are dealing with issues of human and more-than-human relationalities. In order to explore theory in a more situated way, I started walking in-situ, both alone, together with a colleague, guided groups and together with others. In-situ means situated in the original site, and my interest in the origins of materials led me to a local site of extraction, a disused limestone quarry. The purpose of the text is to bring together theoretical concepts with my own insights from walking in the

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quarry. The first section of this text introduces the local scale of the lithic site of the quarry and connects it to the scale of global extraction, its geosocial pasts and presents of the so-called 'Anthropocene' to give a background to why I suggest to think matter and material otherwise. The text touches upon how I see design as an *ecology of practice* drawing from, but not limited to Isabelle Stenger's relational concept (2005), and how my walking has emerged as a *tool for thinking-with* mineral-others. Connecting the concepts *vibrant matter* by Jane Bennett (2010) and *time as becoming* by Elizbeth Grosz (2011), with the situated walks tracing scales of time and space in the fossil strata, led me to my main insight: a multi-scalar type of thinking that I find necessary in order to even grasp matter as vibrant. The following section presents one of the experiential methods more in detail; *tracing-common-ground*, which further explores human-lithic connectedness, followed by a summary on what was learnt from the mineral archive of this site and why the proposed multi-scalar way of thinking can be useful in thinking matter otherwise and why this is valuable.

THE SITE – A VIBRANT VOID OF DISPLACED MATTER

Limhamn is an area outside of Malmö in southern Sweden, and the name means lime-harbor, indicating the site's 'natural resource' that has always been at the center, the limestone. Extraction of lime has most likely taken place since prehistoric times but the start of more large-scale quarrying can be traced back to the year 1866 (Länsstyrelsen, 2016). When the mine closed in 1994, the extraction had resulted in a large void, approximately 1300 meters long, 800 meters wide and 65 meters deep. A void of displaced matter, was my immediate reflection on my first visit. However, it is not a void in terms of empty space, on the contrary, the closed off quarry is bustling with life of different plants, insects and larger animals, some extremely rare or on the brink of extinction. The old quarry, this gigantic (w)hole, is an assemblage consisting of more than 1500 nonhuman inhabitants, in addition to the sedimentary mineral rock, fossils as well as the industrial remnants of human quarrying and processing of the lime. An assemblage, following Deleuze and Guattari's philosophical concept (2013), is here thought of as a spatio-temporal composition of human and/or more-than-humans, always lively and unpredictable, never fixed. Although the quarry was classified as a nature reserve in 2011 due to its rich flora and fauna, it does not mean it is a static, harmonious whole, rather it is an assemblage fitting Bennett's description: an "ad hoc grouping of diverse elements, of vibrant materials of all sorts" that come and go and can be both "intimately interconnected and highly conflictual" (2010, p.23). One example of a contradictory element of the quarry that struck me on my walks, is the water pumps. The current formation of the assemblage is dependent on that 70 liters of water is redirected, every second. Human activities have an obvious part in this entanglement; however, this text is taking its departure from on another important power hierarchy present, namely the violent force of human dominance that have displaced the minerals in the first place, through extraction by hand and later with the aid of machines and dynamite. This violent ascendancy is a power position that is probably not viewed negatively by most, considering the mineral as resource and the effects it has had, as ingredient in produced objects, buildings and infrastructures, developing societies. New building developments surround the quarry, giving the post-industrial site a new kind of value as exclusive view. Progression notwithstanding, I attempt a less human-centered perspective when thinking-with the mineral, nevertheless accounting for the frictions that it might entail.

"We walked through the limestone layers – my skeleton's main component (organizers' comment). A moment in the remnants of a heavy industry where vegetation and wildlife take over. Newly built exclusive apartments cling on the edge of the quarry, balancing, overlooking what exactly?" (Co-walker, 2020)

THE SITUATION – DESIGN AND EXTRACTIVISM

Limestone is a sedimentary rock composed primarily of calcium carbonate (CaCO3) in the form of the mineral calcite. Most products we use on a daily basis include minerals, for example, a glossy paper contains calcium carbonate along with kaolin clay, sodium sulphate, soda ash and titanium dioxide. Concrete, the main end-product for lime and one the markers of the [so-called] Anthropocene (Waters & Zalasiewicz, 2018), contains in addition gypsum, iron oxide and clay. Most plastic products, plastic being another marker, also contains processed limestone. All practices of design are dependent on, made from and marketed by the choice of materials. Yet, despite a growing general awareness of the sustainability discourse, the connections between design and unsustainable extractivism are backgrounded due to issues that are all linked to matters of spatial and temporal scale. For example, the geographically far distances between sites of extraction, production and consumption: the origin of materials, how it is extracted and by whom. Reports show how large-scale mining has negative impact on human rights for local inhabitants around mines in for example mining countries like Zambia (Swedwatch, 2019). Two thirds of consumption-based emissions from Swedish consumers, occur in elsewhere and are therefore counted as emissions in the low-wage countries that produce the designed objects (Naturskyddsföreningen). The temporal scales of life-cycles: despite recent resolutions proposing longer lifetimes of products (European Parliament, 2017), most objects are still designed with a planned obsolescence keeping the consumer in a

continual loop of consumption. But then there is, what I would call a scale of transcendence: I suggest it concerns the level of connectedness between human and nature, which both mean an intellectual understanding of connectedness and how it affects consumerist and other behaviors of buying, exhausting and caring for matter-material-objects-services consumed, determining our so-called ecological footprint (Global Footprint Network). My understanding is that responsibility and care, for example in terms of recycling, is often put on the individual in a neoliberal manner, although the chances of impacting or making change are negligible due to the fact that the recycling systems along with the systems of extracting the matter in the first phase, are cogs in the same globalized economical order where everything is valued on the basis of its ability to be capitalized upon. This understanding is grounded in a "modern divide of nonhuman and human" (Åsberg et.al., 2018, p.2), a belief in human transcendence that creates hierarchies and dualisms. In other words, the view that human dominates nature, which, as I have argued, is key in the global extractivist activities driven by capitalism.

Aerial view of Limhamn Limestone quarry by Google Maps (accessed: May 2, 2021)

THE SITUATION –THE 'ANTHROPOCENE'

The notion of the 'Anthropocene' is becoming established and used in many contexts to describe our planetary age as a new geological epoch, defined by unparalleled human influence upon Earth. Evidence for this originates from human activities that leave large-scale impacts on the Earth's surface such as mining. As an emerging platform for discussing climate change I agree with Nigel Clark and Kathryn Yusoff that the term 'Anthropocene' has a strategic relevance as alarm clock (2017) and in the context of the quarry, the term is useful since it introduces other ways of thinking temporal scale beyond humancentric history. Following this reasoning, yet acknowledging that there are alternative terms suggesting other important perspectives (Haraway, 2016, Malm et. al., 2014), the term Anthropocene is continuously used in this text, however, it is important to problematize it further.

Popularized and coined by atmospheric chemist Paul J. Crutzen and biologist Eugene F. Stoermer, the term Anthropocene is derived from the Greek words *anthropo,* 'man,' and *cene* 'new'. Although their proposed date for the onset of the epoch is the latter part of the 18th century, coinciding with the innovation of the steam engine (Crutzen et. al., 2000), clearly connecting it to European economic and political actions, the term is homogenizing (hu)man impact and responsibility, despite the uneven effects across the south-north divide (see Chakrabarty, 2009, cited in Parikka, 2018, p.53), prompting the question of what man, or anthropo*,* the term is referring to. Yusoff has in the book *A billion black Anthropocenes or none*, built arguments drawing from the important works of scholars like Aimé Césaire, Éduard Glissant, Sylvia Wynter, Diane Brand and more, to highlight the term's inherent racial blindness:

> If the Anthropocene claims a sudden concern with the exposures of environmental harm to white liberal communities, it does so in the wake of histories in which these harms have been knowingly exported to black and brown communities under the rubric of civilization, progress, modernization, and capitalism. (2018, xiii).

Yusoff is problematizing the whole discipline of geology, or what she calls w*hite geology* (2018, p.21), which she recognizes "as a racial formation from the onset and, in its praxis, as an extractive and theoretical discipline" (2018, xiv).

The reason for bringing these aspects up, is the importance of understanding the inequities that a lot of the materials that designers use are built upon, since, the links between designing and extractivism often are obscured. I build this understanding further on Tony Fry's statement that design is inherently contradictory, meaning that on the one hand, design is the creation of something new, on the other hand, creation equals destruction (2009). Furthermore, as Arturo Escobar concludes, "much of what goes on under the guise of design at present involves intensive resource use and vast material destruction; design is central to the structures of unsustainability that hold in place the contemporary, so-called modern world" (2017, p.1). The term extractivism emerged from Latin American scholarship, to describe the commodification of the earth. It is defined as follows by Ecuadorian economist Alberto Acosta:

> Extractivism is a mode of accumulation that started to be established on a massive scale five hundred years ago. The world economy – the capitalist system – began to be structured with the conquest and colonisation of the Americas, Africa and Asia (2013, p.62).

Many sites of extraction are violations of human and more-than-human communities, causing social and environmental destruction, still, as Heather Davies concludes, "there is a refusal to simply condemn these acts, and instead the [design] work figures desire as central. The seduction of colour, of shine, of bling, of telecommunications technologies all operate as fundamental to these images of devastation" (2019 p.4). Furthermore, my experience of the Swedish design community, it is easy to see yourselves as politically neutral and hence stay safely unaware of the ideological work performed by constructing and producing things in the world, often repeating normative values or even reinforce the colonizing of ideas to impose upon others. These problems, Joanna Boehnert suggests, emerge from lack of understanding of the historical circumstances and power relations that have created the unsustainable societies of today and how the capitalistic system, with its neoliberal governance, is impacting lives and the planet in negative ways (2018). And as we are "just now noticing the extinction [we have] chosen to overlook in the making of […] modernity and freedom" (Yusoff, 2018, xii), I can conclude that there is a most urgent need that the connections between design and geo-politics become clear.

Plateaus on the east side of the quarry. Photo: P. Lilja

"This is place is so beautiful with its large-scale white walls" (Co-walker, 2020).

Seen through the strata of the limestone quarry, the epoch of the Anthropocene constitutes barely two millimeters of the first step when walking into the site. The human power however, is evident everywhere in the form of the void itself, the plateaus and the textured walls marked by dynamite. The challenge here, is hence not only to recognize the beautiful fossil sedimentations, but to try to slide across scales of temporality and spatiality, connecting it not only to the politics of global extractivism but also to how the matter itself is understood. The mineral walks attempt to explore the mineral matter as vibrant more-than-human entities, by tracing these landscapes formed by power hierarchies and human exceptionalism.

WALKING-WITH MINERALS…

… can be to trace the relations of minerals and humans in this specific, lithic location. What if we think beyond the industrial history of this place: What happens if we, as human beings, do not put ourselves in the foreground all the time? What if we focus deeper on the background, on the limestone, the fossil and the mineral? Can we try to see even the inert rocks, stones and minerals as lively and vibrant? Look around you and choose a stone from the ground. Pick it up, hold it and keep it with you. This is your mineral companion throughout this walk. The stone is a kind of everyday thing. It's just a piece of rock. The stones and minerals have always been here, they surround you and you are even standing on a gigantic rock, floating in space. Feel the weight of the stone in your hand, grounding you in this specific location. Today, we walk in the enduring company of the rocks, so let's allow for other kinds of rock stories, not just those that talk about human productivity, culture and politics, which presuppose that the mineral only exists for us.

A COLLECTIVE MINERAL WALK

Together with designer Anette Væring, I designed a specific mineral walk that took place on a sunny and calm day in September 2020, hosted and marketed by the municipality of Malmö. It was a two hour-long public event with twenty participants that all had signed up for tickets on a well-established website for local cultural events. The cost of the tickets was a symbolic 10 SEK (€1) to cover administrative costs of the event coordinator, making the walk fairly accessible to find out about and afford. However, the mineral walk in the quarry is not accessible for wheelchairs due to that parts of the rather steep dust roads are not paved. Around two thirds of the participants where artists, designers or researches from other disciplines interested in the posthuman framework, the fact that it was guided by designers or the possibility of accessing an otherwise closed-off quarry. The latter was also a driver for one third of the participants interested in the quarry for a variety of other reasons. Three persons had grown up close to the quarry and had childhood memories of the soundscape of the industry during the 1980's. The italic text sections above and below, are recitations from a text that was read out loud in the beginning of the event as well as in the middle, during an exercise called *tracing common ground*. Some of the feedback from our co-walkers in this public event are quoted in italics throughout this text, and has informally been collected either orally during the last part of the walk, and via email or social media platforms after the walk.

A TOOL FOR THINKING

The public mineral walk, is designed as, what Isabelle Stengers would call, a *tool for thinking*, "that address

and actualize [the] power of the situation, that make it a matter of particular concern, in other words, make us think and not recognise" (2005, p.3). This is grounded in my understanding of my design work as an ecology of practice of sorts, correlative to how Stengers is approaching her own field of physics: "as it diverges, that is, feeling its borders, experimenting with the questions which practitioners may accept as relevant, [and where] the relationship of relevance between the situation and the tool [is key]" (Stengers, 2005, p. 184-5). My ecology of practices is situated in flux between constructed borders of art, design, curatorial practice and research, and my gathered explorations of walking with minerals, are consequently not just attempting to recognise the quarry as a quarry but rather explore it as a tool for thinking to actualize the quarry and the situation. To emphazise the active part of the thinking-tool, the part that actualizes or enact action through thinking, I find the notion of *thinking-with* helpful. I suggest that it means a way of thinking otherwise from thinking *about,* and inspired by Haraway, it is about the ability to think-with other beings, human or not, rendering each other capable of unexpected feats and enlarging their capacities. Because, "[t]he urgencies of the Anthropocene […], demand that kind of thinking beyond inherited categories and capacities in homely and concrete ways" (2016, p.7). And to change the anthropocentric story, think we must; we must think as Haraway exclaims by concluding that "[t]o think-with is to stay with the naturalcultural multispecies trouble on earth" (2016, p.40). In the context of rocks, stones and minerals in the quarry, thinking-with it is an attempt to counteract a mode of thinking about matter as dead and mere resource and instead understand the human-lithic as shared world.

"As we walk back up and out of the limestone quarry on winding gravel roads, I reflect on my childhood memories, the sound of the big stone crusher that I heard every day when biking to school. The long trains transporting the minerals to [the company] Cementa's large cisterns wher it was waiting to be mixed into cement. The cement, the raw cement." (Co-walker, 2020)

What is at stake, according to Stengers, is "giving to the situation the power to make us think" (2005, p. 185), but what is at stake in the quarry, where the sound of the dynamite has long gone been silenced? During the planning phase of the public walk some nagging thoughts lingered: What difference will this walk make? Is this not just a very exclusive walk in an otherwise gated area, for a small group of priviledged participants in a very safe environment considering the absence of toxic elements leaking and evaporating into bodies so common in other mines and quarries elsewhere in the world where these problems have been exported? Now, I would answere yes to the above questions without hesitation, still convinced that this quarry has the potential to actualize all of those relevant frictions in a helpful way. In order to attempt this, the mineral as a discursive tool to think-with might not be enough on its own because just 'thinking' does not necessarily generate a full experience, and as Marilyn Strathern taught so many through Donna Haraway's mentioning: "It matters what ideas we use to think other ideas" (as cited in Haraway, 2016, p.34). To explore question of human-lithic relationalities and if it matter how we think matter further, I am bringing Stengers' idea of relationality between tools and situations together with thoughts on relationality from the field of political science, namely vital materialism, thinking-with Bennett's concept of vibrant matter.

THINKING-WITH VIBRANT MATTER

The notion of vibrant matter is an important part of a theoretical framework put to work here in an attempt to counteract the dominant anthropocentric dualisms, which are a prerequisite for extractivism, not only in Limhamn or elsewhere in Sweden but globally. The problem, Bennett argues, is that "materiality is both too alien and too close for us to see clearly" (2004, p.349). With the concepts of thing-power (2004) and vibrant matter (2010), Bennett wants to make us more sensitive to more-than-humans, realize their powers in and on our bodies and surroundings, and, by connecting it to ecological thinking, evoke an enhanced ethical sense for ecological sustainability. Bennett theorizes a vital materiality in the tradition of philosophers spanning history from Democritus, Epicurus, Spinoza and Diderot to Deleuze and Guattari who would call this vitality *immanent* (1988) in that it exists within matter and runs through and across bodies, both human and more-than-human. Extremely simplified, this vital view is detaching "materiality from the figures of passive, mechanistic, or, divinely infused substance" (Bennett, 2010, xiii).

This text attempts to think-with the mineral by reading it through the concept of for example vibrant matter, however, to most of our co-walkers in the publicly announced event, these concepts were not well or at all known. To disseminate the theoretical context, the site and the the physical walk are key in order to situate thinking and learning from the lithic timescales exposed in the quarry. So, the walk was designed as a humble and easy-to-follow first step of speculating rocks, stones and minerals as vibrant and finding common human-lithic ground, through the two sessions of reading aloud (excerpts in italic), with the aim to engage in an active form of thinking-with and *walking-with*.

TRACING SCALES OF TIME AND SPACE

You are walking through deep time in a kind of museum of layers and thick deposits of sedimented matter that are exposed in this place. This is a strange museum where biology becomes geology. The limestone is a thick mineral cemetery that has been animal and then became stone, during unimaginable 65 million years.

An archive of life, death and the fossils in between. Notice the sedimented walls and regard the layers as a kind of measuring tape. Here, it has taken 50 years for every millimeter of limestone to form. Ask yourself, how many years have you been alive? The Anthropocene, the human epoch, makes up only 2 millimeters of your first step on this journey. Keep walking, and focus on the fact that each step you take, corresponds to about 50,000 years. Now, let us walk 65 million years back in time.

Limestone sediments, Limhamn. Photo: P. Lilja

"Stone", as Jeffrey J. Cohen wrote, "is an aeonic companionship" (2015, p.17), a support I would add, in challenging the life-death divide, because it requires a new understanding of temporal scales beyond the human. It is difficult to grasp the timescales of strata spanning 65 million years, but "a rock […] opens an adventure in deep time and inhuman forces of slow sedimentation" (Cohen, 2015, p.4). Can walking down to the bottom of the pit, carefully contemplating that each step equals 50 000 years, make this fathomless scale of temporality more understandable? The fact that the quarry measures 65 meters from top to bottom and the sediments span 65 million years is an interesting numeric coincident. Furthermore, the walking distance from the starting point at ground level to the bottom measures 650 meters. This made the simple calculations comparing space and time fruitful as we were walking 65 million years back in time. One could of course argue that this exercise is reducing time to spatiality by conceptualizing the strata into a vertically linear measuring tool for counting, a tool at home in the reductionist and modernist world-view. Still, by combining it with physical movement, the aim was to create an embodied experience of this multi-temporal site and perhaps introducing thinking beyond human-time scale. In addition, this potentially opens up for thinking time otherwise, in which spatial scale is also importantly entwined. Grosz argues that "spatial practitioners [like artists, architects and designers] need to develop other notions of time in order to act upon the future", and suggests a notion of "time as becoming", connected to lived experiences and bodies (Grosz, 2001, cited in Schalk, Kristiansson & Mazé 2020, p.180).

"Sometimes I closed my eyes during the silent walk down into the limestone quarry, to more clearly feel the vibration under my feet far below the ground and imagine a tropical sea, 62-65 million years ago, (some million years after the extinction of the dinosaurs) ...then, opening my eyes and to see that I am surrounded by 65 meters of layers upon layers of limestone sediments, huge walls made from fossils rising from the ground, fossils from this tropical sea!" (Co-walker, 2020).

By measuring time through rock strata in order to understand evolution and change, time "becomes detached from the specific anthropocentric onto-epistemologies [opening up] to consider the multiplicity of temporalities and alternative metaphysics" (Parikka, 2018, p.52-53).

"I thought a lot about how this journey down into the ground / earth, into deep time, relates to large scales… specifically how it enters into dialogue with / problematize large modernist projects." (Co-walker, 2020)

When it comes to the lithic participants of the mineral walks, the stone companions are seldom seen as a form of life, rather, they mainly get to represent the cold, dead or inert, and as such, resources to be exploited. Perhaps it would be easier to think and walk-with a living tree, plant or animal as vibrant? Well, the challenge in thinking minerals as vibrant in this particular quarry is rewarding I would argue. Because the sediments introduce a scale between biological life and geological mineral, challenging the binaries of life and death, past and future as well as disciplinary boundaries. The limestone here was formed in a warm sea between 65–62 million years ago and it consists mainly of deposits from microscopic coccoliths (algae), bryozoans (mosses) and corals (Länsstyrelsen, 2016). So, instead of a temporality supporting static and binary categorizations of lively (for example biology, algae, tree) or dead (for example geology, fossil, wood), what the mineral walks attempts to make apprehensible, is a transformational power aligned with what Grosz calls *nature as becoming*, a philosophy of becoming which argues that nature transforms beyond the limits of passivity of resource. Grosz "understands life and matter in terms of their temporal and durational entwinements. Matter and life become, and become undone. They transform and are transformed" (2011, p.5). Fossils, according to Kathryn Yusoff, "unlock this life–death, time–untimely, corporeal–incorporeal equation" (2013, p.779).

Fossil of oyster found in Limhamn's limestone quarry. Photo: P. Lilja

A MULTI-SCALAR DESIGN APPROACH

If the mineral is (to be) rendered lively or vibrant, we must understand it over durations of time beyond the limited timescale based on a human lifetime. This would in turn call for a rethinking of the human-centered linear concept of past-present-future. When thinking-with the limestone quarry, the layers of minerals start to protrude the anthropocentric frame, forming what could possibly be called an archive of more-than-human knowledge. In line with what Stephanie Springgay and Sarah E. Truman argue, rocks are *queer archives* (2018), immanently lively because they melt, erode, collapse and so on. Vibrant in their production of differences over vast timescales, to the extent that it becomes invisible from a human perspective. So, how can we relate to this as designers? Perhaps, if we expand this thinking to include matter processed into materials and designed objects? Objects, Bennett explains, like

> "stones, tables, technologies, words, and edibles that confronts us as fixed are mobile, internally heterogenous materials whose rate of speed and pace of change are slow compared to the duration and velocity of the human bodies participating in and perceiving them. [They appear] as such because their becoming proceeds at a speed or a level below the threshold of human discernment" (2010, p.3-4).

What I have learnt from thinking and walking-with the rocks, stones and mineral during my explorations, is to think beyond the human-centric time-scale and to engage with time as becoming. It is an intellectual act, a type of multi-scalar thinking and a mindset that, I argue, is needed in order to grasp the complexities connected to these urgent times. The ability to think through and across deep temporal scales is an important skill for the designer who wish to be able to actualize strategies for living and dying well in these troubled times (Haraway, 2016, p.1, Tsing et. al., 2017), aiming at different futures. To conclude, I propose that a vital materialism has got the potential to cultivate a multi-scalar way of thinking matter and material through time as becoming, and I am curious to further explore how this approach would possibly predetermine, limit, or enable the ways we then construct our relations to place, to environments, to objects as well as communities of human and more-than-human earth-others. The ethical foundation for this argument will be further unpacked in the final section.

WALKING AS METHOD

This lithic location consists of an assemblage of human and more-than-human agencies in a continuous open-ended becoming, be it the porous walls of mineral fossils caving in, the pump, rerouting the groundwater that would otherwise flood the quarry with unknown effects on the surrounding land, or the rare types of frogs and plants finding refuge here, or the graffiti painter trespassing. By walking-with, we are tracing these encounters creating an understanding of this place and our own connection to it.

WALKING-WITH

> Walking slows you down, time passes differently and mind and body are merged in the effort to cover ground and take in the surroundings. That is, every step embodies time as well as space, each step meshing things past and those to come in an ongoing process, each step participating in the making of worlds and in the process, knitting together responsibility for past, present and future. (Lesley Instone, 2015, p.135)

Walking, has a long and interesting history as both political and philosophical endeavors that for example Rebecca Solnit famously have collected in her book *Wanderlust, a history of walking*, where she is asserting that "walking is a mode of making the world as well as being in it" (2014, p.29). Solnit also touches upon walking as a form of knowledge making:

> "Walking shares with making and working that crucial element of engagement of the body and the mind with the world, of knowing the world through the body and the body through the world" (2014, p.29).

By moving down into and through the sedimented quarry space, I have learnt things from encountering not only minerals, but also water, atmosphere, steel, plants, soil, concrete and animals. I feel affected by this assemblage of more-than-human encounters, in subtle ways hard to put into words, but to conclude, it is building an understanding of place and my relationality to it. Perhaps it is similar to what J.J. Cohen explains: walking "with stone is intensely to inhabit that preposition *with*, to move from solitary individuations to ecosystems, environments, shared agencies, and

companionate properties" (2015, p.11, emphasis in original). If, by agreeing with the propositions presented by Truman and Springgay, it is possible to understand the mineral strata of the quarry as a queer archive of knowledge, I suggest that we can allow the mineral to teach us about deep geological time and vibrant matter while the movement of the walking helps to embody that knowledge. "Walking with stone", Springgay and Truman concludes, "demands that we think not about what the rocks mean to us, nor the memories they hold, but what vital and affective qualities are co-composed" (2017, p. 853).

PERFORMANCE AND IMAGINATION

Unlike my walks in solitude, the public mineral walk is a carefully designed and curated *dramatization* (Braidotti, 2020a) starting with a listening session establishing the site as an assemblage through different narratives, focusing on opening up for more-than-human perspectives through the mineral companions of the walk. Tactility was engaged by touching stones and carrying a selected one throughout the walk. The main part of the walk, was conducted in silence with the aim to focus the participant's attention to the more-than-human encounters. The performativity (Butler, 1999) of the mineral walks, in other words everything that was brought about through the experiential and situated approach, happened through the intra-actions (Barad, 2007) between the designers/guides, the narrative figuration of the vibrant minerals and the participants. Crucial for creating this kind of agential space for renegotiating matter (as mere resource) is to facilitate imagination. The narrative, here in terms of the text that was read, is key in creating imaginaries, and has the potential of *reconfiguring the world in its becoming* (Barad, 2007, p.207). The challenge of designing the public walk as a tool for thinking, is how to offer the co-walkers a stimulating narrative and environment so that they can connect the dots themselves, which puts focus on the function of imagination. The ability to imagine is necessary to be able to relate the vast timescales to the materiality of minerals within our bodies and our surroundings. My conclusion is that whether the walk can be actualized as a tool for thinking and potentially for reconfiguring our relations to matter, is dependent on how well the design and dramatization facilitate for, and spark, the imagination of the walker. I see a potential in the performative walk to become a pedagogical activity where different groups come to learn through the quarry as archive, listening to the researched narrative, walking-with minerals, understanding the timescales and touching the mud – getting in contact with the micro- and macro-materialities of previously extracted and exploited matter. I believe this can raise awareness for the human-mineral relationships and entanglement.

TRACING COMMON GROUND, BECOMING-WITH MINERALS

We are walking talking minerals, able to walk upright over the earth because of the mineral that long ago, infiltrated the organic world of fleshy matter-energy, became our partner and gave us mobility in the form of our skeletons. Without this solid mineral base, we would fall apart, and the same applies to societies, companies, relationships, identities, knowledge. Like the forests and trees that sit like a skin over the earth's stones - without the solid strength of the minerals inside, without the stone, that skin would crumble. Now, start tracing the minerals inside of you, on your skin.

> […]500 million years ago […] some of the conglomerations of fleshy matter-energy that made up life under-went a sudden mineralization, and a new material for constructing living creatures emerged: bone. (De Landa, 1997, p. 26)

Tracing common ground, is an activity of the public walk that took place after the initial 45-minutes long, silent part. Brushes along with paint that me and my colleague prepared from the calcite was placed in a large circle in the middle of the quarry where we, quietly embraced by the distant sedimented walls, sat down together with our co-walkers. The aim of this exercise, is to embody an understanding of the common ground between the bodies of the human and the mineral, by tracing the skeleton in our hands with mineral paint.

Tracing the lithic in the human. Public mineral walk, Limhamn Sept. 20, 2020. Photo: B. Buch-Larsen.

Based on the notion of matter as vibrant, this exercise does not deny that human and more-than-human bodies are different, rather, it aims for an understanding of commonality and connectedness though a shared mineral basis. Many thinkers who have contemplated human-mineral relations, have been inspirational for the design and narrative of this exercise. For example, Cohen writes in his book *Stone, an ecology of the inhuman*, that "human and lithic compose a petric duo" (2015, p.27). Haraway tells us that "[i]f we appreciate the foolishness of human exceptionalism then we know that becoming is always becoming *with* – in a contact zone where the outcome, where who is in the world, is

at stake" (2008, p.244, emphasize in original). I find the notion of becoming-with helpful to describe the aim of the exercise tracing common ground, because it departs from everything's connectedness, challenging delusions of separation, reminding us of our own 'mineralness', that we are formed by minerals and connected to earth's ecological community. In other words, the human and the lithic share a mineral base.

"When we sit on the ground and are given a task to trace the skeleton of our hands with mineral paint, a magical stillness arises, a meditative feeling of getting in touch directly with the limestone, the skin and the skeleton of my hands interacts with the minerals from the Paleocene epoch" (Co-walker, 2020).

Manuel De Landa, author of *A thousand years of nonlinear history*, who reminded us that the human endoskeleton was one of many products of ancient mineralization, also informs us that:

> About eighth thousand years ago, human populations began mineralizing again when they developed an urban exoskeleton: bricks of sun-dried clay became the building materials for their homes, which in turn surrounded and where surrounded by stone monuments and defensive walls (1997, p.27).

This connectedness or entanglement that the activity attempts to bring to the fore, is not about 'becoming one with the world' in 'harmony', rather the whole walk is simply an activity aiming to make us think about our relationalities with the material world, from the microscopic scale of the fossil companions to the macroscopic scale of globally distributed calcium carbonate, embodied here through experiential walking and tracing.

It is also a reminder of the geological pasts that we belong to, and that are moreover part of our present-future continuum (Braidotti, 2020b). The sedimented rock walls exposed in the limestone quarry are also an archive of *human* knowledge, where the Anthropocene, or 'the age of man', is recorded in the strata. Besides, the fossil unearths the process of sedimentation that also occurs within human bodies, reconceptualizing us as a multispecies beings, becoming-with one another (Haraway, 2003, 2008). It reminds me of our geologic origins and futures, and hence, it *queers* (Yusoff, 2013) or *diffracts* (Barad, 2007) the very concept of the human, its origin and identity as a singular force. Considering the mineral common ground of dying stars, limestone fossils and human bodies was an important part of the narrative of the public walk, with the aim to call for an understanding of humans, more-than-humans, matter and time as entangled and connected.

UNEARTHING AN ETHICS FOR DESIGN

To sum up, let me start by stating that it matters how we think matter. Because, as this text argues, the dominant dualistic thinking of human exceptionalism is backgrounding nature with consequences leading to the urgent and troubled times of climate change, mass extinctions and the complex consequences that includes. Nature however, according to Val Plumwood (1993), is not just a background, or something that is separated from us. Rather, "we are fully in nature and nature is fully in us" (Åsberg & Braidotti, 2018, p.1). The void of displaced matter in the quarry is shaped by an anthropocentric understanding of matter and it has provided materials like cement and chalk, enabling human designs in the shape of buildings and cities as well as a variety of commodities from plastic objects to toothpaste, which makes the site of the quarry ideal for designers to contemplate the origins of materials.

Walking-with the minerals of the disused quarry in Limhamn, emerged as a tool for thinking matter and materials otherwise than mere resource. A tool that could unlock the potential in other similar postindustrial sites and material archives. The designed dramatization of a public walk put focus on the function of imagination as key in relating to the enormous timescales of rocks, stones and minerals. The performativity of the experiential activities, (like attentive movement, walking in silence, listening, touching, carrying and caring for stone companions, and tracing-common-ground), emerged as a translation between the abstract timescales, knowledge and the embodied experience of the here and now, aiming for different futures.

The performativity of the mineral walks activated and actualized a theoretical framework with concepts like vibrant matter and time as becoming, which suggests the importance of a multi-scalar thinking, cultivating an ability to think beyond the human-centric time-scale. Potentially, a performative multi-scalar thinking might facilitate the ability to grasp vast time scales that render matter-materials- and objects vibrant, which in turn opens up for designers to respond with long-term accountability. This could potentially unearth an ethical framework and I argue along with the most cited thinkers in this text, that more potent, more complex and more ethical understandings of materiality is needed (Bennett, 2004; 2010, Braidotti 2013; 2019, Grosz, 2011, Truman, 2019 and Åsberg et.al., 2018).

The design of the public mineral walk is for example following the advice of Bennett who is arguing that what is needed is a "cultivated, patient, sensory attentiveness to nonhuman forces operating outside and inside the human body" (2010, xiv). Ethical commitment is needed because it might bring forth a new form of material awareness, potentially impacting

what and how materials are extracted, processed, designed with and used for, potentially evoking more ethically aware production and consumption patterns.

Hence, the main point of this paper is that it matters in what spatial and temporal scale we think matter. Not only a gesture to move beyond the human by recognizing agency in matter; the framework that is emerging here points to that the way matter is understood and related to, can also charge design and research with particular ethical, aesthetic, and political tasks.

Public mineral walk, Limhamn Sept. 20, 2020. Photo: B. Buch-Larsen.

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NORDES 2021

Paper Session 6

Intimate Scales

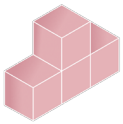
Session Chair | Yaprak Hamarat

On DIY Cloth Face Masks and Scalar Relationships in Design
Joanna Saad-Sulonen, Andrea Botero and Mille Rosendahl Hansen (E)

Places in the Making: How Fashion Design Transforms the Multitude of Scales
Namkyu Chun (E)

Thinking With/In the Wardrobe
Anna-Mamusu Sesay (E)

NORDES 2021



ON DIY CLOTH FACE MASKS AND SCALAR RELATIONSHIPS IN DESIGN

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ABSTRACT

In this paper, we take the case of Do-It-Yourself (DIY) face masks as an entry point to questions of scale and scalar relations in design. We provide two example scalar trajectories that illustrate how DIY face masks - as everyday design artefacts - are in continuous shaping and re-shaping through various forms of active use and design. We also point out how scalar relations manifest in knowledge sharing and circulation of know-how, as DIY masks emerge in a world facing the same COVID-19 virus but within different local realities and relationships.

INTRODUCTION

One of the central tenets of modern design's customary preoccupations with scale, has been to "tame" and manage scale, mostly as an issue of size and growth. This preoccupation translates in the development of a plethora of tools and strategies to allow designers to move - and work - from one (usually small) scale to another (usually larger) leaving away other important scalar relations. This is illustrated in a popular essay by urbanist and designer Dan Hill (2012) when he quotes a famous predicament of Finnish architect Eliel Saarinen: "Always design a thing by considering it in its next larger context — a chair in a room, a room in a house, a house in an environment, an environment in a city plan." In this essay, Hill also recognises that there is more than size and growth relations at play. He calls for design to not only embrace "matter", i.e. the "artifact", but also the "dark matter", referring to things such as policy, regulations, and organisation; in other words, a sort of meta level "context". Design should swing between the meta and the matter, thus opening up opportunities for understanding and articulating wider ("wicked") problems, being able to ask the right questions, and exploring them through concrete interventions.

In this paper, we take the case of Do-It-Yourself (DIY) cloth face masks as an entry point to questions of scale in design and the kind of scalar relations that go beyond the usual focus on size and growth. Face masks or coverings are material artefacts meant to cover the nose and mouth of the wearer with the aim of limiting the spread of their respiratory droplets and aerosols, thus limiting the spread of viruses, such as COVID-19 (Howard et al. 2021). These artefacts have been placed in a central position with regards to many controversies during the spread of COVID-19 in the past year. We are inspired by Saarinen's and Hill's invitations to consider the designed artefact and/in its context(s) - including the "dark matter". However, we are less prescriptive in our aims. Instead of examining scalar relations from the vantage point of professional design activities that tend to prioritize nested relationships of size, we will take that of professional designers (us the authors) examining and learning from multidimensional, emerging everyday design - meaning design that is undertaken in a mundane, everyday fashion, without necessarily involving design professionals (see e.g. Henderson & Kyng, 1991; Wakkari & Maestre, 2007). This focus recognizes the continuous, creative appropriation of existing resources and the exploitation of their affordances as elements of everyday day design-in-use that provide a framework for understanding DIY mask sewing activities as design.

We also build on previous research on the role that knowledge sharing plays in sustaining everyday design (Botero & Saad-Sulonen, 2018) and take advantage of a recent taxonomy of active use and design engagement presented by Kohtala et al. (2020). Their taxonomy considers the continuum between use-as-is, active use, user design, and user innovation to include forms of

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everyday design embedded in phenomena such as hacking, appropriating, making and peer to peer production. They examine active design engagement recognising the interplay between individual forms of design engagement (as related to uses, objects, meanings and images, and local settings) and collective ones (organizational communities, imaginaries and ideologies, and interaction arenas and global platforms), thus also touching on the role of knowledge sharing. Kohtala et al.'s recognition of diverse shapes and relations within design engagements provide a helpful tool for us to interrogate scale with. The research questions guiding our work are the following: What kinds of scales and scalar relationships are visible in the phenomena of DIY design(s) of face masks? In particular, how can we identify and problematise scale and scalar relationships in the case of DIY masks?

MOTIVATION AND APPROACH

The motivation for our research started with the COVID-19 pandemic triggering our concern with the proliferation of the new disease, as three human inhabitants of the planet earth, located in two Northern European countries. For us, this started around mid-March 2020 when infection was detected in Finland and Denmark and restrictive measures were put in place, but face masks were not recommended, and were even discouraged (Czypionka et al., 2020). The initial global lack of protective personal equipment (PPE), including face masks, triggered grassroots level sharing of information on how one could create a face mask that would protect from the virus. Instructions started appearing online from East Asia - and soon from many other countries. We started following examples and collecting online instructions, how-to video tutorials and emerging research through our combined knowledge of English, Spanish, Finnish, Danish, and Arabic. We also dug up our sewing machines - some of us didn't advance further than testing a few designs and making initial prototypes, whereas some of us managed to make a bunch of masks for ourselves and friends. As the pandemic unfolded and different rules and regulations were put in place by health authorities, we started building a repository of instructions and initiatives and started compiling data more deliberately; complementing it with interviews of people in Denmark who were sewing masks and sharing instructions online.

MASKING PEOPLE

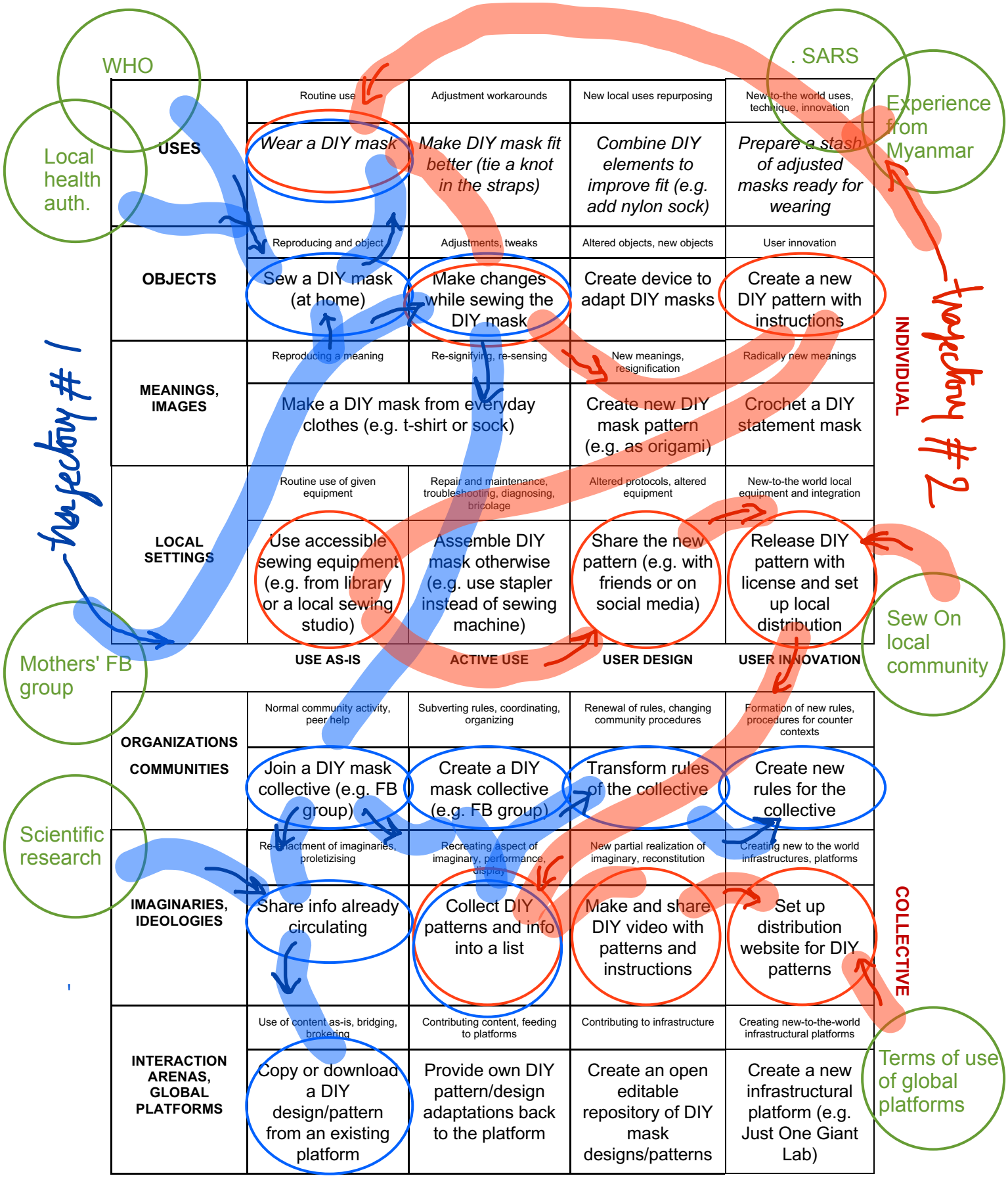
During the pandemic there has been much debate about the efficacy of wearing face masks. Right now, research seems to indicate that even simple DIY cloth masks do limit the spread of droplets and aerosols (Howard et al., 2021) although the protection of the mask wearer is still controversial (Bundgaard et al., 2020). Nonetheless, consensus seems to be emerging that face masks are key infrastructural components of effective collective mitigation and adaptation strategies to the virus (e.g.: Czypionka et al., 2020, Howard el al., 2021). For a long time during the pandemic, mask provisioning and information sharing happened mostly at the grassroots level, mediated by digital media due to social gathering restrictions imposed. The World Health Organization only accepted the relevance of using masks on June 5th, 2020 (WHO, 2020), contributing to delays in setting official guidelines and regulations in place in most parts of the world. This delay has been explained partly as an attempt to avoid panic-induced public hoarding of masks. Masks were in short supply due to disruption of global trade caused by pandemic restrictions and reduced local manufacturing capacities as a result of globalization (Howard et al. 2021). However, researchers also suggest that other factors involved in the dismissal of masks in general could be considered. This includes, for example, the adoption of a "throw-away culture" in the health care sector, which led to the progressive replacement of effective reusable face masks by disposable ones since the 1960s, leading to subsequent lost in know-how (Strasser & Schilchn, 2020).

Media and academic debates about the availability and use of face masks and coverings (including DIY ones), have been largely framed in terms of questioning or praising its benefits or harms - and less so in terms of the implications of 1) attending to masking as a social practice governed by sociocultural norms (Westhuizen et al., 2020), and 2) taking more seriously matters of design of the artefact itself. For the latter, this means, , amongst others, considerations regarding proper material selection, adequate fit of different patterns, usability and desirability (Clase et al., 2020).

SCALING TRAJECTORIES AND PATHS

Scale, like concepts such as environment, space, place and practices, is one of the elements from which totalities are built. Human geographer Richard Howitt (1998) reminds us not to naturalize this category in terms of size (e.g. large or small) or level (e.g. local, global). He instead proposes to consider scale as a relational element that, like in music, reminds us of resonances, compositions and temporalities. Following his invitation, we propose to use narrative collections to identify some of these simultaneous scalar relations. Table 1 shows a series of examples taken from our empirical material on DIY mask making. The examples are overlaid on Kohtala et al.'s (2020) taxonomy of active design engagement. In their original article each category is exemplified by peer to peer open design examples. Here, we make use of examples of DIY face mask making from our empirical work to populate the taxonomy and suggest scaling trajectories as means to provide insight on some of the resonances, compositions

Table 1: Varieties of active design engagement in DIY mask making and scaling trajectories (Adapted from Kohtala et al. (2020)



	USE AS-IS	ACTIVE USE	USER DESIGN	USER INNOVATION
USES	Routine use *Wear a DIY mask*	Adjustment workarounds *Make DIY mask fit better (tie a knot in the straps)*	New local uses repurposing *Combine DIY elements to improve fit (e.g. add nylon sock)*	New-to-the world uses, technique, innovation *Prepare a stash of adjusted masks ready for wearing*
OBJECTS	Reproducing and object Sew a DIY mask (at home)	Adjustments, tweaks Make changes while sewing the DIY mask	Altered objects, new objects Create device to adapt DIY masks	User innovation Create a new DIY pattern with instructions
MEANINGS, IMAGES	Reproducing a meaning Make a DIY mask from everyday clothes (e.g. t-shirt or sock)	Re-signifying, re-sensing	New meanings, resignification Create new DIY mask pattern (e.g. as origami)	Radically new meanings Crochet a DIY statement mask
LOCAL SETTINGS	Routine use of given equipment Use accessible sewing equipment (e.g. from library or a local sewing studio)	Repair and maintenance, troubleshooting, diagnosing, bricolage Assemble DIY mask otherwise (e.g. use stapler instead of sewing machine)	Altered protocols, altered equipment Share the new pattern (e.g. with friends or on social media)	New-to-the world local equipment and integration Release DIY pattern with license and set up local distribution
ORGANIZATIONS COMMUNITIES	Normal community activity, peer help Join a DIY mask collective (e.g. FB group)	Subverting rules, coordinating, organizing Create a DIY mask collective (e.g. FB group)	Renewal of rules, changing community procedures Transform rules of the collective	Formation of new rules, procedures for counter contexts Create new rules for the collective
IMAGINARIES, IDEOLOGIES	Re-enactment of imaginaries, proletizising Share info already circulating	Recreating aspect of imaginary, performance, display Collect DIY patterns and info into a list	New partial realization of imaginary, reconstitution Make and share DIY video with patterns and instructions	Creating new to the world infrastructures, platforms Set up distribution website for DIY patterns
INTERACTION ARENAS, GLOBAL PLATFORMS	Use of content as-is, bridging, brokering Copy or download a DIY design/pattern from an existing platform	Contributing content, feeding to platforms Provide own DIY pattern/design adaptations back to the platform	Contributing to infrastructure Create an open editable repository of DIY mask designs/patterns	Creating new-to-the-world infrastructural platforms Create a new infrastructural platform (e.g. Just One Giant Lab)

and temporalities involved. Many other trajectories can be identified but we do not present them here.

TRAJECTORY #1

The first narrative trajectory follows the path of DIY mask patterns, first at the level of individual design engagement, and then through collective ones. A pattern is a design artefact that allows the reproduction of a design by others. Creating and altering mask patterns is a form of innovation, which relies on knowledge sharing strategies to spread further. The first pattern we encountered was made by a Taiwanese anaesthesiologist (Dr. Chen Xiaoting) who shared it on the 6th of February 2020 as a Facebook post in Mandarin and English. The post features photos and instructions asking people to seek help from someone who knows how to sew. The second one is known as the HK mask, a pattern based on the work of Hong Kongese retired Chemistry lecturer (Dr. Kenneth Kwong) who first shared his patterns and drawings on a bilingual post in Facebook in March 2020. Both social media posts move from individual-initiated design engagement beyond the simple use-as-is, towards active use to user innovation, in the form of providing knowledge necessary to create masks. The posts address aspects of material selection (types of fabrics and qualities), filtration possibilities (best materials, home replacements, ways of testing them), fit (patterns for different sizes, tips to make better knots and importance of nose fitting), adherence (economical arguments for cloth masks, advice on how best to organize their production and possibilities of making a fashion statement).

Knowledge sharing that first took place on Dr Kwong's own social media, later spilled to other collective forms of innovation through relationships. A community sewing studio (Sew On) for elderly people led by a local fashion designer (Winsome Lok) contacted him as his post resonated with them. Together, close to 40 volunteers helped refine the design and produced instructions and masks. Other collaborations also resulted in a website of compiled materials (DIYmask.site); in different languages, showcasing the original illustrations of Dr Kwong's patterns and videos with sewing instructions created by the Sew On studio. The collective also has a GitHub account to share the website code, thus hinting at possible further user-innovation through the creation of new infrastructural platforms.

There are some precedents that suggest other kinds of scalar relations that do not fit neatly in the table. For example, this trajectory's starting point is in East Asia, a region that holds fresh memories from a similar respiratory virus (SARS), which may explain its early onset. In the case of Dr Chen Xiaoting there is also early experience with the use of cloth masks in hospitals in Thailand and Myanmar - a practice no longer existing in most hospital settings nowadays. The case of the HK mask also rides on the positive positioning of face masks in general as symbols of freedom and associated style statements during the Hong Kong protests.

TRAJECTORY #2

The second narrative trajectory starts from collective design engagements (the lower half of the table), and moves into individual and collective activities. The entry point is a mothers' group on Facebook, where one of our informants, a Danish lady in her 40s has been a member since she had her child 8 years ago. In June 2020 she encountered in this Facebook group a post by another member asking where one could buy a cloth mask. As a hobbyist seamstress, she got interested in making masks, firstly to provide them to others in the group and later for her own extended family and friends. She first used a free pattern (shared on a Danish textile website known for providing many DIY guides), that she adjusted for better fit: making it bigger, changing the side stitches and iterating ways of adding a pipe cleaner for a better nose fit. Having a nickel allergy herself, she tested the pipe cleaner for nickel. She also tested the fit of the mask by asking her husband to exhale smoke from his e-cigarette. She also searched DIY mask making videos on YouTube for inspiration, consulted the Danish National Board of Health, and relied on her husband to translate the recommendations for fabric types in the WHO guidelines. She also joined one of the local Facebook groups dedicated to making DIY cloth face masks initiated by 2 other women.

We interviewed one of them who had started sewing masks already in March 2020, when there was no official discussion in Denmark about mask wearing. Like many others she started by finding a freely available pattern online (from a large Canadian sewing company known for their patterns). This pattern included pockets for interchangeable filters that was too complicated for her, so she adapted it to be easier to sew while keeping the concept. She was aware of the DIY face masks of Taiwan and believed in their experience as they had gone through SARS. She was at that time active in a local Facebook group, where many members were writing negatively about face masks. Within this group emerged a small subgroup that thought differently and she and one member decided to create another Facebook group dedicated to making face masks. As the group's admins, they aimed to support the activities of the group by bringing forward research and recommendations grounded in scientific evidence.

Around autumn 2020, the mask making Facebook group, its administrators, and some members started to receive public and private negative messages. Some messages claimed that the DIY masks were not effective, and their use would actually spread COVID-19. Initially the group admins announced the closure of

the group but after outpouring of support decided against it. They nonetheless removed some members and updated the group's rules to include a section explaining their zero tolerance for hateful rhetoric and bullying of any kind.

DISCUSSION AND FUTURE DIRECTIONS

In this exploratory paper, we have started to map some scalar trajectories and relationships in design engagements by looking at the phenomena of DIY face mask designs. The DIY face mask belies designers' common perception of scale as a thing to tame, limited to concerns of size and growth. The kinds of scales and scalar relationships we have identified in our work resonate with Howitt's (1998) invitation to think of scale as relational. Scale exists as simultaneous design engagements at local and global levels, sometimes emerging independently in different contexts but often also connected through human relations and online textual and audio-visual knowledge sharing. We are witnessing an interweaving of design engagements around the creation of design artefacts - masks or patterns - and the sharing and composition of knowledge about creation (instructions in different formats, choice of platforms for sharing, and sometimes even the design of the sharing platforms).

Design engagements around DIY cloth face masks making and knowledge-sharing deal primarily with a concern for protecting oneself and others from COVID-19. However, they are played out through various relations and factors linking individuals, collectives, local and global policies, supply chains, aesthetic choices and social practices - the "dark matter" of design. These can also be identified and problematised as scale and scalar relationships in the case of DIY masks. Our research has but scratched the surface in understanding DIY cloth face mask making as a set of "scaled" design engagements. We envision further work at the empirical level and in forging conceptual and theoretical connections between scaling as relation and e.g. the understanding of design as infrastructuring (Karasti, 2014). Such connections would consolidate a framework for understanding design that extends the usual temporal and scalar boundaries associated with single artifacts, projects, size and growth, towards the distributed sets of practices and temporalities at play in and around design that also involve creative sharing and political assertion.

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PLACES IN THE MAKING: HOW FASHION DESIGN TRANSFORMS THE MULTITUDE OF SCALES

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ABSTRACT

This short paper questions what it means to make a sense of place through fashion design. The notion of placemaking has been discussed in the literature of design and fashion yet remains fragmented, especially due to the complex fashion system. The nuances of place should be carefully examined when relating to fashion design. The ways in which the notion of place is conceptualized in fashion are introduced to explore impacts of designing fashion in two very different scales: the geographical space, such as cities and nations, and the human body. Fashion design transforms these scales continuously through its dual system of material production for clothes and meaning production for fashion. Conceptualizing these scales of placemaking in fashion design can contribute to the fuller understanding of its impacts in spatial and personal levels.

INTRODUCTION: REIMAGINING SCALES OF DESIGN PLACES

Understanding how different forms of design practice can impact on diverse scales allows both researchers and practitioners to recognize the value of design better (Hunt, 2020). Thus, the notion of *place* has been actively explored due to its possibility to convey flexible and inclusive definitions (e.g., Julier, 2013; Manzini, 2015). Moreover, the notion has been closely associated with the phenomenon of fashion (e.g., Breward & Gilbert, 2006; Crewe, 2017). However, these discussions on place from design and fashion have been developed in segregation.

This is partially due to the complexity of the contemporary fashion system that sets difficulties to explore (Aspers, 2006; Aspers & Skov, 2006). One of the definitions for fashion is “what people wear” (Barnard, 2007). This simplistic definition actually connotes the complexity of creating fashion. Since the modernization of western societies, fashion is no longer dictated by an exclusive social class. Rather, it has been co-created by designers and people who wear clothes regardless of their class in society (Vinken, 2005). In fact, fashion has become a social process that is not created by an exclusive group of designers (Loschek, 2009). What fashion designers can create are only clothes (and accessories) that have certain potentials to become a fashion (Loschek, 2009), or simply *fashion-able*. This material production of clothes is produced by not only a single designer but also a team involving multiple experts of pattern-making, pattern-cutting, sewing, sample-making, among others (Aspers, 2006). This duality of *material clothes* and *immaterial fashion* is essential for understanding the peculiar relationship between the practice of fashion design and its impacts on certain places / contexts. This complexity of fashion restricts developing the discussion on the making of place through a dynamic conversation between the fields of design and fashion.

Accordingly, the main intention of this exploratory paper is to open a venue to engage in a constructive dialogue between the fields. Understanding the impact of designing fashion in the multitude of scales can contribute to enriching the dialogue. As a theoretical endeavor, this paper seeks to inquire how the notion of place is conceptualized in designing fashion from previous studies in design and fashion. This inquiry provides a useful perspective to comprehend the ways in which fashion design makes meaningful transformations on different scales from the geographical space to the human body.

The structure of the paper is as follows. First, the discussions on place in the design literature will be

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introduced to provide the theoretical context from design. Second, from the perspective of fashion studies, two scales of the space and the body are presented to explore how fashion design makes a sense of place while making certain impacts. It concludes by projecting possible future studies.

DESIGN AND PLACES

In design, a number of scholars have explored the emerging relationship between design and place. For instance, British design scholar Guy Julier (2013) proposed viewing design as a culture that embraces a wider scope encompassing designers, production, and consumption, instead of limiting it exclusively to the visual aspect. To apply this perspective in the context of place-branding, two European cities, Leeds in the United Kingdom and Barcelona in Spain, were introduced (Julier, 2013, p. 138-159). Taking from the discourse of urban design, he noted that place-branding is "to promote a reconfiguration of perceptions of the human resources available in a location" (Julier, 2013, p. 151). Here, design contributes not only to forming visual and material artifacts based on the cultural heritage but also, as a practice, to projecting a certain "attitude" derived from the location (Julier, 2013, p. 159). Beyond the practice of architecture and urban planning, this involvement of design for places has taken place recently alongside the emergence of branding practice in the design profession around the 1980s (Julier, 2013). Besides these two cases, when emphasis on creative industries, especially design, in post-industrial cities has been increased, the development of designers' new relationship with places has emerged more strongly in the context of cities and regions rather than nation-states. Julier (2013, p. 154) explained that the multicultural and inclusive aspect of a city or a region offers design-friendly conditions for interweaving production, consumption, and distribution into a tightly bounded location.

In comparison to Julier who related the notion of place with a geographic location, Italian design strategist Ezio Manzini (2015, p. 189) suggested a place as "a space that is meaningful for someone." This inclusive definition of place connotes that the meaning is constructed through dialogues between diverse actors in a social space; this thus shifts design practice from place-branding to place-making, as "making" requires collaborative efforts beyond the design profession. Manzini (2015) argued that the evolution of the design profession has not occurred in isolation from the rest of society. Rather, it has happened concurrently with the emergence of collaborative initiatives that are willing to get involved in local issues. While seeking new modes of constructive coexistence for the design profession and these collaborative organizations, Manzini (2015, p. 63) introduced potential strategies to achieve "the expert design contribution to a co-design process aiming at social change" – in other words, design for social innovation. The strategies include making the current condition more visible in order to identify points of change; making new infrastructure that encourages active participation of diverse social actors; making the encounter between collaborative organizations and design experts more effective and meaningful; making social innovation replicable and expandable; and making the new ecology of a social and physical space (Manzini, 2015).

The last strategy is especially associated with the emergent design practice of placemaking. According to Manzini's definition of a place (2015), the discursive process of meaning-making in contemporary society is no longer restricted by geographical distance due to the development of communication technology, such as the Internet. Thus, the idea of places is more relevant for the social context as their existence reacts to fragile and uncertain conditions in the physical territory. Building and rebuilding of places deal with "a close relationship between the existence and the quality of a territory and that of the communities which live in it, and by living in it produce places and keep them alive" (Manzini, 2015, p. 195). With cases from two very different contexts (Italy and China), he examined the ways in which design experts contribute in this practice of placemaking (Manzini, 2015). Upon the employment of design expertise, the experts adopt the current local state and focus on available or potential resources to construct a new place collaboratively with local actors.

From these perspectives of design, placemaking can be conceptualized as the emerging practice of design from the social construction of meaning for places through continuous and collective efforts of making in action. This connects design with physical and social, or material and immaterial, places.

MAKING THE PLACE IN FASHION: FROM SPACE TO BODY

Meanwhile, since the birth of modern democracy in the western societies, the idea of fashion has been discussed as a certain level of changes in symbolic and material worlds involving a wide range of individuals (Lipovetsky, 1994). Fashion has been strongly attached to these multidimensional ideas of place not only in the historic development of modern fashion in particular cities, such as Paris and New York (Rantisi, 2002; Kawamura, 2005; Breward & Gilbert, 2006), but also in the contemporary condition where the geographic and socio-economic bonds of clothes are inseparable (Skov, 2001; Crewe, 2017). Aspers (2013, p. 222) emphasized: "Spatiality is both constituted by fashion and helps to constitute fashion." Furthermore, separately from the literature on designing places in design research (e.g. Julier, 2013; Mazini, 2015), placemaking of fashion

design has been discussed already in the sociological domain of fashion research (Rantisi, 2011; Skov, 2011; McRobbie, 2015).

However, designing fashion requires further articulations due to certain differences in comparison to other subfields of design. For instance, Swedish fashion researcher Lars Hallnäs (2009) shed light on how fashion design and other design subfields are different in terms of methods. He noted the absence of "a problem" to solve in the practice of fashion design, unlike in other subfields. In contrast to this problem-solving approach, fashion design tends to highlight "introducing a difference" as the foundational characteristic (Hallnäs, 2009, p. 59). Thus, understanding the impact of fashion design in scales can help the initiation of constructive dialogues between the fields. In the following, the relationship between fashion design and place is conceptually explored in two-fold: the geographical space and the human body.

GEOGRAPHICAL SPACE AS PLACE

As noted earlier, the relationship between fashion and geographical spaces / places has been explored from different perspectives, such as education, policy, styles, production and consumption (e.g., McRobbie, 1998; Skov, 2001; Niessen, Leshkowich & Jones, 2003; Crewe, 2017). Instead of covering them all, this paper pays special attention to the ways in which the practice of fashion design actually involves the making of places.

"What do fashion designers produce that is significant for the nation?" (Skov, 2011, p. 150) This question well represents the discussions on placemaking in fashion research. From previous studies that investigated placemaking of fashion design, three themes were identified (see Rantisi, 2011; Riegels Melchior, 2011; Segre Reinach, 2011; Skov, 2011; McRobbie, 2015): (1) the involvement of diverse actors in the implementation of placemaking, including designers and local fashion actors from both the public and private sectors; (2) the contribution of fashion design in both symbolic and economic developments as well as internationalization for a place; and (3) the flexible range of placemaking in fashion design from a neighborhood to a city and a nation. Based on these themes, placemaking of fashion design can be conceptualized as the ability of fashion design, based on collaborative efforts of diverse local actors, to contribute to the development of a local fashion scene while creating a stronger sense of place, from nation to neighbourhood, to be recognized in the global context (Chun & Gurova, 2019).

HUMAN BODY AS PLACE

Adopting the perspective of British fashion scholar Joanne Entwistle (2000, 2015), the notion of place can be revisited to relocate the focus from geography to the human body, which is one of key characteristics for fashion. This can be viewed as an expansion of placemaking but on a smaller and more private scale compared to the geographical space. Entwistle (2000, 2015) discussed the ways in which the individual human body is dressed with clothes, which can become fashion through social dialogue and acceptance. She theoretically explored the notion of the human body as a place while situating the dressed body in the social world through several angles, such as gender and dress code, among others. In particular, Entwistle emphasized the perspective of Merleau-Ponty (1976, 1981) viewing the body as forming a "point of view on the world" (1976, p. 5) rather than passively being objectified. She noted that "our body is not just the place from which we come to experience the world; it is through our bodies that we come to see and be seen in the world" (Entwistle, 2000, p. 334). This view deepens the understanding of the impact of fashion design and its application to a more personal and thus more meaningful place for individuals.

Aligning to this view but more relating to the actual design of immaterial fashion and material clothes, the human body situates and is situated by the practice (Ræbild, 2015; Chun, 2018). Dressing the body of the wearer or being worn by someone is often mentioned as one of objectives for their design practices (Chun, 2018). Thus, as much as the geographical space, the human body becomes an important place where fashion design makes a certain impact.

In fact, being associated with this more private and intimate scale caused creating social prejudices toward fashion design to be considered as frivolous and insignificant (Nixon & Blakley, 2012; Finn, 2014; Chun, 2018). By introducing this perspective of the human body as place, the research on fashion design practice can overcome the prejudices. Individuality in the collective has become more important in the neo-liberal society (Lipovetsky, 1994). Thus, the impact of fashion design that directly communicates with human bodies can contribute to developing new dynamic discussions at the intersection of design and fashion while sensing the difference. As a continuation of these efforts, more recently, a number of practice-based researches were published to further explore the agency of clothes on the bodily scale of wearers (see Valle-Noronha, 2019).

CONCLUSION: NEW OPENING

In relation to fashion, the notion of place can be understood from geography to the human body. Fashion design engages with these scales through its unique contributions that embrace both material and immaterial productions. In other words, the place, where fashion design involves transformations, is located somewhere

not only “out there” in the world but also “in here” within the private body of individuals (see Figure 1).

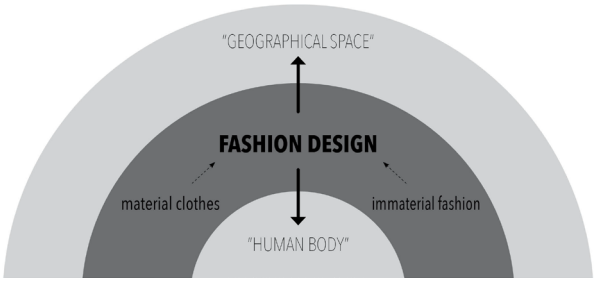

Figure 1: A visualization for two scales of the geographical space and the human body in fashion design.

This short paper aimed at exploring how placemaking can be conceptualized for fashion design while examining a number of seminal works from two neighboring yet distanced fields of design and fashion. Its intention was neither to devalue the development of each discussion nor to draw a line between the fields. Rather, acknowledging the particular contribution of fashion design supports developing the dynamic interplay between the fields. Thus, this conceptualization of placemaking on the geographical and bodily scales invites active future conversations to follow.

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THINKING WITH/IN THE WARDROBE

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ABSTRACT

In this paper I discuss different scale-making practices related to the wardrobe. I will firstly discuss how locating a potential for more sustainable clothing futures within the wardrobe can be understood as a re-scaling project, shifting attention away from industry defined macro scales towards the micro scale where people's engagements with their clothes are located. Based on a short vignette from my own fieldwork with five first-time mothers and their babies' wardrobes I will then present the heuristic device *thinking with/in the wardrobe*, which I developed to think through different scales of abstraction found and applied to my empirical material. In the last part of the paper I will then take a critical look at my analytical approach thinking about the problems I encountered once I started transforming my analysis into my dissertation argumentation. To overcome the obstacles that an analysis on multiple scales confronted me with, I present the conceptual idea of *wardrobe encounters* as a way of presenting my findings coherently while allowing the complexities that emerge when diverse scaling projects merge, to unfold.

INTRODUCTION

In our here-now reality of the many environmental crises of our time, researchers interested in fashion and clothing are increasingly stepping into the wardrobe as a research setting, as it is praised to hold potential as an entry point into more sustainable clothing futures (e.g. Klepp & Bjerck, 2014; Fletcher & Klepp, 2017). Bearing at once testimony to the increasing over-consumption of clothing and textiles and thereby becoming the very representation of throwaway culture, studying wardrobes simultaneously reveals practices of (continuous) use(s) that challenge and complicate the temporality of "fast fashion". By paying attention towards and emphasizing the ways people use their clothes rather than the economically driven framework of consumption choices within the purchasing context, we see patterns and practices emerge that might be thought of as being "accidentally sustainable" (Woodward, 2015), i.e. highlighting e.g. practices of care that go into using clothes.

> Pay attention to the practices of use, and we pay attention to fashion in larger contexts: the 'life world' of people who wear clothes, their actions, their ideas, how they configure material, how their choices combine to affect the whole (Fletcher, 2016).

Hence, the wardrobe and the practices related to it are linked to potentialities to think and do Fashion Sustainability differently and this potentiality is, I argue, related to a shift in scaling the wardrobe.

In this paper I discuss different scaling projects related to the wardrobe. I will start out by briefly elaborating how turning towards the wardrobe in light of debates on Fashion Sustainability can be understood as a re-scaling project, shifting from the macro scale that is dominated by industry needs towards the micro scale of people's clothing uses.

Drawing on a short vignette from my own fieldwork with five first time mothers and their babies' wardrobes, I will then move the discussion towards unpacking three levels of scaling I applied to my

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empirical material, namely *thinking in*, *thinking within* and *thinking with the wardrobe.* I understand these levels as scales of abstraction, moving from the tangible towards the intangible, from the micro towards the macro, and from the private towards the public. Yet, although scale-making is an integral part of research (as it is of social life in general) that helps us organizing, ordering and navigating by applying infrastructure to our thinking processes (Carr & Lempert, 2016), an increased awareness of the often taken-for-grantedness of scales is necessary, as they are by no means ontologically given; rather, "scale must be brought into being: proposed, practiced, and evaded, as well as taken for granted" (Tsing, 2005). In the last part of this paper, I then elaborate critically on the shortcomings of my heuristic device of *thinking with/in the wardrobe* in light of the problems I encountered once I started transforming my analytical ideas into my dissertation argument. I finish up by introducing the conceptual tool of *wardrobe encounters*, a framework I apply to let the various scales of abstraction work through my argumentation.

LOCATING FASHION SUSTAINABILITY IN THE WARDROBE – A MATTER OF SCALE

Fashion and research practices related to the phenomenon have always navigated between the micro and the macro scale, emphasizing e.g. how fashion at once encapsulates macro scale issues such as capitalism as well as engagements on the micro scale of people's identity projects (Woodward, 2007). With an increased focus on the devastating environmental as well as social consequences of the fashion industry, people's consumption habits, especially in the global North, have become a central topic of discussion. This has contributed to a shifting focus towards garment consumption, thereby including the consumers' role(s) into wider debates into trajectories towards increasing Fashion Sustainability. It is within this context that the wardrobe as a research site becomes of heightened importance of investigation. Focusing on the consumer side of the Fashion system, understanding using clothes not only from the perspective of identity construction but in its broader complexity, paved the way for a counter-narrative of what fashion is, emphasizing that garments, when in use, become much more than a commodity. As Fletcher (2017) suggests

> notice the context of use and we acknowledge fashion values and actions that fall outside the normal terms of reference of the market, we exercise our fashion intelligence in a broader field. Hone our attention on using garments and we may start to question the legitimacy of assumption, firmly lodged in global understandings of success and development, that continuous growth in sales is essential, that more is better, that it leads to life.

What Fletcher (2017) coins as *Craft of Use*, is a conceptual framework that addresses the many aspects that come to light when we take serious the ways people engage with garments. Even though this might be regarded as a shift in scale from the macro to the micro, as it calls for attention towards the small scale engagements people have with their clothes, I understand this move as a shift on two grounds: firstly, it challenges the macro perspective that for a long time has dominated discourses and practices of Fashion Sustainability, often being dictated by industry needs and perspectives. Secondly, it simultaneously also broadens the micro perspective of relationships people have with their clothes as use is much more than a means to establish an identity.

This shift in attention away from macro frameworks towards the more micro scale of engagement does not stand isolated within Fashion Sustainability research. A similar argument is e.g. made by Gibson-Graham (2014) in relationship to "the economy" and the role ethnography can play in changing its dominant narrative: "For ethnographers today, no task is more important than to make small facts speak to large concerns", she writes, "to make the ethical acts ethnography describes into a performative ontology of economy and the threads of hope that emerge into stories of everyday revolution". We can then understand the shifting focus towards the wardrobe as a more general trend of moving away from understanding people's behaviour within already formed, taking for granted large-scale frameworks. Thinking Fashion Sustainability from the macro scale imposed by industry needs that often reinforce and operate on a logic of continuous growth and which validate solutions based on their potentiality for scaling up, erases the potential of change found within the wardrobe. "Scalability banishes meaningful diversity, that is, diversity that might change things" (Tsing, 2015). The politics of moving our attention towards the micro setting of the wardrobe is thus related to dismantling the naturalness of taken-for-granted frameworks, in order to create space for nuanced engagements that might not be scalable but question our pre-defined understandings. It is here where a source of change might emerge, where the micro might inform and thereby transform the macro scale.

THINKING WITH/IN THE WARDROBE

How to study something so large-scale as sustainability within the small-scale setting of the wardrobe? This question somehow lingered in the back of my research project all along. My empirical material was collected through fieldwork with five first-time mothers' engagements with baby clothing, trying to understand

how different uses might inform our thinking about and doing of sustainability. Implicitly, my research design was based on scaling the wardrobe as being located somewhere in-between the micro and the macro scale; incorporating at once the micro engagements people have with their clothes, while also allowing for broader discussions that relate to large-scale issues. This is a common understanding of the wardrobe, often seen to be operating in-between, a contact zone where e.g. boundaries between the private and the public are being negotiated (Skov, 2011), or the global and the local collapse into each other (Miller & Woodward, 2011).

To think through the different scales of my participants' babies' wardrobes, in my analysis, I developed the heuristic device of *thinking with/in the wardrobe* (figure 1), which helped me in applying an infrastructure for thought upon my empirical material.

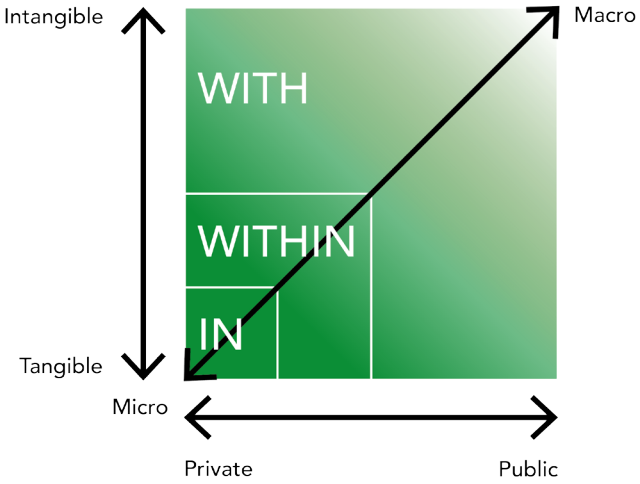

Figure 1: Scales of *thinking with/in the wardrobe*

I will briefly introduce how I used *thinking with/in the wardrobe* in the context of my own analysis by drawing on a short vignette from my fieldwork:

"It is just so difficult to know how much clothes they should wear, you know?" Marianna and I are sitting on the floor of her living room, surrounded by baby clothes we have taking out of her daughter Nina's wardrobe. "And then they tell you to think what you would wear and then just put an extra layer on top of that. But somehow that doesn't really make sense to me, because I am always cold and Mikkel wears way less clothes than me." I nod, because I know all too well what she is talking about: how to know whether your baby is warm enough or overheating? "When we were in Australia, I really liked dressing Nina in these". Marianna is fishing a flowery blouse out of a stack in front of her. "I often matched them with these pants. You know, it was so warm and I remember when I had to travel with work to countries where you have to cover up, how nice it was to wear clothes where the air could come through. I remember the feel of it" She takes up the blouse, rubbing it through her fingers, "just that very light cotton".

In relationship to this vignette the level of *thinking in the wardrobe*, prompted me to think more in-depth about the spatio-temporal encounters taking place in the situational context of my research. I started wondering how the setting of my wardrobe inventories, namely the private spaces of my participants homes contributed to the unfolding of situations; what kind of emotional affects these spaces made possible and how that varied from one participant to another. *Thinking in the wardrobe* also directed me towards paying attention to how touching clothes can enable meaning-making processes based on embodied memories related to clothing materials and the sensations on the body experienced through them. I therefore came to understand this scalar level as being located within the realm of the private, where engagements with tangible things enabled at once situational meaning-making processes as well as a curiosity about how to translate these haptic engagements into my own research.

On the level of *thinking within the wardrobe*, the above storied encounter prompted me e.g. into paying closer attention towards how motherhood is a process rather than a status, and how practices of dressing ones child "correctly" can contribute to enable (self) validation, while there is also always the chance of perceived failure; I wondered who "they" are, and from which authority they speak and how ideas about "good maternal care" and its perceived naturalness play out within the space of the wardrobe. It was also a way to think how e.g. kinship and friendship ties are being (re-)established and negotiated through baby clothing and practices of use related to them. The level of *thinking within the wardrobe* thus guided thinking processes that traced the workings of larger discourses within the space of the wardrobe, trying to better understand how baby clothing engagements are linked to them in multiple ways. Within my conceptualization, *thinking within the wardrobe* then relates to the meso level, drawing the micro level engagements with baby clothes into broader, more large-scale contexts and vice versa.

Where I with *thinking in the wardrobe* ask questions about the tangible and direct engagements taking place in situational research moments and the affects they had, and with *thinking within the wardrobe* tried to understand how broader discourses and values enter into the space of the wardrobe, are negotiated and made-sense of here, the last level, *thinking with the wardrobe* moved me into a manifold of possible trajectories to be explored. It ushered my thinking processes further away from the concrete engagements into more abstract wonderings about e.g. care. Using maternal care as an entry point, I grew increasingly interested in discussions on e.g. *care ethics* (Tronto, 1993; 2013), the *logic of care* (Mol, 2008) and care as

knowledge politics (Puig de la Bellacasa, 2017). *Thinking with the wardrobe* thus opened up a space for explorations that, even though they might have had their fundament within the concrete encounters made during my fieldwork, moved my thinking into broader debates, many of them relating to onto-epistemological issues. As I have briefly presented, I use *thinking with/in the wardrobe* as a heuristic device to think through my empirical material on different scales of abstraction that relate to various levels of micro/macro, private/public, tangible/intangible engagements (see fig.1). Although useful in creating an infrastructure for thinking and thereby helping to navigate and order complexity, while keeping my analysis open and flexible, this approach also created shortcomings. I will discuss the problem I encountered while writing up as well as the approach I applied in order to work around it in the next section.

TOWARDS WARDROBE ENCOUNTERS

As I described above, *thinking with/in the wardrobe* enabled me during my analysis to move between different scales of abstraction I detected and applied to my empirical material. It was a fruitful way to explore different ideas and trajectories and keep my analysis open while still moving it forward. Yet, once I started to write up the ideas that emerged into my dissertation, I was confronted with the problem of how the manifold of ideas and trajectories that had opened up, could be bundled together, organized if you wish, into something that resemble a coherent argument. This, I argue, is very much a problem of scale and scale-making, as research outputs, in the end often are presented in favour of one scalar perspective over another, so as to present research findings in some kind of coherent way. To work around this problem, I found inspiration in the writings of anthropologist Anna Tsing. As she puts it

> To listen to and tell a rush of stories is a method […] Its research object is contaminated diversity; its unit of analysis is the indeterminate encounter. A rush of stories cannot be neatly summed up. Its scales do not nest neatly; they draw attention to interrupting geographies and tempos. These interruptions elicit more stories (Tsing, 2015)

As Tsing argues, if we allow for stories to emerge and commit to following them where they might take us, scales and especially one-dimensional scalar frameworks might not work. Rather, by following stories, we have to make space for multiple, interacting and at times interrupting scales; this is not problematic, even though it might be framed as such in scientific discourses, but rather an ontological ground from where to start. Taking these ideas into account and letting them work through my research project, I came to coin the conceptual framework of *wardrobe encounters.*

Wardrobe encounters account for moments of intensity, where something felt like *some*thing (Stewart, 2007). They are found in the ordinariness of something so small as the vignette I presented earlier. Yet, as I have tried to demonstrate, out of this seemingly ordinariness, stories might emerge. The notion of *wardrobe encounters* then can be understood as a descriptive tool, accounting for the intensity of moments and situations that make up research; moments of curiosity, wonder and at times frustration, when something fells like *some*thing. On the other hand, I understand *wardrobe encounters* also as a methodological approach towards studying the wardrobe that incorporates multiple scales of abstraction related to *thinking with/in the wardrobe*, following the stories that emerge in the complex entanglements that wardrobes afford. This approach doesn't seek to build closed argumentations, but rather open-ended exploration of where the stories that emerge might lead to. *Wardrobe encounters* by definition then are manifold and situational, i.e. every encounter is filled with potentialities of unfolding, cutting through multiple scalar levels at once, challenging their ontological standing.

The conceptualization and focus on *wardrobe encounters* thus is an attempt to let the different scales I detected in and applied to my empirical material, interact and –connect with each other as well as with my thinking processes. Rather than excluding one scale for the benefit of another I am trying to bring them together and let them work through each other.

CONCLUSION

In this paper I discussed different scaling project found within the research setting of the wardrobe. After elaborating on how focusing on the wardrobe as entry point into more sustainable clothing futures can be understood as a re-scaling project in itself, I moved the discussion towards my own research project, unpacking three levels of scalar abstractions I applied to my empirical material. I described how the heuristic device of *thinking with/in the wardrobe* provided a useful way to understand and move around different scalar levels of abstractions, opening up multiple trajectories to be explored. Yet, in the last part of the paper, I also elaborated on the difficulties I encountered once I tried to bring together the multiple scales I detected and applied to the analysis of my empirical material. To overcome these problems, I introduced the notion of *wardrobe encounters*, an attempt to let the different scales of the babies wardrobes interact and –connect in my thinking processes and in the finished product that will become my dissertation. As the final version of my dissertation is yet to be finished the usefulness of the notion of *wardrobe encounter* to at once capture as well as open up ideas will still have to be shown. Let's see where this story will lead.

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Paper Session 6

Learning Scales

Session Chair | Eeva Berglund

Micro-Scale Curriculum Development in Design for Sustainability Education
Karen Marie Hasling and Louise Ravnløkke (E)

Re-Thinking Pedagogy and Dis-Embodied Interaction for Online Learning and Co-Design
Salu Ylirisku, Giyong Jang and Nitin Sawhney (F)

Appropriating a DBR Model for a 'Research Through Codesign' Project on Play in Schools - to Frame Participation
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MICRO-SCALE CURRICULUM DEVELOPMENT IN DESIGN FOR SUSTAINABILITY EDUCATION

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ABSTRACT

This paper explores and discuss how formalised learning activities, inspired by design methods, can be used as a pedagogic means to support transformative learning in design for sustainability education.

The paper departs from the experience that formal efforts with strengthening sustainability in design education are often focusing on macro-level curriculum development; on the progression of courses based on learning objectives and goals and less on what we call micro-level curriculum development, being the actual learning activities constituting a course.

In the paper, we introduce a template for formalising learning activities, we present concrete learning activities developed in the context of fashion design for sustainability education and we demonstrate how these can be used to structure a course.

INTRODUCTION

This exploratory paper departs in the field of design for sustainability education and discusses the necessity to increasingly consider the multiple levels in curriculum development.

Experience is that implementation of initiatives supporting sustainable transition are often focusing on higher-order and macro-scale of institutional or program levels making explicit values, mindsets and perspectives, whereas formalising and working systematically with activities in courses and how to implement on micro-scale, lack attention and acknowledgement.

In this paper, we argue that in order to fully integrate design for sustainability in the curriculum and to support levels of transformation (Sterling, 2010) in design for sustainability education, it is necessary to work on all levels of curriculum simultaneously and interlinked. This means to apply curriculum development in-courses as a means to support progression between-courses.

Consequently, here we present a structure for learning activities to support sustainability in design education as well as examples of, how these activities can be combined. This is based on the question:

How can we, inspired by design methods, work with formalised learning activities to support design for sustainability education?

We find that, the paper is specifically relevant for institutions and tutors working within these that:

- Want to integrate activities focusing on design and sustainability in an existing curriculum (course/program)
- Are designing a (new) curriculum (course/program) focusing on design and sustainability
- Already have integrated aspects and perspectives of sustainability in the curriculum, but would like to obtain a better understanding.

CURRICULUM DESIGN AND DEVELOPMENT

In education, curriculum development and maintenance thereof occur on multiple levels.

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- On institution level guided by the study program
- On program level guided by the course description
- On course level guided by the course brief

Both the course description and the study program are formal and documents used to define the learning objectives and goals of courses and programs, while the course brief is used to describe in-course content such daily activities, assignment(s) given, deliveries and required readings. Whereas the first two are recurring documents, the latter is formally re-written each time a course is running. Even though practice is to take inspiration in previous years' courses and to engage the same tutor(s), in-depth understanding of the course content and progression in activities are person-driven and thus vulnerable and can be difficult to communicate.

DESIGN METHODS AND CURRICULUM DEVELOPMENT

Being tutors and researchers in the field of design, the use of design methods and processes is strongly acknowledged and integral parts of our way of working.

In many ways, tutoring can be compared to facilitating a design process. The needs and goals are determined by the course description and the methods applied and their structure in-between are described in the design brief.

However, whereas we expect students to be explicit and transparent on their use of methods by means of a research question, procedure and evaluation of experiments and how they inform each other – on validity, reliability and replicability – we rarely do the same ourselves when it comes to the learning activities we apply in teaching. The below table outlines the parallels in design practice and course design

Table 1. Comparison between design process and course structure

	Design process	**Course module**
Entry	Need and research question	Learning objective and goals
Procedure	Combination of design methods	Combination of learning activities
Support	Design tools	Presentations literature, learning tools
Outcome	Design concept	Deliveries

We find it relevant to explore and discuss, what we can learn from design processes and design methods in teaching situations. We want to emphasize that learning activities have different roles and natures and that combinations of activities can support not only a course itself, but the progression in a curriculum as learning activities will be easier to trace and build on across courses.

In the same way that the syllabus is a considered as a well-established means to guide progression, we argue that formalising learning activities – making them explicit – can support progression in courses and programs and to communicate and transfer knowledge between students, tutors, head of programs etc.

Emphasising the similarities to design, but also research methodology, learning activities can build on quantitative and qualitative, link and inform each other through 'accumulation', 'comparison', 'expansion', 'series' or 'probing' (Krogh & Koskinen, 2020) as well as they can take place in a 'lab' (e.g. in class room), a 'field' (e.g. as excursions and field work) and a 'showroom' setting (e.g. exhibitions) (Koskinen et al., 2012).

We hope that this relation between curriculum development and design methods and processes is somewhat clear to those who engage with both. We also hope that with this paper, we can support and push forward work with curriculum development with multi-level focus.

THE LEARNING ACTIVITY TOOL

The empirical part of the paper takes point of departure in the 'Learning Activity Tool', a collection of formalised learning activities, developed as part of the FashionSEEDS project (2018-2021). FashionSEEDS is an Erasmus+-funded project to support fashion design for sustainability education through development of tools and toolkits on course and program level available on an open-source platform from the summer 2022.

Based on the authors' previous experience with developing learning tools to facilitate working with design and sustainability (Author 1 2017, 2020, Author 2 2020), in the project the Activity Learning Tool, a collection of learning activities, was proposed as a way to offer a tangible means for tutors to find inspiration in, engage with and apply in teaching.

In the project, the learning activities can inform the developed 'Course Development Card', a collection of 15 course unit descriptions structured in pillars of sustainability and levels of transformation and the 'Tutor toolkit', developed for tutors to plan course modules.

The activities are described based on a common template. The following presents the underlying thoughts behind the development of the template and the information provided for each learning activity. As a way to evaluate the template, while developing the activities, the authors used the template to understand

the progression of the courses they had previously taught.

DEVELOPING THE TEMPLATE

With inspiration in design methods, a template was developed to include descriptions:

- Description: The objective of and goal with the activity together with a guiding entry question to contextualise the activity ('Why')
- Procedure: The step-by-step execution of an activity to describe the procedural framing of the activity ('How')
- Resources: The resources recommended to conduct and support the activity such as existing toolkits, related activities and literature ('What')

To further structure the activity, the following filter options were applied and illustrated with pictograms:

- Pillar(s) of sustainability with reference to (Dessein et al., 2015) ('Why')
- Timeframe ('How')
- Teaching approach with reference to the didactic triangle (Rienecker et al., 2015) ('How')
- Activity format with reference to approaches to knowledge production in the design process (Friis, 2016) ('How')

The collection of learning activities was planned to exist both as a physical card deck in A5 size and as a digital entry on the FashionSEEDS platform. The online platform increases visibility and accessibility of the tool, while we regard the physical deck as instrumental for concrete and hands-on course development.

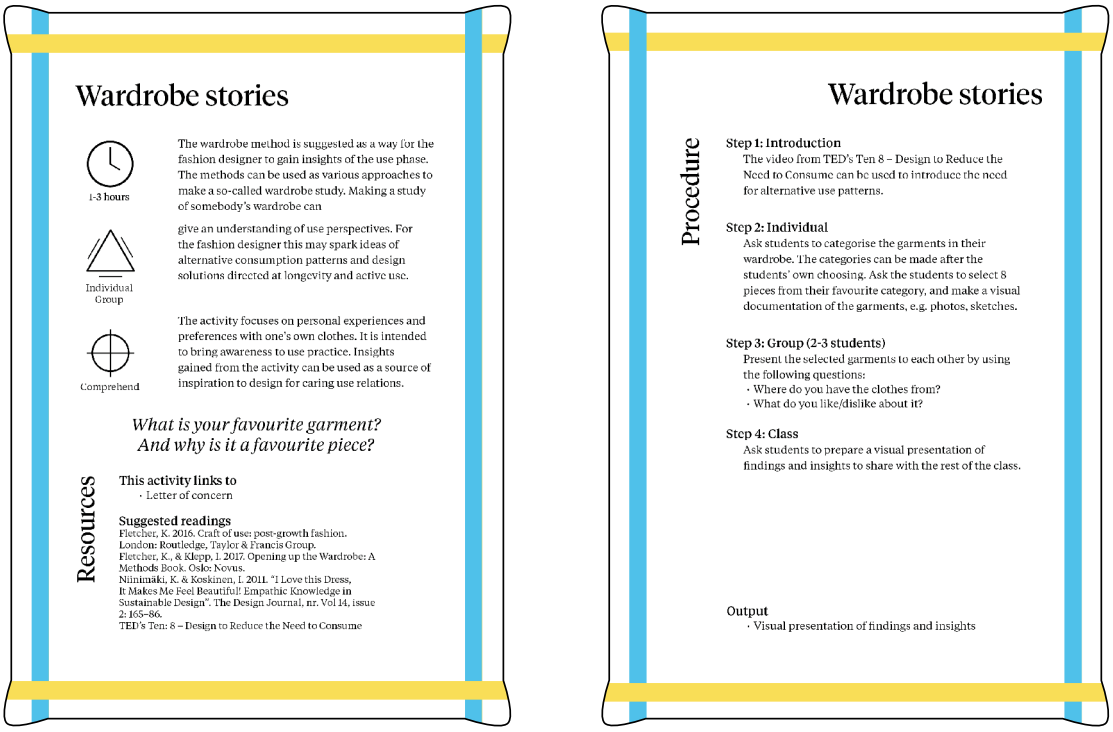
DEVELOPING THE COLLECTION OF ACTIVITIES

Prior to developing activities, extensive work was put into collecting existing resources as the primary strategy was to propose activities based on these. After a couple of iterations, where the number of activity ideas came down from more than 70 to 38, these were further briefly described by means of objective, procedure, relevant pillar(s) of sustainability, estimated time frame(s), activity format(s) and proposed literature. The collection was then shared with the project partners that were asked to evaluate the quality and relevance of activity ideas within one specific pillar each.

Based on the project partners' feedback, the learning activities were further described. In this process, activities were modified, split and merged to ensure an even distribution of activities across filter options and resources. The detailing of cards was also informed by sustainability key competences (UNESCO, 2017; Wiek et al., 2011) and Bloom's taxonomy of learning (Anderson et al., 2014; Bloom et al., 1956). However, as we see that the complexity of each activity can be adjusted to fit a certain level, it was deliberately decided that these should guide rather than define the activities.

Per ultimo January 2021, the collection counts 38 learning activities, but more will likely be added as the project continues. The final layout of both the digital version on the platform and physical version in a printed card deck is in its final stage. In figure 1, the learning activity 'Wardrobe stories' is shown in the current layout draft for the printed deck.

Figure 1. Example of learning activity 'Wardrobe stories' in a layout draft.



USING THE LEARNING ACTIVITY TOOL

The following will provide an example of, how the formalized activities can be used to frame the content and progression of an introductory level course module with focus on materials use in garments and with the environmental pillar as the common denominator of the activities. The proposed course module consists of five learning activities:

- Insights of unused garments
- Materials origin and functions
- Recycling facility
- Exploring material parameters
- Garments with many lives

The learning activities in their printed deck layout draft is shown in figure 2, while table 2 outlines the progression of the learning activities by means of Teaching approach(es), Activity format(s) and Entry question.

In development of the course module, we have aimed for applying a variety of teaching formats based on the individual student and group work to facilitate students' learning progression.

We have also aimed for activity formats that predominantly support analysis of the topic from a reflective mindset, but with steady changing back between doing and thinking, between 'collecting' and 'comprehending' that in the last learning activity is converted into 'conceptualising' and thus translating learning into something concrete.

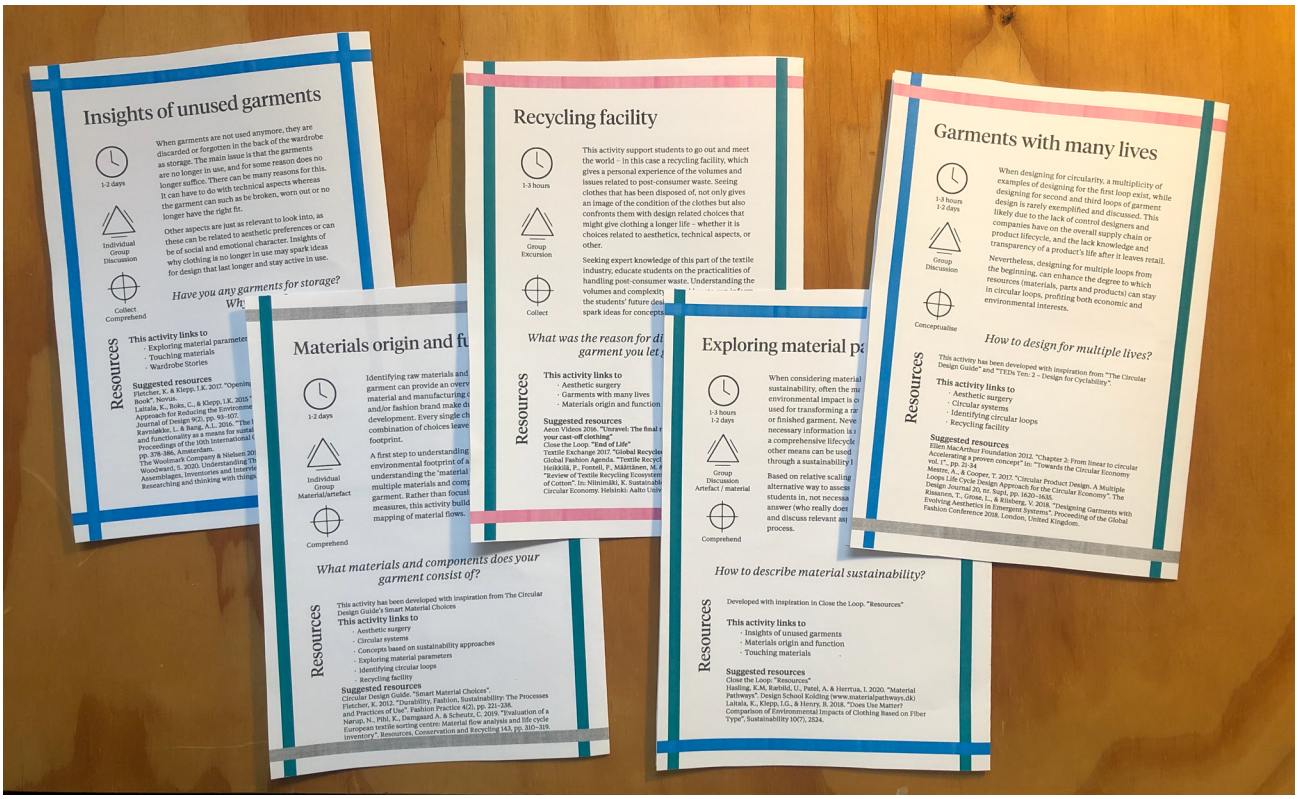
If looking at the questions asked in the five learning activities, the first three takes point of departure in students' own wardrobe and thus relate potentially new insights with something they know already. This can be a launch pad for increasing complexity and pushing students into working in other contexts.

DISCUSSION

Reflecting on the learning activities as a means to support transformative learning in design and sustainability education, they have been developed to emphasize and mature students' ability to reflect on and account for what they learn and how they can use it. Here we see that students' cognitive learning (Anderson et al., 2014; Bloom et al., 1956) and development of sustainability key competences (Wiek et al., 2011) are directly linked to transformative learning.

Furthermore, we have developed the learning activities in an 'open format' that make them integrable on multiple levels in education. In the learning activity 'Wardrobe stories' studies can start with studying their own wardrobes and if wanting to increase the level of complexity, studying others' wardrobes, such as being in a different place in life than the student. We hope that tutors and course planners will embrace and use this flexibility built into the proposed learning activities to create attention and discussion on the role of different teaching approaches in (design for sustainability) education.

Figure 2: Outline of the five learning activities in a course model example.



Learning activity					?
Insights of unused garments	Cultural	1-2 days	Individual Group Discussion	Collect Comprehend	Have you any garments in storage? Why is that?
Materials origin and functions	Environmental General	1-2 days	Individual Group Artefact/material	Comprehend	Which materials and components does your garment consist of?
Recycling facility	Economic Environmental	1-3 hours	Group Excursion	Collect	What was the reason for disposing the last garment you let go of?
Exploring material parameters	Environmental Cultural	1-3 hours 1-2 days	Group Discussion Artefact/material	Comprehend	How to describe material sustainability?
Garments with many lives	Environmental Economic General Cultural	1-3 hours 1-2 days	Discussion Group	Conceptualise	How to design for multiple lives?

Table 2: Overview of the five learning activities based on Pillar(s) of sustainability, Timeframe, Teaching approach, Activity format and Entry question.

CONCLUSION

In this exploratory paper, we have proposed to work with formalised learning activities to support micro-scale curriculum development in design education for sustainability. The learning activities are defined by a template inspired by design methods. Furthermore, we outline a sequence of learning activities as an example of a course module emphasising teaching formats, activity formats and entry questions.

We argue that formalising learning activities can:

- Provide a frame for formalising already used learning activities in a course or program.
- Create a means for making explicit and communicating course / program content.
- Support progression of a curriculum based on defined parameters allowing for cross-scale referencing of learning activities
- Offer learning activities for reference and inspiration.

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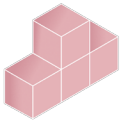

RE-THINKING PEDAGOGY AND DIS-EMBODIED INTERACTION FOR ONLINE LEARNING AND CO-DESIGN

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ABSTRACT

Online courses are a key means for universities to scale up their educational offerings to wider audiences. In 2020, as the COVID-19 pandemic worsened, many such courses that were initially designed to be given in-person, were pushed online. Instructors and their respective institutions, however, had limited knowledge of processes, practices, and tools to design high-quality learning experiences. This paper collects faculty and student experiences from a Nordic university and outlines key challenges for designing high-quality live online learning sessions. It demonstrates that, given the fundamentally different contexts for learning in digital settings, teachers need to rethink their understanding of what is possible, and engage with creative tools and pedagogical practices that support enhanced learning experiences online.

INTRODUCTION

The year 2020 changed our educational landscape dramatically, as institutions were forced to move courses online due to lockdowns caused by the COVID-19 pandemic (Kimmel et al., 2020). In this situation, the reason to go online was different from the usual scaling up and making educational offerings accessible to broader audiences. As courses that were not initially designed for remote instruction were forced to go online, unanticipated difficulties arose (Serhan, 2020). For many teachers this rendered salient the limitations and possibilities of remote instruction for the first time.

Organising great learning experiences in an online context is trickier than simply digitalising existing courses and making them available over the internet. Based on our interviews with teaching faculty and students, as well as on our own teaching practices in project-based learning, we identified three key challenges: 1) digital context is a fundamentally different setting for human interaction as compared to embodied interaction in physical space; 2) digital tools that facilitate teaching and learning evolve rapidly, and instructors need to invest time for learning such tools to accommodate those into their teaching practice; and 3) engaging pedagogical design of online learning sessions calls for attention to *appraise embodied interaction*, *promote live online pedagogy*, and *better facilitate human encounters*. Our work seeks to highlight a timely review of these phenomena during an unusual context of distance learning in the midst of a pandemic; our findings echo many aspects of earlier research in the fields of human-computer interaction (HCI) and computer supported collaborative work (CSCW).

The approach that we have adopted in this paper is qualitative and exploratory, and emerged in part through Participatory Action Research (Baum et al., 2006). The paper focusses on the design aspects of *live online learning sessions*, which may take diverse forms including lectures, tutorials, lab work, and workshops. They are constrained events with well-defined agenda,

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resources, and time, while the participants are expected to be co-present during the sessions.

BACKGROUND RESEARCH

The year 2020 unexpectedly boosted existing global trends to offer university courses online. For over a decade, universities have moved part of their educational offerings online to provide more accessible education and to scale up the number of students who enrol and the study credits offered. We have witnessed the proliferation of various online platforms, such as edX (https://www.edx.org/), Udemy (https://www.udemy.com/), and Coursera (https://www.coursera.org/), that provide possibilities for anyone to participate in a higher education course. These online educational platforms typically provide *asynchronous* learning services, i.e. most of the materials, such as videos, texts, and questionnaires, are pre-produced and students can proceed through the course content at their own pace.

During the COVID-19 pandemic, most higher education institutions were forced to move their educational offering online. As such institutions typically have students physically present, courses are mainly organised *synchronously*, i.e. all participants of a learning session must be co-present at a specific time. Our focus is on the organisation of synchronous educational live sessions online.

ONLINE EDUCATION AS DISEMBODIED PRACTICE

Online education is mediated by digital technology; here the digital context is a fundamentally different setting for human interaction and learning as compared with embodied interaction in physical spaces. Physical contexts facilitate thinking, doing, and interaction in ways which are challenging to replicate in digitally mediated systems (Klemmer et al., 2006). Today's solutions, such as video calls with screen-share-presentations, rips interaction off its embodiment; this has implications for how we experience a video-mediated learning session.

For example, it is not possible to address a particular individual by simply looking at them without special equipment, see e.g. (Sellen et al., 1992; Nguyen & Canny, 2007). In a physical classroom this (the act of looking at) is often an effective and lightweight gesture for teachers to reach out to particular individuals. By reading a student's face, the teacher may seek for confirmation that one has understood what they say, or signs of possible agreement. Moreover, the direction of a student's gaze, body posture and orientation a teacher may discover if the student is attentive to teaching. Sun et al. (2019) studied a real-time facial expression tracking system to estimate students' responses to teaching during a live online lecture. The system gives an overall rating of the response allowing the teacher to adjust the progression accordingly. Such affective AI systems can be notoriously inaccurate and their ethical use in educational settings must be carefully deliberated. However, the development of such technologies indicates the challenges being confronted by teachers in engaging with students in distributed online learning.

Physical settings afford people easily to refer to things pointing at them and using terms, such as 'this' and 'that'. Already in the 1990s the ability to orient and point at things inspired explorations into how systems could enable people to better communicate through spatial visual and aural cues (Billinghurst et al., 1998). Lee (2007) argues that spatiality may be leveraged for co-creative computer-mediated practices, as people can use their habituated ways to negotiate, persuade, manipulate and coerce by resourcing the objects available in their shared space. Achieving such computer-mediated real-time spatial collaboration, however, may be technical very challenging; as seen for example in the telecollaboration experiment by (Rhee et al., 2020).

Upon attending courses online, design students were removed from their physical project rooms. In design projects, student teams typically have a personal space, where they can work with their own project's materials, e.g., to organise hand-drawn charts and sticky notes. Klemmer et al (2006, p.144) argue that visible artefacts support situated learning and peripheral participation as well as collaboration. The physical manifestations of thoughts that the sticky notes carry on the walls of their personal spaces, are essential cognitive resources for the teams; and their visibility, ease of access through a glance, and often tactility, are important means of progressing in the process of co-learning and co-design.

Design and engineering education also involves offering courses about innovation that typically feature hands-on lab/studio work as well as real-world exploration in physical settings outside the school. Kimmel et al. (2020) list several educational settings for studio/laboratory work in an online/mixed situation, and some of these are very difficult to move online, for example, the building of physical prototypes, which is a common part of the project-based design and engineering courses.

A novel feature that follows from the disembodied character of live online education is the possibility to jump from one session into another in an instant, thus, contributing to so-called 'zoom fatigue' (Wiederhold, 2020). Video calls enable people to move from one session into another in a matter of two clicks; they simply end the previous call and join the next. Thus, they may not have any intermissions, such as walking over to others and chatting informally, to reflect on their experience between different video calls; students barely have time to reflect and recover from their

previous learning session. This may work against pedagogical aims, as debriefings and reflection either done alone or in a group have been considered beneficial for learning (Pearson & Smith, 1986).

CHALLENGES IN LIVE ONLINE PEDAGOGY

In the context of the COVID-19 pandemic instructors with limited experiences in online education were forced to move their teaching online, and they could not properly adjust their course structure or materials for this dramatic change (Clark-Wilson et al., 2020). Serhan's (2020) report illustrates how the urgent move from in-person courses into the digital realm caused resentment from many students who felt that they were receiving an inferior quality of education.

Before the pandemic, Fletcher and Bullock (2015) conducted a study to explore the effects of online teaching. They argue that moving teaching online changed the pedagogical role of the teachers, turning it into a responsive assessment and feedback role from the earlier more active and formative facilitator role. They also claim that the online setting was consequential for reducing teacher's ability to foster positive relationships with their students (ibid.).

When designing courses for an online setting, Bao (2020) recommends chunking the content into blocks of 20-25 minutes whilst adding some time for digesting the content. They argue that this helps students to better focus on the subject of study in the online context. We can identify several causes for the fatigue experienced in an online learning context: 1) *low bandwidth*, 2) *tool management,* and 3) *multi-channel communication.* These are further elaborated below.

Low bandwidth. One of the main reasons a video-mediated live conversation is often more challenging than face-to-face interaction is its sensory quality, which is significantly lower than in-person settings. Video requires significant data bandwidth, and unless the learner's internet connection supports high data bandwidth, using video can cause significant problems in the teaching/learning experience, as the visual content may become hard to decipher, and spoken words may become incomprehensible due to cut-offs or digital stutter. Online video quality, i.e. the visual and aural resolution, is perceptually inferior to real-life interaction, which may be even worsened by sudden network issues that cause delays and signal drops, and it takes more cognitive effort to apprehend the content. This is especially problematic for international students who may participate from abroad over a poor connection. Bandwidth limitations have proven to cause fatigue even in phone-mediated conversations (Antons et al., 2012). The processing of the lower quality interaction signals requires heightened attention from participants, whereby, digitally mediated interaction is likely to cause increased drain of what Kahneman (2011) calls 'mental energy'.

Tool management. Combined with the extra effort that teachers need to invest in managing the novelty of digital technology and online education, running a teaching session can become highly stressful and taxing for an instructor as well as for the students. A teacher needs to manage the digital instrumentation, such as microphones, audio levels, and screen sharing, to keep the session moving, which further strains their limited capacity and attention.

Multi-channel communication. The orchestration of a live online learning session requires a teacher also to handle the various peripheral channels, which are available to the students. Depending on the course, these may include such digital tools as:

- Learning Management System (LMS) such as Moodle, Canvas, and Blackboard, with possibilities to provide course information, provide assignments and feedback, facilitate discussion in forums, and share recordings and readings
- Live video call software (such as Zoom and Teams) with chat and additional features
- Presentation software (such as PowerPoint and Keynote)
- Course website or blogs
- Live discussion groups (such as Slack and Discord)

BARRIES TO FORMING HUMAN RELATIONS

Studies have found students often experience remote instruction negatively albeit recognizing it as being more flexible than face-to-face learning (Serhan, 2020; Al Rawashdeh et al., 2020). Students have also been found to switch their cameras off during a video-mediated lecture (Bauer et al., 2020). This may be due to bandwidth reasons, i.e. the two-way video stream is too heavy for the connection, privacy reasons, i.e. students are either not comfortable for their peers to peek in their homes, or they may decide to undertake other tasks (unrelated to learning) while the educational session is running. Students have also reported feeling intimidated speaking up in a video call in front of the full class, and thus, they may have not received the assistance from teachers and peers that they desired (Bauer et al., 2020).

Students have plenty of possible sources for distractions when they participate in online education. Serhan (2020) lists one's family and one's phone as possible sources, and underlines the apparent ease with which a student, with their camera switched off, may avoid focusing on the study subject in the live online learning session. A student's attention to learning materials and active participation in an educational session can be discouraged by unnecessarily poor experiential quality (Knipe & Lee, 2002). Online learning sessions may

need to be designed with even more engagement in mind as compared with traditional classroom settings; in a physical classroom a student usually has far less distractions, and the teacher can monitor the extent to which a student is attentive and respond accordingly.

Wang et al. (2017) argue that the engagement of online students calls for a redesign of instructional activities as well as the need to promote the importance of good audio quality. They (ibid.) studied a blended synchronous learning environment known as HyFlex, i.e. hybrid class with flexible participation options (Beatty, 2007). In a HyFlex, or hybrid session, the teacher has two different groups of students participating in a single event: the embodied and the disembodied group. These two groups have dramatically different capabilities for participating in a session, including conversing, enacting, constructing, gesturing, pointing, orienting, and perceiving. Wang et al. (2017) emphasise the facilitation of *effective communication* not only between the teacher and the students, but between the different groups of students, i.e. those online and on-site.

Toor (2020) embraces the importance of investing in community building with new students, who come to the university in the midst of a pandemic. They may have never met their peers nor their teachers in person, and thus, the human relations need to be established from scratch online. The significance of connecting with peers in online learning is well-recognised for over a decade, see (Blackmon & Major, 2012). Amongst the techniques Toor (2020) employed in her practice were 1) giving strong students more responsibility to take notes and share those with the rest of the class, 2) promoting small-group interactions, and 3) peer reviewing. Bao (2020) also emphasises the role of teaching assistants to be available to offer online support for students.

OUR STUDY AND DATA

During COVID-19 pandemic in 2020 (from March to December), we conducted a range of online courses to examine the challenges and opportunities for online learning among students and teachers. The data we collected and discuss here covers interviews with faculty members (Table 1) and students (Table 2), as well as our own experiences in running educational sessions in six multi-disciplinary project-based courses (Table 3). We have selected one of the educational sessions from the six courses for a closer analysis.

Table 1. Interviewed faculty members

No.	Position	Academic field	Teaching experience (years)	Interview date (d/m/y)
1	Lecturer	Electronics and Nanoengineering	>10	15.12.2020
2	Teacher	Electronics and Nanoengineering	2	16.12.2020
3	Lecturer	Management Studies	1	17.12.2020
4	Lecturer	Electronics and Nanoengineering	>10	17.12.2020
5	Associate professor	Electronics and Nanoengineering	7	22.12.2020
6	Lecturer	Electronics and Nanoengineering	>10	22.12.2020
7	Learning designer	Learning Design	6	26.11.2020
8	Coordinator	Electrical Engineering	>10	16.12.2020

Table 2. Interviewed students

No.	Degree	Major & years	Nationality	Interview date (d/m/y)
1	Bachelor's	Second year at Electrical engineering	South Korea	14.12.2020
2	Bachelor's	Second year at Electrical engineering	Vietnam	22.12.2020
3	Bachelor's	Second year at Electrical engineering	Finland	23.12.2020
4	Bachelor's	Second year at Electrical engineering	South Korea	04.01.2021

Table 3. Courses where we organised live online sessions. *We analyse a workshop session in Course No 1 below.

No.	Context	Level	Participant count	Time
1*	Human-centred Research and Design in Crisis (project)	Master's	10	Summer, 2020
2	Multi-stakeholder IoT Innovation (project)	Master's	48	Oct-Dec, 2020
3	Human-centred Innovation (project)	Bachelor's	28	Jan-May, 2020
4	Design Thinking and Prototyping (project)	Bachelor's	24	Sep-Dec, 2020
5	Prototyping with Industry (project)	Bachelor's and Masters'	32	Jun-Aug, 2020
6	User-centred product innovation project	Master's	100	Sep-Dec, 2020

The interview sample includes both faculty members and students, and it was initiated by an internal university project to develop the quality of digitalised online education within electrical engineering. We also included one lecturer in the field of management studies, as they were using an engaging technical setup for running the online sessions. The main focus was on

faculty, as the project examines how new educational digitalisation services and online educational practices can be developed for teachers. We included a smaller sample of students to offer feedback as well. The participants were selected on the basis of their anticipated relevance to this project. Since we were restricted by the COVID-19 situation, all the 1-hour interviews were conducted using a remote mode (video calls) instead of traditional face-to-face meetings.

The plan for interview questions was divided into three different phases: before, during, and after the course. The first stage was about teaching preparation, planning courses for faculties, and about registering courses for students. The second stage was more about interaction between students and teachers during the online course. The third stage related to student feedback on the courses and improvement of future courses offered. As the profiles of the interviewees were different, we also asked individually tailored open-ended questions.

The data were analysed using a bottom-up approach with affinity diagramming, which is a designerly naming for what is originally known as the KJ method (Scupin, 1997). The method is based on a thematic clustering of individual observations and findings from field data and grouping those into wider themes relevant to the project. We have also employed our own experiences as instructors (authors 1 and 3) and students (author 2) participating in the same community as a resource when interpreting and sharing our findings.

The key findings from the *faculty* were related to the following themes:

1) *Interaction.* Interacting with students was experienced as much harder in online settings.
2) *Edu-tech knowledge.* Knowledge of educational digital tools was limited, and varied greatly across the instructors.
3) *Confusion.* Instructors received e-mails excessively with questions from students about practicalities.

Interaction. The interviewed faculty members largely echoed the views presented in literature about the difficulties in interacting with students online. During lectures, the students typically switched off their cameras. In some courses this was explicitly requested in order to reduce the amount of data traffic. Some of the instructors utilised questions in order to engage the students. These were typically responded by an awkward silence from students. Puzzled by the pause, the instructor then had to come up with other strategies on how to handle the situation.

There are many potential reasons for the silence: 1) the question was not audible due to technical issues, 2) the students were not properly attending to the presentation, 3) a student may have talked with their microphone muted, and 4) the question might have been too easy or hard, which might make some students feel either stupid or intimidated. Instructors had no means of getting cues about these. The strategy that was chosen by some of the instructors was to persistently wait for someone to respond, meanwhile reminding the students to ensure their mic was unmuted when talking. Typically, the answers came from a few of the more active students.

Based on the first author's experience in teaching a first-year bachelor course, the difficulties in interacting with the students during online sessions also led to less personal connections with the students. After running a full semester-long course, there were still a number of students, whose face the instructor had never seen before, and thus, would not be able to recognise them when encountered later, e.g., in the hallway or lab.

Edu-tech knowledge. The transition to online teaching happened suddenly in March 2020. The instructors complained that they did not have knowledge of the proper tools to use in their course online, nor had they prepared their course to be offered online. Furthermore, their host institution had not provided ready-made instructions or tutorials on how to move existing courses online. Thus, the instructors were forced to improvise, and most of the instructors interviewed simply used their existing course structure and content, transposing their existing lectures into online video presentations. Most also utilised the live recording features of the video call platform, and offered the recorded videos to students through the local LMS for later review.

The interviewed instructors complained about a lack of information on what tools and methods were needed to prepare for high-quality online courses. All of the interviewed instructors said that they do not know what tools and methods were best suited to enhance their courses. The university provided broad guidelines, but the instructors did not consider them of practical value. In addition to moving courses online, new teachers also need to understand what kinds of pedagogical techniques and strategies work for online learning. The teachers acknowledge that sharing ideas on teaching approaches would be really helpful for each other.

Confusion. During online teaching several faculty members reported receiving a large number of e-mails from students asking for course assistance. The situation for online learning was novel for both the instructors as well as students, which required the teachers to anticipate possible problems that would arise in the online context upfront. The instructors complained that due to the quick transition from in-person to online teaching, they simply did not have sufficient time to prepare properly:

"In an ideal world, I was ready before the course would begin, but in the real world, I will always have many things underway." – Faculty member (No 4)

Moreover, to transition to online teaching and achieve well-working processes, the instructors would have needed to update the structure, content and pedagogical approach for their courses, for which they had very limited prior experience. Their experience transitioning to inline learning was a journey into a new territory.

The key findings from the *students* supported those of the instructors interviewed, about challenges in interactivity and engagement:

1) *Boredom*. Students experienced many of the online lectures as dull and boring, and they had difficulties maintaining their attention on the lecture content.
2) *Disengagement*. The lack of participants keeping their video cameras open created a 'desolated atmosphere' in the virtual classroom and students felt their peers are not really attentive to the course content or to each other.
3) *Confusion*. Poorly documented changes to courses as well as the delivery of course content through multiple digital platforms caused confusion among students.

Boredom. All of the students interviewed mentioned that they lost their focus on the lecture more easily as compared to face-to-face teaching. The sessions were experienced as being too long. A 45-minute session without a break often made students lose their sense of attention. When courses, which were originally designed to be given face-to-face, were simply moved into the online context, their duration and structure did not appear to be effective as intended by the teachers. The students started to feel fatigue quicker. They mentioned that a lengthy online session with a monotone voice explaining course content had far less dynamic to maintain students' attention effectively. They also mentioned feeling annoyed with some lectures that were delivered over a low-bandwidth network connection or with too low-quality audio/video. Students wished for more concise and to-the-point sessions, and technically higher quality materials.

"Listening to the monotone voice makes me lose my concentration while sitting on a chair for three hours." - Student (No. 3)

Disengagement. Students commented that interaction between students is important, especially, for first year students, as it helps to make the classroom atmosphere more engaging and they get to know each other better, in addition to learning about the subject. Since they could not get a chance to do school activities with classmates physically together, they did not feel a sense of belonging, as they did not get to know their peers during the course. Some teachers had required brief introductions from all students in the class, but this was considered too short and superficial to contribute to establishing real collaborations across the students. With students being around people in the sessions that they did not know well, they became increasingly shy to speak in public during the class. This was especially problematic for students, who would have needed more assistance with potential struggles with course content.

Students also mentioned that teachers could have used the chat features more often, as they felt it easier to write a quick note than to open their camera, unmute the mic and talk aloud to everybody. Based on the student interviews, even though the number included in our study is very small, it already seems fair to argue that teachers need to consider how to better organise the live online classroom sessions so that the atmosphere is inviting and engaging, and that is supports building personal relations. Lowering the threshold for allowing students to bring up their need for support must be considered in online sessions.

Confusion. Towards the autumn the course syllabi were not appropriately updated, as courses needed to accommodate a slightly different plan than the previous curriculum. When teachers had left the revision of the syllabus to the last minute, students had to make choices between courses based on insufficient and ambiguous information. For elective courses students often tend to drop out if the course does not meet their expectations, which caused unnecessary turbulence in some courses where student worked in teams.

Students also reported being confused, because they needed to plan and coordinate their studies through multiple digital platforms, such as course registration, personal study plan management, and online learning, which may have some overlaps and parallel functionalities. Moreover, different teachers also have different course-specific practices in how they utilise such platforms, e.g., for providing students with follow-up materials after lectures.

LIVE ONLINE TEACHING EXPERIENCE

We ran a workshop to frame an open-ended design challenge in the field of human-centred research and design in the context of crisis. This was our very first experience in running a workshop completely in an online setting, and it was the very first workshop that we organised together (the first and last author). We are experienced workshop facilitators, both with over 15 years of facilitator experience, and we relied heavily on our experiences when planning the workshop.

Previously, when facilitating a live in-person workshop, the following kinds of concerns usually needed to be taken care of before the session:

1) finding and reserving a suitable venue
2) ordering refreshments for participants
3) organising the tables, seating and working materials in the space

4) making sure that technology in the rooms works (projectors, audio, lighting, Wi-Fi)

5) planning the seating of participants, ensuring those working together are co-located

6) bringing along pens, papers, and other physical materials for design and co-creation

7) reserving, preparing, and bringing documentation equipment, such as video cameras, microphones, and stands

An in-person workshop day begins with commuting; some of the participants may need to travel substantial distances, often by train from other cities to attend. On the workshop day the participants may arrive in a staggered manner, often within 15-20 minutes of each other. This enables people to get coffee, look around, and chat before the workshop starts. In an online workshop most of these behaviours are different.

We organised a live online workshop using a Zoom video call and an online brainstorming platform called Miro (https://miro.com). Planning the online workshop was similar in many ways to in-person sessions:

- Outlining a preliminary task for the participants so that they come to the workshop with some prepared materials and thoughts
- Defining a schedule with key transition points and objectives (expressing observations, clustering observations, and articulating design directions)

This time setting up of the workshop space happened virtually, by outlining specific digital spaces on Miro for the students to articulate their observations.

The workshop start. We (three facilitators) started with 9 students that were joining in from multiple continents (Europe, Asia and Australia). The students had been given a task to provide their thoughts about the workshop themes on the Miro canvas prior to the workshop. This was expected to help the students to familiarise with the Miro platform as well as prepare their thoughts for the workshop (see Figure 1).

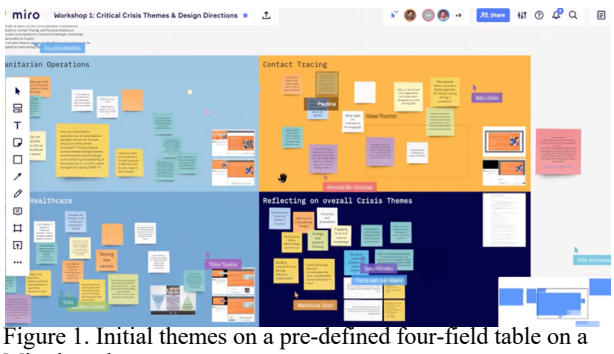

Figure 1. Initial themes on a pre-defined four-field table on a Miro board.

Guiding attention. One phenomenon of virtual meetings is how orientation towards shared objects (such as post-it notes, displays, etc) and participants may become ambiguous. We had both the Zoom video call as well as Miro collaboration happening in parallel. While one the facilitators was explaining materials on the Miro board, the other kept switching between the Zoom call screen, which showed the other facilitator's view into the canvas. It was easy to see there, what they were talking about. However, during some of the turns, when a person explaining did not have their screen shared, it was sometimes confusing to find which note they were referring to. This provoked the facilitators to do more dynamic switching between the open windows on the screen and the Miro canvas to look for the notes being mentioned. Miro has a feature to highlight all the participants' mouse cursors on the screen, which helped in finding a coordinated target for shared attention.

Students' reflections. Students commented "*it was interesting to see one's own notes being moved by the others*". This happened when a student was constructing a cluster of their own, but then another student dragged their notes into a different location. It provoked the student to reflect on why this move was happening, and then to look at what was going on. The students also mentioned that they enjoyed working on the canvas together, and that it was fun to see what everybody was doing at the same time. They stated that it feels more efficient than physical post-its, the pixels are easier to move around, and looks more legible. The success of the Miro platform use, however, depends on the dynamics of the team. For this session we had teams working very collaboratively and creatively.

In addition to enabling the facilitators to propose clearly outlined surfaces, i.e. those 'boards' to express the design directions, the 'surfaces' could be dynamically adjusted in response to what kind of content was shared. Compared to a flip sheet, they too often have overly constrained space for the kinds of creative expression that the workshop participants may desire. The resulting outcome was the most visually diverse affinity diagram that the facilitators have experienced in any 2-hour workshop (see Figure 2).

Figure 2. The Miro board at the end of the workshop; new themes emerged beside the earlier shared notes.

The feedback from the students about the workshop experience was very positive, and also we, the facilitators of the workshop, felt it was a very productive and collaborative way to advance the project. Real-time interactions were highly valued as well as observing what other participants were working on.

DISCUSSION

The challenges we identified in the paper related to online disembodiment, interaction, and human relations mostly echo findings from earlier studies in the fields of HCI and CSCW. Our work complements these with experiences of appropriating existing technologies into live interactions in online teaching, learning, and co-design during the COVID-19 pandemic. Below we reflect on our findings with the hope of supporting the design of high-quality online learning experiences.

EMBODIED INTERACTION

Online interactions were considered challenging due to its disembodied character, as people could not use their bodies to orient and gesture (Sellen et al., 1992; Nguyen & Canny, 2007). Based on our experience, the collaborative use of the shared Miro canvas and the parallel use of screen sharing through Zoom, enabled people to signal both their visual orientation (the shared screen) and gestures (visible mouse pointer) to the collaborators. The participants experienced the collaborative editing of a shared canvas to give a sense of spatial setting, where the others are working simultaneously. It enabled participants to observe what others were attending to by rendering each participant's named mouse pointer visible to the others; students liked this experience of virtual co-presence. It seems that this 2D-screen-based solution can achieve, at least to an extent, some of the key goals of the technically way more complicated solutions, such as the one studied by Rhee et al. (2020). Moreover, we have tested the solution with online workshops with up to 160 participants, and the 2D web canvas can support remote learning and design activities at a substantial scale.

Some of the courses involved on-site lab and prototyping exercises. Teachers considered online simulation tools not able to properly address the embodied characteristics of actually working with materials. For example, in electronics, it requires one to take extra care to not damage the components through wrong handling, and in physical prototyping the process typically involves a lot of improvisation with what is available. It seems that digital systems do not yet provide an enough rich context to support a 'thick practice' (Klemmer et al., 2006) in order to replace actual situated learning within physical design and technology settings.

New platforms are emerging to provide promising opportunities for more embodied virtual interaction in live online meetings. For example, a company called Spatial (https://spatial.io) offers attractive possibilities for hybrid online meetings, where the participants' upper body is rendered with people's hand gestures and overall bodily orientation. It remains to be seen how well platforms like this will support improved collaborative learning, design, and cooperative work.

LIVE ONLINE PEDAGOGY

Currently, the remote teaching condition has endured for over a year, and as basically all courses have been run online at least once, some several times, whereby, there exists a new, significant, and growing resource of relevant experiences within the organisations. Teachers already know quite well what works and what does not with their students in the context of their own course in the online setting. Moreover, after our interviews, teachers have already been able to adjust their courses to better work online, see e.g. (Chen et al., 2021). Thus, the situation has changed dramatically after the collection of our data, and we would recommend organisations to conduct internal reviews of and dialogue about the emergent best practices that teachers have developed. These experienced may be utilised also for the generation of organisation-wide templates for setting up new courses in the local LMS.

It is now apparent that different topics have different kinds of challenges when taught online. Some, for example, the teaching of programming is quite easy to move online, as screen sharing combined with a live video call works excellently as a teaching tool. This does not work so well with physics and mathematics, where hand-writing is an essential part of the practice, and where collaborative calculation training sessions have proven to be tricky to be organised online.

Teachers have also developed new ways to activate students while they are studying remotely. For example, at the studied university, teachers have after our study radically increased their use of various kinds of quizzes as part of their course material. Moreover, many of them have also adopted the chunking of lectures into 20-25 minute episodes, as suggested by Bao (2020).

Currently teachers are already seeing the prospect of being able to offer more flexible study options for students. It seems likely that teachers will utilise their experiences from the remote teaching in order to reduce their own lecturing burden related to repetitive topics, as well as to offer self-driven students more flexible options for completing certain types of courses, possibly supported by enhanced self- and peer-evaluation processes.

FACILITATING HUMAN ENCOUNTERS

Based on our experiences in facilitating project-based courses, it seems that valuable human encounters are more likely to happen in smaller groups. Thus, it is even more essential in the online context to have students actively engaging with their peers in smaller teams. In such teams they are also much more likely to speak up and also switch on their video cameras. Students also use chat/text-based applications, such as Telegram, to coordinate their team discussions. In a large online course at MIT (https://computationalthinking.mit.edu/Fall20/), instructors facilitated students to interact with their peers through a discussion forum application called Discord. We have used Slack workspaces for such forms of synchronous and asynchronous interaction among students and instructors in our courses. This promotes both informal, open format, and rapid interaction between the students, and it does not require conducting all learning, co-design and course coordination over live video-based sessions, which can often be more time-consuming and overwhelming.

Educational institutions should also foster more meaningful pedagogical exchange among instructors of online courses. Through semi-formal or informal discussions instructors could share experiences experimenting with different kinds of live online learning platforms as well as practical tips in overcoming the emerging challenges in recalibrating pedagogical practices in online learning contexts.

CONCLUSIONS

Distributed online learning is a key strategy for higher educational institutions to scale up their offerings to make them accessible to wider audiences. This paper explored the experiences of faculty and students of a Nordic university during the first nine months of the global COVID-19 pandemic. It identified three key challenges that educators need to address in order to design their live online learning sessions to better serve their pedagogical purpose. First, the *disembodied character* of today's live online communication and learning platforms significantly reduces the cognitive resources that people usually have during in-person situations, making it more challenging to interact and communicate, while often excluding training and practices of physical skills, which are essential in many areas of design and engineering. Second, *live online pedagogy* has several characteristics that make it different from in-person pedagogy: bandwidth limitations, digital tools, and multi-channel communication all must be addressed by adapting the pedagogy. And third, live online learning sets up novel *barriers to forming human relations*. Strategic choices that enable students to better connect with their peers while working on their coursework may lower these. Because the digital context is fundamentally different setting for supporting learning and co-creation, teachers need to improve their understanding of what is possible pedagogically, while learning new tools and platforms that allow enhanced learning experiences in live online settings. Based on the disembodied and multi-channel character of online contexts, both teachers and students can embrace new forms of dynamic interaction, peer-based learning, co-creation, and informal exchange that amplify the potential of distributed online learning.

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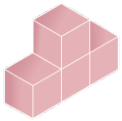

APPROPRIATING A DBR MODEL FOR A 'RESEARCH THROUGH CODESIGN' PROJECT ON PLAY IN SCHOOLS - TO FRAME PARTICIPATION

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ABSTRACT

On the basis of an ongoing research project on designing play in schools, the aim of this paper is to explore how a fruitful combination of design-based research (DBR) and research-through-design (RtD) can enrich both research strategies. Through a number of examples of codesign processes with pedagogues, the paper explores how it is possible practically to communicate, reflect and frame participation *inside, outside* and *beyond* research through a codesign project. By exploring ways of participation within situated pedagogical practices and ongoing experiments, the paper unfolds ways for researcher and stakeholders to exchange and challenge worldviews and everyday practices. The main contribution is, first, to show how merging design-based research with codesign can add a focus on stakeholders as important participants by emphasising the systemising benefits of collaborative reflections and, second, to show how a DBR model can be enriched and extended in its understanding of experiments.

INTRODUCTION

The Research-through-Design (RtD) approach, originating in Frayling (1993), is today a widely used approach to practice-based design research (Vaughan 2017). Since this origin, related concepts such as constructive design research (Koskinen et al., 2011, Gall Krogh & Koskinen, 2020) and programmatic design research (Brandt et al., 2011) have emerged to refine understandings of what happens in such design research practices. Yet, despite their slight differences, what cuts across these terms and approaches is i) the research is typically multidisciplinary and ii) construction or experiments are considered to be at the core of the work and knowledge production (i.e. Bang & Eriksen, 2019).

In 2008, Koskinen, Binder and Redström first introduced the framework 'lab, field, gallery and beyond' with the aim of mapping different areas and the overall theoretical grounding of design research. The ongoing PhD project: *Pedagogical Play Practices* (PPP) in focus in this paper could be positioned in the 'field' domain as it, among others things, applies a codesign approach and is taking place in the context of two Danish suburban elementary schools. The focus is on play in schools and, beyond the children involved in play situations, the main collaborators throughout the project are the two local teams of pedagogues (Jørgensen & Skovbjerg, 2020). (By the term 'pedagogue', we refer to danish professionals with a specific education, trained to work holisticly with children). In short, we characterise this PPP-project as a 'Research through CoDesign' project.

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The PPP-project is enrolled in a larger project called *Can I Join in* (CIJI). The CIJI-project applies a design-based research (DBR) approach that - as RtD - is applicable for large-scale and multidisciplinary research projects. DBR is a research strategy developed in education research, where design processes are used as a way to organise, push and drive the research process (Ejsing-Duun & Skovbjerg, 2019). Within this research tradition, models of these processes have been built (Ørngreen, 2016) that argue for combining strategies from different design approaches (Ejsing-Duun & Skovbjerg, 2019). Yet, within RtD, DBR approaches and models do not appear to be well known (Skovbjerg, 2020).

The first aim of this paper, is to explore and exemplify how a DBR model can be appropriated to, merged with and add to the communication and reflections on and in a Research through CoDesign project.

Second, the aim of the paper is to explore and elaborate how appropriations over time of a DBR model can practically assist in framing participation differently and, by doing so, offer a perspective on participation as something interchangeable and scalable throughout a research project. Through examples of codesign processes with pedagogues, the paper explores how it is possible to practically communicate around, reflect on and frame participation *inside, outside* and *beyond* a Research through CoDesign project. This second aim is thus also to discuss ways of framing and practically staging participation in codesign projects, with the intention of challenging and transforming worldviews and everyday individual and collective situated pedagogical practices – in this case, in the context of play in schools.

MERGING OF DESIGN-BASED RESEARCH AND RESEARCH-THROUGH-DESIGN

In this section, we first outline the core points of DBR. Next, we outline core positions within a RtD approach to design research, particularly with an emphasis on codesign research with real-world everyday contexts, practitioners and practices. By combining strategies from RtD with a DBR approach, we show potentials for the fields to learn strategies from each other, especially in regard to the partnership of researchers and practitioners within collaborative processes. In order to show some of the crucial overlaps wee see ind the two approaches, we chose to present them in a plain manner.

THE APPROACH OF DESIGN-BASED RESEARCH

DBR is a relatively new research approach that has evolved over the last two decades in the education field (Anderson & Shattuck, 2012; McKenny & Reeves, 2018; Ørngreen, 2016). The overall purpose of using DBR has primarily been to research and develop learning processes in collaboration with educators by using design processes as the motor.

Ørngren states that DBR is "an interventive method that researches educational designs (products or processes) in real-life settings to generate theories in the domain and to further develop the specific design through iterative processes" (Ørngren, 2016 p. 20).

These iterative research processes have been illustrated in different models, most of which divide the research process into four phases or domains. In this paper, we draw on a model that was developed in the PPP-project and inspired by the work of Gÿnther (2009) and Barab & Squire (2001). The model consists of four domains, and each domain is characterised by different research practices that to some extent apply different research paradigms. The four domains are: the **context**, where the field of the problem is settled; the **lab**, where principles for what we want to experiment with in the field are produced collaboratively; the **experiment** domain, where we intervene in the empirical field with our design experiments; and the **reflection**, where we (still collaboratively) discuss what we have learned and experienced, discuss possibilities of exploring further and developing prototyping theory and principles.

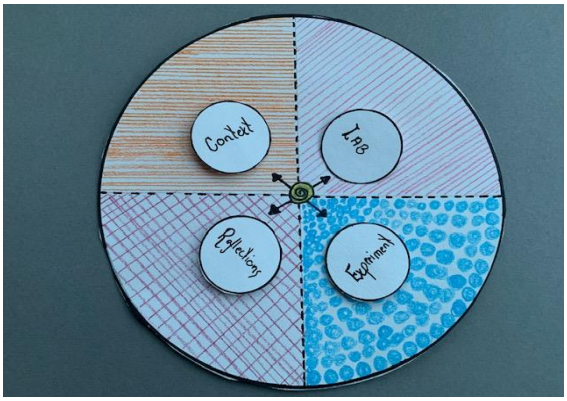

Figure 1 The DBR model, highlighting four domains of a design research process. The model here is constructed for and used in the PhD-project on Pedagogical Play Practices.

The dotted lines in Figure 1 between the domains and the spiral at the centre illustrate the dynamics of the research processes as a back-and-forth movement. The domains are interrelated and will continuously affect the practices of the other domains. This aspect correlates with the often stated 'messiness' of doing RtD. However, maintaining the ideas of different domains can shed some light on this messiness (e.g. according to how experiments expand and move the research). This, we will show in the analyses.

THE APPROACH OF RESEARCH-THROUGH-DESIGN, PARTICULARLY CODESIGN IN DIALOGUE WITH DBR

Within the frames of RtD, the effort of mapping different areas and theoretical grounding is ongoing. In the following, we will elaborate on notions of the 'lab' (and 'field'), the 'experiment' and 'codesign' and merge them with DBR.

The Lab (and Field)

Koskinen et al. elaborate on *Research Design Through Practice* (Koskinen et al., 2011). Very briefly, they describe the 'field' in design research as inspired overall by the social sciences (including anthropological studies), often described and enacted as participatory or codesigned and largely carried out in collaboration with real-world stakeholders in their everyday use-contexts. In the same text, the 'lab' covers design research for example related to experimental psychology, with often craft-based and/or technologically driven experiments done in a studio or laboratory setting.

Prior to that, work by Binder makes some crucial points regarding the lab. Binder draws on ideas from the natural sciences of the lab as a controlled environment for experiments. In design research, however, according to Binder the interactions between participants in real-life settings are the core; as such, the lab is a setting where different stakeholders "collaboratively explore possibilities in a transparent and scaleable process" (Binder, 2007, p. 2). Transparency can be maintained through for example thorough notetaking, pictures and drawings. The outcome is not a product; rather, it is "to prototype a sustainable practice that can make sense of new design options" (p. 4). Thus, the lab is in the field.

In regard to the lab of DBR, this way of thinking can add to the notion of 'exploring principles' for design in real-life settings. We see similarities in 'design principles' to what Binder calls "designerly interventions" that can support creativity and "establish a workable design situation" (p. 9). As such, design principles, cocreated in a DBR lab, can initiate new ways of thinking about doing and help practitioners make different yet comparable designs in practice.

The Experiment

Related to RtD, Brandt et al. (2011) state that experiments are not tests in a scientific sense or confirmation of an implementation strategy but rather unfoldings of research, substantiating or challenging the questions that we ask. Experiments in design research can come in many forms and typologies e.g. *expansive* experiments that aim to uncover a new area while moving with the findings and *comparative* experiments that try out a concept across contexts (Gall et al., 2015). Experiments can come as artistically inclined activities and as aesthetic practices; they can be framed from the start of a project or continuously; and they can evolve in many directions. However, experiments are generally regarded as the pivot of RtD research, as they can drag explorations and reflections in new directions and thus become important vehicles for knowledge production (Bang & Eriksen, 2019; Brandt & Binder, 2007; Gall et al., 2015, Gall & Koskinen 2020). Drifting and successively opening new perspectives on the research hypotheses is regarded in RtD as a strength and an opening to exploring the complexity of real-life settings.

In the first DBR research projects, testing didactic tools in collaboration with teachers was common. However, in DBR – as in RtD – purposes for and ways of doing experiments have been extended. In brief, in DBR experiments are understood as framed practices initiated in real-life settings – such as classrooms – containing iteration and adjustment (Barab & Squire, 2004; Günther, 2009). Today, openness in thinking about – and doing – experiments is not contrary to the understandings of experiments in DBR; however, we believe that the thorough theoretical grounding of experiments in RtD can supplement and expand experimentation within a DBR framework.

CoDesign

What we today, in short, often frame as codesign research (e.g. Sanders & Stappers, 2008) started with computing and information systems research back in the 1970s and 1980s. Among others, it was inspired by and merged with ethnographic and action research approaches, and it grounded the field of participatory design research (i.e. Ehn, 1988; Greenbaum & Kyng, 1991). The main goal in codesign – as in DBR – was then, and still is, to move experiments away from the lab and into real-life settings and to integrate methods and techniques from other research areas such as ethnographic fieldwork, participant observation and visual strategies (McKenny & Reeves, 2018) in close collaboration with practitioners.

Collaboration is the core, and codesigners are constantly searching for ways of "bringing together a wide range of actors to identify and develop possible futures" (Huybrechts, Benesch, & Geib, 2017, p. 145). Codesigning e.i. includes ambitions of mutual learning, giving voices to participant practitioners, framing ways for them to unfold their ideas and reflections, etc.

Participation in codesign first and foremost refers to ways of working sensitively in relations with stakeholders. It does so because the pivot is to enhance stakeholders ability to participate in a "genuine partnership" (Simonsen & Robertson, 2013, p. 5). By being attentive to what occurs, new possibilities for trying out and strengthening the partnership emerge.

Ehn and Ulmark (2017) state that "The aim should be rather to create a situation where all stakeholders have a role in the analytic and creative work as far as possible on equal terms, and sharing the responsibility" (p. 80).

Thus, participation becomes a matter of concern in which new and unforeseen forms of participation can become visible (Andersen et al., 2015). For Andersen et al., this primarily refers to new participants dragged in by stakeholders. In our view, participation as a matter of concern also points to the complexity of the researcher doing codesign in the field and thus becomes a participant in the everyday life of the stakeholders.

As we will illustrate in the analysis, we see participation as a continuous search for ways of positioning stakeholdes, including ourselves, differently during a research process, and we use the DBR model to empathize how the domain of reflection can add to a codesign by pointing to the importance of creating spaces for coreflecions. Doing so enables us to make framing an option for discussions on participation as a matter of scaling.

PRESENTATION OF THE PROJECTS CAN I JOIN IN AND PEDAGOGICAL PLAY PRACTICE

In this section, we present the CIJI-project and illuminate the obligations and contributions of the PPP-project in regard to the CIJI-project. In addition, we present how DBR is used in the CIJI-project in order to initiate the play experiments that are the pivot of the CIJI-project and the starting point of the PPP-project.

The CIJI-project explores how it is possible to design for inclusive play environments using DBR strategies (Barab & Squire, 2004; Jørgensen & Skovbjerg, 2020; Skovbjerg, 2020). The main research question is explored through four work packages: one about play types when designing for inclusive environments, one about communities of practice, one about measuring play experiences from the perspective of children and the last about pedagogues and their participation in play, which is this codesign project, PPP. The research questions of the fourth package are phrased as follows: *How do pedagogues participate in play? How do pedagogues handle inclusion and exclusion processes according to play? How do pedagogues collaborate in these processes*? The PPP project answers by exploring how pedagogues can act collaboratively in order to enhance the participation of different children in play. The ambition is to qualify the practices of pedagogues in order to qualify the school lives of children.

The PPP-project and the CIJI-project share fields, as they are carried out in collaboration with the same two teams of pedagogues. These pedagogical teams are situated in schools in two local communities. The first of the schools, School Red, has a diversity of children, according to cultural and social backgrounds. The second, School Blue, represents a more homogeneous group of children with primarily an academic background, except for a small group of travelling children – children from a nearby suburb who, due to a political decision on integration in schools, are transported in buses across the city. Both of the schools answered an open call for collaborative partners in a research project on play in schools. The call was conveyed though BUPL Aarhus (Union for pedagogues). Four schools answered. The two participating schools were chosen according to their demographic differences. The schools joined in on a pilot study. The pilot study worked as an "initiating experiment" carried out in order to frame the project and establish the research methodology and positions (Bang & Agger, 2019, p. 4.8). Afterwards, the schools had the opportunity to withdraw. Neither did. Instead, they became cosignatories on an application for funding.

The interdisciplinarity of the CIJI includes different researcher areas, such as design, anthropology, sociology and psychology. The interdisciplinarity contains both qualitative and quantitative sub-studies and includes methods from ethnography, action research and factor analyses. The PPP-project, as a codesign study, is part of this interdisciplinarity and contributes to the overall project at a methodological level by framing, enacting and exploring the collaboration with the pedagogues.

By exploring and nourishing relations with the pedagogues, the PPP-project affects what is workable in the other subprojects. In some sense, the PPP-project eases the way for other researchers who for example might come for a week or two to conduct interviews. As such, the PPP-project lubricates a gate into the field for researchers in the larger project.

The CIJI and the PPP projects comply to the rules of GDPR and the Danish Code of conduct for Research. Parent signatures have been obtained and all children are free to leave the experiments at any time.

DESIGN-BASED-RESEARCH IN THE CAN I JOIN IN-PROJECT

The DBR approach with the illustration of the four domains is used continuously by researchers in the CIJI-project in order to position and interconnect each work package. We use it in order to organise the research processes, to position the main entrance for each work package and to provide transparency across the work packages through acts of documentation.

In the **domain of the context**, we investigate the school as contexts for play. Here, we use methods of fieldwork, review and – as mentioned – an initiating experiment in the pilot study. In the **domain of the lab**, we meet with pedagogues in order to plan and create play experiments. In order for the pedagogues to scaffold their play experiments, we provide them with design principles, including options for materials, space, time, number of children, play types and play practices. In the **domain of experiments**, however, we all play - with different roles: pedagogues being attentive towards the

children and the researcher making participant observations. In the **domain of reflection**, we initiate different types of reflective workshops on the experiences of the pedagogues' participation in the play experiments. We do so in order for pedagogues to adjust and develop their experiments and at the same time have the opportunity to share experiences. Each of the play experiments, designed by the pedagogues, runs over 6 weeks and has two iterations.

The PPP-project started out being active in all four domains of the CIJI-project but is gradually separating itself and expanding in the domain of reflection. It does so because pedagogues claimed a need to immerse themselves in the values that were enacted during the play experiments. Therefore, the domain of reflection became a new kind of lab, where the codesign researcher (the first author) and the pedagogues cocreated two kinds of play-reflective experiments called 'the dramatic reflection experiment', with five iterations across the schools, and the 'dress-up-doll' experiment, with three iterations also across schools.

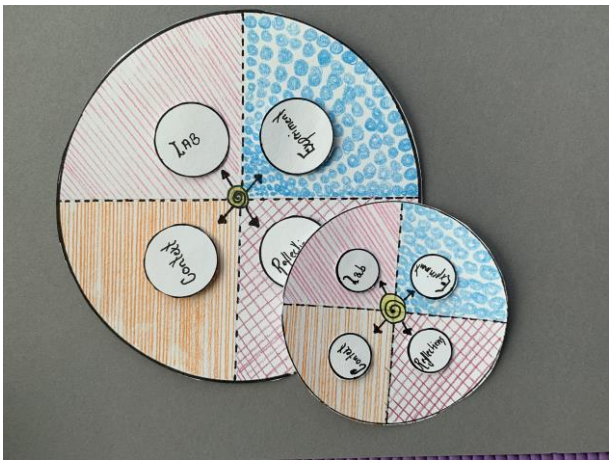

Figure 2 The DBR of the codesign experiments in the PPP-project positioned within the DBR model of the larger project.

Recently, critiques have commented on the notion of context, which in most original DBR is limited to the classroom. Some researchers plead for an expanded use of DBR outside traditional classroom settings (Ørngren, p. 36). The CIJI most explicitly does so since we do not investigate learning designs in the frames of a classroom but design for play in the school environment, which apart from classromes include corridors, workshops, staff meetingrooms, leisure time areas and outdore areas. This shift in focus means that traditional classroom settings transform and become contexts for play rather than learning, as does the rest of the school.

Apart from using the DBR model in communication between researchers, we use it in communications with the pedagogues. We do so in order to make the codesign process as transparent as possible. At every meeting and workshop, we drag out the model in order to show them where we are and to indicate the agenda of the meeting or workshop. We do so in order to make the purpose of the doings of the researchers transparent. We want to show them how things in the larger research project are interconnected and how they themselves become participants. In other words, we use it to frame and scale the different roles of participation within the project.

FRAMING PARTICIPATION IN THE PEDAGOGICAL PLAY PRACTICE-PROJECT

In the analyses to come, we draw on empirical material created by the codesign researcher, originating from three experiments in the PPP-project. The empirical materials of the project consist of fieldnotes, participant observations, interviews, pictures and transcribed visual and auditive materials, crafted by the codesigner. In addition, written narratives and sticky notes made by pedagogues are included. The empirical quotations in this paper consist of transcribed materials from workshops in the domains of lab and reflection.

As suggested by Krogh et al 2015, the experiments in the project are categorised as both 'expansive' – drifting along, crafted by important issues of participation that occur – and 'comparative' – involving two schools and adjusted in relation to two teams of pedagogues and two groups of children.

The three experiments mentioned are as follows:

The play experiments – cocreated and carried out by pedagogues from August 2019 to October 2020. Here are four experiments (a 5th was cancelled in Mai 2020 due to Corona). Each experiment runs over 6 weeks and contains two iterations in each school. Empirical mateirals consist of participant observations, pictures and films.

The dramatic reflection experiment – cocreated and facilitated by the codesigner. One experiment, carried out over 6 months (2019-2020) containing five iterations across the schools. All iterations are videorecorded and transcribed.

The dress-up-doll experiment – created and carried out by the codesigner over one month (February 2020), containing three iterations across the schools. All iterations are videorecorded and transcribed. Cases are formulated and carried back to reflective meetings with pedagogues. These meetings are videorecorded and transcribed.

Insights from the experiments have emerged through analyses inspired by a coding system that comes from grounded theory (Flick, 2014). The codes used in the analyses are developed through selective processes, starting with several open codes then reduced to four clusters: a) *grown-ups interactions with children*, b) *school as frame for play*, c) *pedagogues participation in*

the PPP-project and d) *pedagogical professionalism.* This paper relates to b), c) and d).

FRAMING PARTICIPATION INSIDE THE PROJECT

WHY REFLECTIVE EXPERIMENTS?

From the beginning – actually, the first lab workshops in august 2019 - where the pedagogues were to plan and create play experiments, certain values occurred as obstacles for creating and doing play experiments. The first was about how the pedagogues understand play. A core value, frequently discussed, was the value of play as 'free play', meaning children playing without adults interfering. This value was a challenge in order for the pedagogues to frame and act according to the play. It became even more transparent when the experiments began to evolve. It seemed to affect pedagogues, providing them with doubts according to their actions. How to act supportive to children who experienced play difficulties without taking control over the play?

One pedagogue said: "It is a dilemma. Shall we support the children in play, nourishing and following their ideas, or shall we support the child who is in difficulties by managing the play?"

There seemed to be a perception of actions as a question of either-or, a dichotomy between actions of supporting play and actions of framesetting and adult-managed activities. This dichotomy emerged as a result of doing play experiments that bodily involved the pedagogues and tested their everyday practices in new settings. A frequently asked question was "When are we to frame and manage more and when are we to let more go of things in order for play to emerge?"

It seemed that these sensitive experiences of dilemmas in their own practices according to play renewed their need of reflections. That is reflections that mirrored their specific actions during the play experiments and questioned them as *professional pedagocial* actions.

The pedagogues asked for "A way to reflect upon our intentions of a play experiment, how children react in reality and how we then respond to their reactions."

DRAMATIC REFLECTION EXPERIMENT

The codesigner developed a reflective experiment in order to examine these values and the tacit knowledge that seemed to disturb the pedagogues in doing play experiments. Such reflective experimens should enhance the pedagogues' experience of being part of the project and support the movements in intentions and doings that they asked for. With a reference to Donald Schön (1995), it should enhance the movement from reflections *in* actions (according to play) to professional reflections *on* actions (according to play).

The experiment was inspired by 'the magical if' from Stanislawskij (1940) and merged dramaturgical techniques with a supervision-setting in order for pedagogues to *act out* their play experiences in the context of a reflective team of colleagues in a meetingroom at the school.

Figur 3 A situation from Dramatic Reflection where the male pedagogue play a role as a pedagogue who tries to motivate a child (the woman pedagogue) to join a play as 'he' likes.

The codesigner used the DBR model to create transparency in this experiment and the positions of participation that it installed throughout the process of invention. That is, through the lenses of the DBR model, the codesigner illuminated how the pedagogues participated in the domain of the **context** for this experiment by formulating the dilemmas that this specific experiment is to explore. In the domain of the **lab,** pedagogues and researchers cocreated and tried out different models of play reflection that ended up with a prototype, called dramatic reflection. In the domain of **experiment,** the pedagogues try out the prototype and, in the domain of **reflection**, we all participate in reflections on both the content of the reflective experiment and the prototype for reflections.

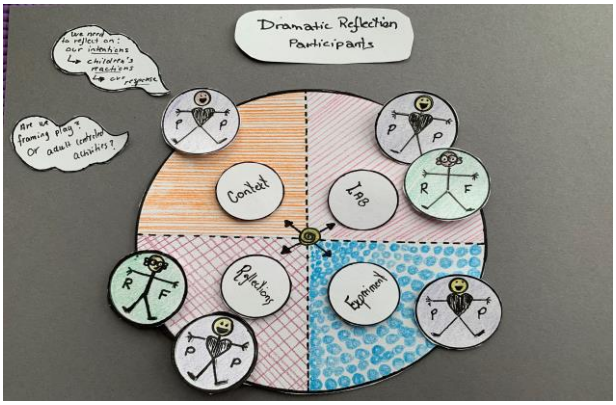

Figure 4. The DBR model used in Dramatic Reflections. The person symbols are: pedagogues = big heart and mouth; researcher = big eyes and ears.

During the experiments of dramatic reflection, the two pedagogical teams diverged. The team in School Red was very enthusiastic and liked to dwell on reflections such as "What might happen in the head of this child?" or "It helps imagining children's experiences when we reflect on concrete examples without knowing the name of the child." The team in School Blue, on the other hand, was not keen on continuing to do this experiment. A couple of them expressed a slight resistance. From ethical considerations the codesigner stopped and invited the team to exchange experiences in a traditional verbal setting and so they did.

DRESS-UP-DOLL EXPERIMENT

Starting from the domain of **reflection** from the dramatic reflection experiment, a new experiment occurred. This is the dress-up-doll experiment. In this experiment, the DBR model is used to show how our roles of participating are shifting.

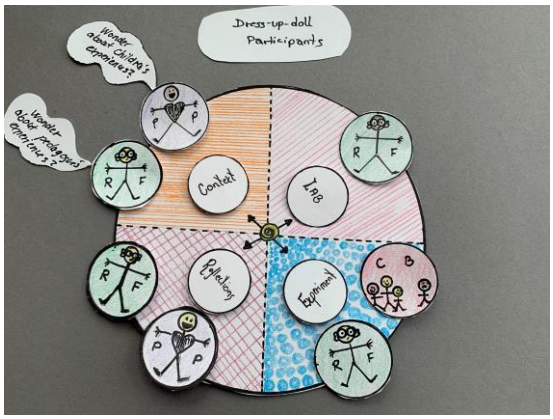

Figure 5: The DBR model used in the Dress-up-doll experiment, where our participation differed, and children participated in the domain of the Experiment with the codesigner.

In the **context** domain, we this time all participate in formulating problems. The problem formulated by the pedagogues from both Schools are: "How do children experience playing with pedagogues in school?" The problem formulated by the codesigner derives from the diversity of the teams and is thus formulated: "How do pedagogues experience playing with the children – and with me?"

In the domain of the **lab**, the codesigner now is the only participant, consulting a designer in order to create a dress-up-doll tool for her to play with children during the following experiment, in a way that at the same time can initiate the children's narratives on play in schools. The reason for this is to explore children's expressions and experiences while playing. At the same time, the codesigner wanted to put herself in a pedagogical play situation, using the design principles that the CIJI-project had given the pedagogues. The reason for that was to provide herself with the possibility of having a *conversation with the situation* (Schön, 1995) as if she was a pedagogue in a play experiment.

In the domain of the **experiment**, the codesigner participates with the children. Starting from the codesigner's own experiences in the domain of the **experiment**, cases were formulated and brought back to the pedagogues.

I the domain of **reflection,** again the pedagogues and the codesign researcher participated. Here a new type of reflective workshops were organised around the cases**.** The idea was to frame reflections differently, accommodating those pedagogues who did not like to do drama. Instead reflections were made on the actions of the researcher.

FRAMING PARTICIPATION OUTSIDE THE PEDAGOGIDAL PLAY PRACTICE-PROJECT

During all of these experiments, and especially in the reflective domains, ideas of *pedagogical professionalism* emerged as part of conversations on *schools as frame for play*. It became obvious that in this conversation pedagogues included other participants – first and foremost, the teachers.

For some of the pedagogues, teachers seemed to be a challenge if pedagogues are to design for play in school because teachers have the power to define the rules of the schools and classrooms. E.g. one pedagogues state: "There is a rule of no ball-play in this yard. The teachers made it because one of them was hit."

To other pedagogues, teacher was mentioned as collaborative partners whom they wanted to include in the project.

"I wish the teacher could join in. Then they could learn about play and about what pedagogues can do."

Even though the conceptions of the teachers diverge, it seems that bringing them into the conversations about play in schools, push the conversation in a direction where the professionalism of pedagogues are in play.

A pedagogue says: "Of course we shall work with play and play practices, that is our professionalism. We are not teachers."

Thus, doing play practice might become a possibility for pedagogues to maintain a *different professionalism* from that of the teachers.

By using the idea of domain in the DBR model, we would say that the reflections made in relation to the experiments illuminate important matters of concern regarding the context as seen by two teams of pedagogues. That is, we gain important knowledge on *the school as a frame for play* now and for future designs for play in schools. Also, we gain knowledge of the role of the teachers as participants in an

investigation on *pedagogical professionalism* in schools.

FRAMING PARTICIPATION BEYOND THE PEDAGOGICAL PLAY PRACTICE-PROJECT

Above, we used the DBR model to show how collaboration with pedagogues on play in schools involves participants inside and outside the PPP-project and how this also points 'beyond'. In this section, the question on participation beyond is further analysed.

As mentioned, we used the DBR model in communications with the pedagogues in order to enhance their research participation. A request from one of the pedagogues forced the codesigner to consider more specifically how the model can be used according to the everyday practices of the pedagogues.

In the end of a lab workshop, a pedagogue asked: "We have a mandatory task, given by the municipality. We are to work with 'professional learning communities' and we would like to use Kolb's learning model. Could you please next time, integrate that model in the play project like the other DBR model so that we don't have to work on two separate projects?"

After a brief hesitation, the codesigner agreed. The reason for hesitating was that this request at first seemed to point away from the CIJI-project and the focus on doing play experiments. The acceptance of the request, however, was a consequence of the codesigner seeing herself as a codesigner who is appreciative and responsive towards the everyday lives and needs of the pedagogues. Also, the codesigner understood the request as a sign of trust; a request for specific competences of the researcher and, as such, it could not be neglected.

As it happened, the comparison of the DBR model and Kolb's learning circle established a frame for mutual learning and reflection. We set up the models facing each other, and we coexplored their appropriation according to pedagogical practices in general within the frames of a school.

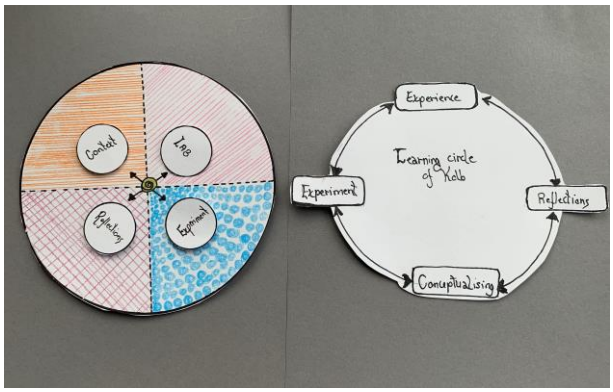

Figure 6. Similarities and differences of the DBR model and Kolb's learning circle were co-explored in a reflective session.

We did not dwell on the fact that the models stem from different theoretical paradigms, as the Kolb model is a learning circle and the DBR model is a research model for design-based experiments. The idea was not to teach. Instead, we used the models as a starting point for discussing their applicability for pedagogues who want to try out new actions or experiments according to play and frame ways of evaluating these new actions. We discussed both models as supportive for the movement from reflections in actions to reflections on actions.

We also dwelt on differences. Here, it became obvious that the DBR model opens up the domain of *context* in a more explicit way. The context domain, however, is crucial, as the request for help indicates. The everyday life and practice of pedagogues are embedded in shifting tasks, devised and planned by stakeholders from outside the schools and away from the children. As such, this request for integration of the models and projects points at how different stakeholders, the municipality and research projects might complicate the busy everyday life of pedagogues, leaving it up to themselves to create coherence between projects and tasks while they at the same time try to prioritise and nourish proximity to the children. The DBR model seemed to support the pedagogues in discussing how contextual issues are crucial in relation to their ability to work professionally with play in schools.

At this point – where the pedagogues drag the model into a discussion that foregrounds matters of concern in their everyday life, the DBR model shifts status. It is now no longer just a model that supports iterative research processes; it becomes a model for discussing opportunities, obstacles and changes that must be addressed for pedagogues to continue working professionally with play in schools. As such, the model mirrors *the pedagogues' participation in the PPP-project* by maintaining a focus on everyday practices.

Working with changes locally is always embedded in a broader societal and political context that must be contemplated in future design. It seemed the pedagogues, by using the DBR model on their own grounds, so to speak, became very much aware of this. Design for play in schools beyond both the PPP-project and the CIJI-project should somehow integrate teachers and municipalities.

DISCUSSION

In this section, we discuss how the merging of DBR, RtD and codesign can combine and add to each other's field and how we, by merging them, can offer transparency and scalability for different possibilities of participation within collaborative processes.

APPROPRIATING AND MERGING DBR AND RTD APPROACHES IN CODESIGN

By appropriating and merging DBR with RtD, this paper illustrates how the two design research approaches can benefit (from) each other.

First, we argue that RtD can enrich and extend the notion of experiments in DBR, and by doing so, the field of DBR can transgress more rigid ideas of testing and implementing. A core feature in the way DBR is used in the CIJI-project is that we do not search for new methods to implement, as do many DBR studies (Akker, Gravemeijer, McKenny & Nieveen, 2006; McKenny & Reeves, 2018;). Rather, we cocreate experiments in order to search for actual challenges and future possibilities. This resembles the ideas of RtD and codesign, and it is largely through the understanding of experiment that RtD, codesign and DBR meet in the project. The CIJI-project drags the DBR approach into a new research area and, by applying open-endedness to the approach and by understanding the experiments as exploration of and questions for the field, it becomes possible for DBR and RtD to be combined.

Secondly, by merging DBR and codesigning, we add a focus on coreflection as an important process in experiments that frames stakeholders as important participants dragging and pushing a codesign project in new directions. We show how experimental reflective processes contain possibilities for changing roles within codesigning. By being attentive to what occurs, the codesign researcher can continuously explore collaborative processes by framing participation anew, facilitating new roles for stakeholders as well as for the researcher. We argue that creating situations where all stakeholders find the ability to participate on equal terms in mutual learning, does not mean they have the same roles to play throughout a research process and in each new experiment. We will also argue that collaborative reflections can benefit from experiments where the researcher attempts to throw herself into situations similar to those of the practitioners in order to use these attempts to exchange worldviews and experiences of the everyday life of a profession. Overall, we argue that framing participation differently throughout a codesign project can provide the researcher with new perspectives on participation and add to the notion of participation as a matter of scale.

Finally, we would like to point out that the DBR model can be used as a means of systematising 'expanding and comparative' experiments. In doing so, the model offer some transparency both within a RtD project and in the interrelations between a large and framesetting project and a sub-project (e.g. a PhD project). As such, we would say that the DBR model becomes a beacon for the design researcher's own participation as a coresearcher in a large, framesetting project, in which she has certain obligations. At the same time, the model shows how she does independent research, merging a RtD and a DBR approach. We will argue that the DBR model can be used to offer transparency and scalability for finding the balance between interconnectedness and independence in PhD projects that carry their research out as part of a larger project or in relation to other stakeholders that dictate overall research questions or problem to address.

CONCLUSION

Both DBR and RtD have evolved from ideas of multidisciplinarity and with the aim of moving experiments away from the natural science lab and into real-life settings. Even though the two approaches are not yet very well known to each other, we conclude that they can benefit from their merging, especially in notions of the lab, the experiment and the reflection.

In our analyses, we have presented a case about play in schools in which the appropriation of a DBR model in a 'RtCoDesign' PhD project is used in order to make the framing of participation in codesign transparent and scalable. By showing how to frame participation continously according to what emerges, we have demonstrated different scales of participation *inside*, *oustside* and *beyond* research. We conclude that participation comes in many forms including the participation of researchers in the practices of stakeholders and as participants in larger projects. Thus, we conclude that framing participation is an important matter of scale for researchers doing codesign.

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NORDES 2021

Paper Session 6

Urban Scales

Session Chair | Jacob Buur

Scaling Up and Down. Landscape Design Processes and Choreographic Inquiry
Enrica Dall'Ara and Melanie Kloetzel (E)

Scaling Experiments in Urban Space – An Exploratory Framework
Eva Knutz and Kathrina Dankl (E)

Closer to Earth: Scales of Planning for Urban Waters
Kristine C.V. Holten-Andersen (E)

NORDES 2021

SCALING UP AND DOWN. LANDSCAPE DESIGN PROCESSES AND CHOREOGRAPHIC INQUIRY

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ABSTRACT

This paper focuses on *matters of scales* in the project Landscape in Motion, which involves creative research in the fields of landscape design and performing/digital arts. Landscape in Motion acts as an interdisciplinary inquiry into the relationship between urban infrastructures and the human scale, and it aims to define an innovative site-sensitive methodology for both urban design processes and site-based arts. Within the project, movement and dance act as a focal point to evaluate and highlight the social/environmental value of urban infrastructures. Integral to the project is the defining of an interdisciplinary lexicon as well as the development of a novel annotation system, 'score-maps'. Framed by a brief description of our developing methodology, the paper discusses the challenges and possibilities of crafting a system of multi-media representations that capture the scale of the human body and the larger site to inform both landscape design and choreographic creation processes.

INTRODUCTION

Landscape in Motion is a project that involves creative research in the fields of landscape design and performing/digital arts. The interdisciplinary project aims to craft an innovative site-sensitive methodology for both urban design processes and site-based arts that takes into account cultural/aesthetic and environmental heritage. Key to the project is bringing into consideration the relationship between the urban/site scale alongside the human bodily scale, through the instruments of both landscape analysis and artistic inquiry. The richly layered neighbourhoods of Ramsay and Inglewood in Calgary, Alberta in Canada, offered an appealing context for our investigation. These neighbourhoods include dense interfaces between the city centre, rivers, cultural heritage sites, mobility infrastructures, industrial sites, brownfields and vacant lands. Human-scale residential and commercial fabric interfaces with the inhospitality and vast scope of major infrastructures and industrial areas, providing fascination for designers and residents alike. Currently, the city of Calgary is in the beginning stages of implementing the construction of a new Light Rail Transit (LRT) line that will profoundly transform the Ramsay/Inglewood area; as researchers invested in the cultural heritage of Ramsay/Inglewood, we sought to uncover a novel methodology for honouring the neighbourhood's heritage in light of the transformation.

This presentation highlights the scalar details of the project, Landscape in Motion, which aims to develop a methodological process and relevant lexicon via the creation of 'score-maps', an annotation system that captures the insights of the human body to inform both landscape design and choreographic creation processes (Dall'Ara & Kloetzel, 2021).

BACKGROUND AND OBJECTIVES

Landscape in Motion prioritizes interdisciplinary inquiry to consider the relationship between major urban infrastructures and the human scale. More specifically, the project attempts to re-imagine urban infrastructures and their hardscapes as cultural and/or green infrastructures (Plieninger & Bieling, 2012; Czechowski et al., 2015) via the mechanism of the human body (Foster, 2010) and site-specific

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performance (Pearson, 2010; Hunter, 2015; Barbour et al, 2019).

For the project, movement and dance act as a focal point to evaluate and highlight – as well as measure and conceptualize – the social/environmental value of urban infrastructures. Inspired by Land Art and the work of landscape architect Lawrence Halprin (1916-2009) and dancer/choreographer Anna Halprin (Halprin, 2011; Halprin & Kaplan, 1995), we utilize the artistic expression as a poetics for both site investigation and recording (Kaye, 2000; McPherson 2006), with the Halprins' "Motation" drawings offering an example of how diagrammatic representations can document, direct and depict dance-landscape interactions (Halprin, 1965; Halprin, 1969).

Using both spatial data (mapping) and experiential activities (on site surveys, and site-specific physical and aural performance methods), the project produces specific creative outputs, including digital landscape representation, score-maps, dance films (Brannigan, 2011; McPherson, 2006; Kloetzel, 2016), landscape meta-design for the site, and an online platform that interactively links the above-mentioned outputs.

A CROSS-SCALAR METHODOLOGY

Frequent journeys through Inglewood and Ramsay to consider the phenomenological properties of the areas revealed the need to narrow the options for physical investigation in order to guarantee an appropriate analytical depth for both the smaller scale of the human body and the grander scale of neighbourhood. Furthermore, the dialectic between different scales in this context offered particular appeal because of a seemingly osmotic connection between secret or micro-sites (hidden narrow alleys, local community art, installations or signs, etc.) and vast infrastructure spaces such as railway yards, major roads and highways. As specific sites surfaced for movement exploration – including a neighbourhood park (Jefferies Park), marginalized spaces along rail tracks in Ramsay, and a courtyard of the oldest brewery in Inglewood – a series of questions emerged as well: In what ways could we address the different scales of the project? Could the four-dimensional nature of both danced experience and landscape processes/perception be translated into two-dimensional mapping? How could we combine different dimensional sensations into a 'viewing' experience? And, critically, how could we enact a process and a mapping experience in a way that would not re-enact colonial imperatives?

Aware of the colonialist erasures and assumptions within mapping practices (Harley, 2001), and in order to address the role of *time* on site (Lynch, 1960; Kaye, 2000; Pearson & Shanks, 2001), we started to use the term 'experiential archaeology' to frame the mapping endeavour. We found this new term able to signify the personal and experiential nature of being in place while also underscoring concepts developed within critical cartography, landscape architecture theory, site-specific performance theory, and dance studies that highlight the gamut of bodies that have traversed a site over time.

Framing the mapping project for the dance members of the research team around the anthology *Site Dance: Choreographers and the Lure of Alternative Spaces* (Kloetzel & Pavlik, 2009), the dance research team underlined four main concerns within site-specific performance: history, phenomenological and physical interactivity, aesthetics, and community relationships. By focusing (initially) on these four main areas and applying the concept of experiential archaeology, the dance portion of the team was able to combine their growing knowledge and impressions of the individual places through iterative experience with (what the team began to call) a 'light' flâneuse-style engagement that prioritized diverse experiences of a site across both time and a diversity of bodies (Hammergren, 1996). (Figure 1)

Figure 1: Dancers' map. "Environmental Dialogues".

As the dancers concentrated on personal experiences of site, the landscape architecture team employed the concept of cross-scalar 'double-glances', where 'small-scale' glances at proximity and detail joined with 'large-scale' glances at landscape systems and scenery (Dall'Ara, 2012). From this approach, the landscape architecture team developed a series of layered axonometric and perspective view maps to highlight key historical periods and landscape components of the area (Figure 2). The maps were shared with the entire team to assist with recognizing the evolving palimpsest of the three sites over time.

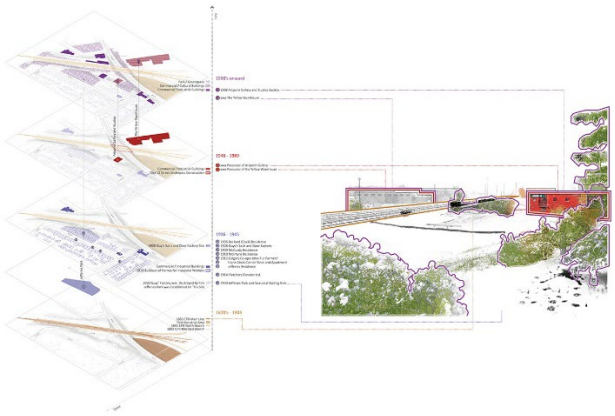

Figure 2: Landscape analysis maps. Crossing temporal and spatial scales.

As the research progressed, the team also met with community members (Robin Tufts and Jennifer Mahood) and with landscape ecologist Mary Ellen Tyler in order to flesh out diverse personal (and age-related) experiences of the site as well as the experiences of more-than-human (Abram, 1996) bodies – animal and plant ecology (Reed & Lister, 2014) – at the site. With such additional understanding of the site, the dance research team was able to create a series of action-oriented maps that focused on history (a timeline of gesture), phenomenological interactions between body and site, community, and more-than-human concepts (Kloetzel, 2019a); these action maps helped spur the creation of the final score-maps by the design team.

SCORE-MAPS AND SCALES

As the score-mapping process progressed, key parallels as well as critical differences emerged between the landscape design and site performance disciplines. While it was very clear that the essential dimensions of *space* and *time* figured significantly for both disciplines, we found that it was also imperative to capture the *action* and *quality* of action in order to communicate the movement components of the danced experience. As well, we wanted to develop score-maps that could honour both the site scale and the human bodily scale and provide visualization of the interrelationship and transitions between them. While *crossing through scales* and seeking *solidarity* (Corajoud, 2000) – temporal and spatial linkages – between various landscape components is inherently part of landscape design, the communication of the human bodily scale and of the body's motion on site still poses challenges in terms of representation.

Specifically, as iterations of the score-maps began to take shape, we faced the difficulty of 'simultaneously' highlighting the main landscape features that characterize the site (such as urban fabric, circulation infrastructure, topography, vegetation patterns, etc.) and the human-environment interactions (including choreographic inputs such as background/foreground, kinesphere, movement pathway, level, and facing, etc.). Similarly, the challenges of the time dimension have demanded that we represent the longer-term temporal aspects of landscape processes alongside the much shorter temporal experience of human movement.

In order to offer this multi-scalar and cross-scalar approach for both time and space, the score-maps employ a system of multi-media and cross-referential representation, which allows us to capture the scale and the movement of both the human body and the site. Diagrammatic plan views act as a synopsis of the main spatial organization of landscape components, bodies, and actions (Figure 3), while perspective views more powerfully show the scenery and the *atmosphere* (Dall'Ara, 2021) of the place along with imagery of specific body-place relationships enacted by the dancers (Figure 4).

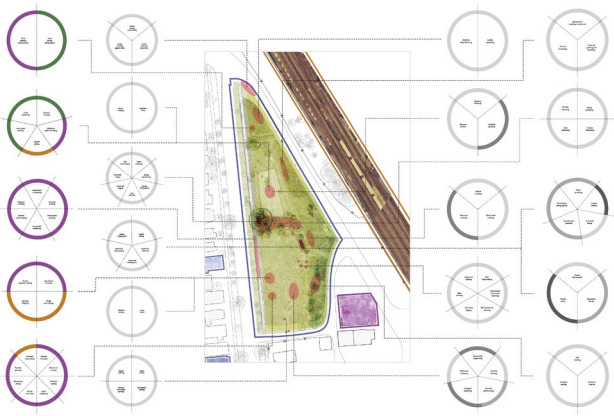

Figure 3: Jefferies park's score-maps. Plan view synopsis.

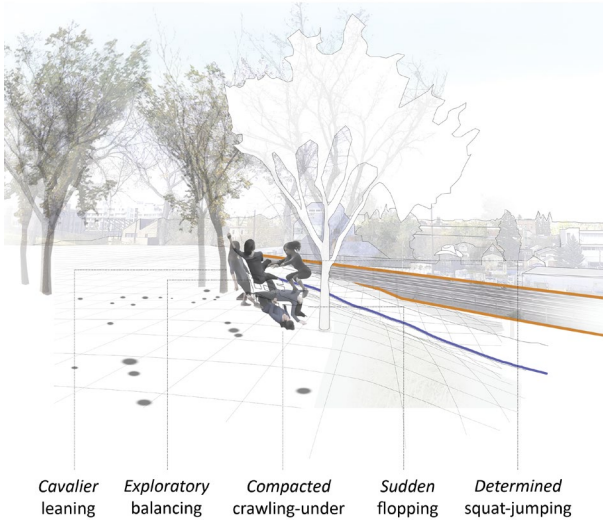

Figure 4: Jefferies park's score-maps. Bench area / Environmental Dialogues / Perspective view.

Other critical details of the score-maps include color-coding, which offers a method for sharing temporal aspects of era and age range, and collage techniques, which emphasize major landscape components of the site such as the historic rail line and vegetation patterns. Annotations that detail *key actions* by the dancers and the *quality* of these actions sit alongside others that highlight the presence and progressions of more-than-human beings in the environment that have inspired both choreography and landscape design. Finally, information on the actions and motion at the micro scale of the body (and body's parts) are further detailed through sequences of photographs (Kamvasinou, 2010) that represent individual actions and their respective *qualities* (Figure 5).

Figure 5. Jefferies park's score-maps. *Violent tumbling down hill*. Example of sequence of photographs to represent individual actions and their respective *qualities*.

CONCLUSION

In enacting this dialogical communication (Kloetzel, 2019b) between landscape analysis, movement analysis, choreography, filming, and landscape design, questions of scale come up repeatedly with dramatic effect on our various outputs. Kinesthetic information gleaned from the dancers' movement experiences in individual sites (and, on an even smaller scale, at specific micro-sites within individual sites) provides new lenses for interpreting and representing a context for landscape architecture purposes. Similarly, the analytical methods and contextual approach employed by landscape architects offers insights that deepen choreographic creation processes on site. As the dance researchers have discovered, keeping in mind landscape analysis that references a site's design and functions (across time) as well as the site's relationship to the larger context can have an illuminating effect when applied at the scale of the body. Applying this constant perception and analysis at the macro scale, the dancers have uncovered an ability to more quickly delve into critical details of the site, developing choreographic ideas that maintain a perspective informed by larger understandings of the area (its functions, community, and flows) over time.

Likewise, the landscape architecture team now sees how micro-sites can be mobilized by the embodied movement experience, helping to inform design at the macro scale. The team has found that the dancers' interactions with the site and the micro-scale of their gestures/motion can bring up insights about the genesis of movements *from* the site and *in* the site. At this stage of the process, implications for subsequent design are not fully unpacked. However, this collaboration underscores that the value of little things, an appreciation of simplicity, and the potential of "minimal intervention" (Lassus, 1998) should not be overlooked within landscape design. As the fragility, beauty and power of the human body reveal, it is critical for landscape designers to create comfortable and welcoming spaces (at the human-scale) within the cities, spaces where cultural/societal values are embedded in the ecology of a place. Furthermore, the *quality* of the dancers' movement and their narration of the landscape as a poetic expression enriches the discourse in landscape design, offering a new understanding of the human/environment relationship. The micro-scale of the dancers' gestures, as if through a magnifying glass, also emphasizes key aspects of the landscape's materiality, showcasing its *grain* with greater detail, engaging tactility and other sensuous stimuli, and communicating the intensity of the landscape and of the *life* in the landscape.

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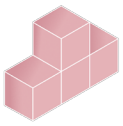

SCALING EXPERIMENTS IN URBAN SPACE – AN EXPLORATORY FRAMEWORK

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ABSTRACT

In this article, we outline an exploratory framework that attempts to capture different types of scaling practices in urban space. "Scaling" in this context is understood as a concept that involves a temporary intervention in public space that negotiates agency among human and non-human actors. The aim of this framework is to assist curators and researchers in conceptualizing site-specific interventions or exhibitions in urban contexts.

Keywords: Urban Space, Urbanism, Scaling, Design Experiments, Design Research

INTRODUCTION

The starting point for this article is the methodological considerations regarding a site-specific exhibition in the city of Kolding during the Nordes2021 design conference. Along a route through the city, eight sites have been selected as locations for design experiments that negotiate *matters of scale*. These sites include urban spatial objects such as a bridge, a bench, a narrow path; or sites along the river and the harbour, that involves different types of flora or urban wildlife, such as rats, ducks and marine animal species. So far, a call for intervention proposals at these sites has been launched. Based on an analysis of existing experimental work in urban space and typologies for citizen participation, an explorative framework capturing different types of scaling practices in public space, is introduced. The aim is to provide design curators and researchers working in urban space with a theoretical outline that helps organize engagement and participation among different human and non-human actors.

CONCEPT OF SCALING

The concept of scaling in this context, is understood as a program that involves a (temporal) occupation of a city site (a territory) and an intervention that negotiates agency among human and non-human actors. Humans can be the citizens or stakeholders experiencing the intervention (as maker, spectator, participant, living being). Non-humans may be the urban spatial objects, infrastructures, pathways or specific (non-human) elements that connect to the intervention itself, involving for instance waste, pavement-stones, water, temperature, light or darkness. In this conception of scaling, we are proposing a scalar relationship between the city as site and the living beings/humans who act on or experience a specific site. The design intervention can be translated into a form of scaling strategy. The exploratory framework we introduce, assists in making combinations of urban practices and design/art strategies visible and thus broadens the general understanding of scalar relationships.

The research questions we are posing ourselves in this paper is: How may urban interventions give (allow or deprive) agency of the "actors" that constitute a specific site? How may design interventions in urban space be operationalized and translated into a form of *scaling strategy*?

THEORETICAL OUTLINE

THE CITY AS CONTESTED SPACE

The question of who has the "right to the city" (cp. Henri Lefebvre) and the ongoing debate on how to build socially sustainable cities that engage and inspire its residents is a recurring and urgent theme in design research (DiSalvo, 2010; Fuad-Luke, 2013; Markussen, 2020), urban activism (Harvey, Borasi & Zardini, 2008;

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Mayer, 2009; Purcell, 2008; Brenner et al., 2012) and within the experience economy, which advocates for creative city policies (Florida, 2002). The city as contested space has different and conflicting agendas that determine public policies. The overall aim of neo-liberalism is to shape attractive business climates and to optimize conditions for investment capital – with the argument that this will foster growth and innovation (Florida, 2002). Within this model, business determines public policies, and questions concerning social justice, equality or environmental issues are downgraded (Harvey, 2005). David Harvey argues for a more humanized and participatory agenda in terms of how we experience, value and collaboratively "make" the city. Quoting sociologist Robert Park's definition of *what a city is* Harvey suggests that the city cannot be separated from our social lives, aesthetic values and desires for how we want to live. We "are the city" – so to speak.

The city is man's most successful attempt to remake the world he lives in more after his heart's desire. But if the city is the world which man has created, it is the world in which he is henceforth condemned to live. Thus, indirectly and without any clear sense of the nature of his task, in making the city, man has remade himself.

Robert Park (1967, pp3)

As a counter-movement to the neo-liberal approach to governing and managing the city, citizens around the world have increasingly become engaged in public movements with a social or cultural agenda, e.g. the empty-space movements, which aim to occupy abandoned buildings in order to provide affordable housing; vegetable gardens maintained by local residents; sub-cultural festivals that strengthen the community or the establishment of alternative economies through sharing, lending or gift-practices. The agenda for this type of practices is a sustainable life for all city residents.

THE CONCEPT OF AGENCY

The agency paradigm, emerging in sociology since the 1990s, investigates the integration of structure and action theory (Sewell 1992). It explores the options of individuals to enact power and free will within the structures of society. Linked to the concept is its correlation to approved actors who can act out the agency. According to Latour (2005) "actors" in a network may consist of humans (living beings, people or animals) as well as non-humans (materials, things, events, places). They all have "agency" to act. Latour suggests that some humans or non-humans authorize, permit, allow, enable or forbid actions – and some do not. In allowing that things and materials as well as living beings may have the ability to mediate or configure certain forms of citizenship participation, the concept of agency can be used to inform our discussion on how human and non-humans are interrelated in the city and how urban interventions may allow or deprive agency of the "actors" that constitute a specific site. The deeply integrated social aspect is like a grammar that guides social actions. Thinking with ANT (the Actor-Network-Theory) thus means that new objects and interventions may lead to a renewed repertoire of social ties (see Latour 2005, pp.233).

FRAMEWORKS OF CITIZEN PARTICIPATION AND EXPERIMENTS IN URBAN SPACE

During the last decades several typologies of citizen participation have been developed, such as Arnstein's 'Ladder of Participation' (Arnstein 1969); Crawford's 'Key Dynamics of Shared Urban Practices' (Crawford, 2011, Fig. 1) or extensive models inspired by these (e.g. Iveson, 2013).

Crawford's five key dynamics of shared urban practices:

1. **Defamiliarization**
   (meaning: identifying new possibilities in taken-for-granted spaces of the city);
2. **Refamiliarization**
   (re-occupation of alienated spaces in the city)
3. **Decommodification**
   (the assertion of use values over exchange values in urban space);
4. **Alternate economies**
   (such as recycling and gifting economies);
5. **Collaboration across difference**
   (in the sense that involve emergent rather than pre-constituted subjects)

Figure 1: Crawford's Key Dynamics

Whereas Arnstein's model is divided into degrees of citizen power, tokenism and non-participation, Crawford's model consists of five key dynamics that suggest identifying new possibilities in taken-for-granted spaces of the city; re-occupation of alienated spaces in the city; the assertion of use values over exchange values; recycling and gifting economies; and involving emergent rather than pre-constituted subjects.

We have been inspired by these models for several reasons. First of all, distinctions like these are useful for understanding degrees of citizen power (Arnstein) and temporary urban spaces as sites for citizen participation (Crawford). Secondly, they represent early attempts to understand how government and local authorities circumvent the concept of "citizen participation" and how the relationship between those in power and the "powerless" can be defined in terms of roles (Arnstein). Thirdly, they attempt to capture various DIY practices, urban experiments and initiatives in the city (Crawford, 2011). These examples of 'every-day urbanisms' and experimental projects represent different perceptions of "what the city is" and how human and non-human actors may interact in urban spaces. In the context of design, these frameworks are yet to be operationalized.

We wish to draw upon these theories to further explore art and design approaches as means of scaling practices. These approaches enact shifts in power between different human and non-human actors (e.g. “makers”, citizens, objects, things, sites). In the following, we will discuss strategies of scaling through a number of exemplars all of which can be categorized as urban projects, interventions, design experiments or works of art in the urban space. Through these exemplars we will reflect on agency and the various roles that may be assigned to human and non-human actors.

EXEMPLARS OF CONTEMPORARY INTERVENTIONS IN URBAN SPACE

DOWN-SCALING AS STRATEGY

Works by Slinkachu or Sprinkle Brigade (Fig. 2) provide agency to insignificant elements of the street, such as tiny things, trash, lost items or dog waste. The citizen is encouraged to be the mindful observer, paying attention to the value of tiny, almost imperceptible changes in the urban scene.

Figure 2: Miniatures by Slinkachu (left), “Law and order” by Sprinkle Brigade (right)

The first proposed strategy concerns the concept of “down-scaling”. As a strategy, it can be translated into a conscious attempt to minimize, simplify and deliberately reduce complex contexts into smaller worlds or entities that offer a different (sometimes humorous or ironic) perspective on the "big world".

Down-scaling can take the form of physical re-scaling of different (not prioritized) elements of the street converted into microworlds that reflect the universal sense of being overlooked, forgotten, lost or somehow alienated in relation to the “real” world. However, down-scaling as a strategy can also be converted into activities that are purposefully “slow”, e.g. inspired by “down-shifting” or as projects inspired by micro-economies such as Illac Diaz's DIY Solar Light Bottle experiments made from recycled waste, for citizens living in slum-areas. Down-scaling includes making things small, slowing things down, or adding value to seemingly insignificant and inferior elements of our environment.

SCALING THROUGH PERFORMATIVE DISRUPTION OF “NORMALITY”

Urban interventions by Mark Jenkins (Fig. 3) use the street as a "scene" for performative happenings by adding agency to everyday elements in the city and turning public city sites into unexpected (crime) scenes.

Figure 3: Works by Mark Jenkins in Washington DC and Malmö

Jenkins often uses realistic objects or life-like characters, and these non-human actors are assigned the role of provoking confusion and sometimes concern among citizens passing by. The citizen thus becomes an involuntary, instant and (emotionally) unprepared participant, who unknowingly becomes part of a staged situation. This approach works with scaling by using strong performative elements to disrupt existing properties in urban space and to integrate the human body or human activity as part of the intervention. This strategy aims to create controversy and raise awareness of various issues normally ignored by the public (e.g. food waste, poverty or suicide among young adults). Disruptions range from causing slight surprise to more serious feelings of worry, uneasiness or anxiety.

SCALING THROUGH ACTIVISM

Public interventions by Sarah Ross, Hermann Knoflacher, Santiago Cirugeda or project Park(ing)Day (Fig.4) provide agency to citizens by challenging the law. This may be approached by re-occupying alienated spaces in the city (the work of Ross or Knoflacher) or by setting up time-based projects that allow use value over exchange value, as in Taking the Street by Cirugeda or project Park(ing) Day.

Figure 4: Above “Archisuit” by Sarah Ross and “Gehzeug” by Hermann Knoflacher. Below: Taking the Street by Cirugeda and project Park(ing) Day

In these types of urban inventions both the citizen and the “maker” are framed as part of an activist action, critical voice or protest against the system. Agency is given to citizens by empowering people through non-human objects designed to reform sites in the city (e.g. benches that force us to sit in certain ways) and make them more accessible, or through actions that temporarily activate sleeping places, playgrounds or social hotspots.

This approach to scaling concerns the more activist and political aspects of urban interventions; who has access to the city? Activism as a strategy aims to re-claim and democratize the city that has been alienated due to ideals of economic growth and commodification of culture. It ranges from massive and extensive actions that aim to influence policy-making and change the law - to minor activism and small-scale interventions that seek to “bend” the law.

SCALING THROUGH CO-DESIGN

In urban projects such as “City Garden” by Bureau Detour, “Library of Things” by Jewell, Adjaye and Duggan or “Urban Animals and Us” by Jönsson and Lenskjold (Fig. 5) agency is given to citizens through ‘making’ activities. “City Garden” experiments with the building of communities in alienated spaces of the city; “Library of Things” builds mobile local libraries and experiments with lending, recycling and gifting economies; and “Urban Animals and Us” experiments with collaboration across differences. The latter examines the 'terrain vague' between humans and wildlife by bringing urban animals (such as pigeons and gulls) into contact with the residents of a nursing home to experiment with new forms of collaboration and shared agencies (Jönsson & Lenskjold, 2014).

Figure 5: Above “City Garden”. Below “Library of Things” and “Urban Animals and Us”.

In all cases the participants become “collaborators”; they take part in the making activities and thus take responsibility for the project’s outcome. ‘Making’ activities in these cases may consist of building community gardens (as in “City Garden”), repairing used household goods (as in “Library of Things”) or in the making of birdseed balls (as in “Urban Animals and Us”). This approach to scaling relies on co-design activities and workshops with local residents. Co-design as a strategy aims at building sustainable communities through citizen participation with the purpose of bringing together people and resources in local neighbourhoods. Projects range from ‘making’ activities with simple materials and confined design tasks to more complex workshops involving a high diversity of technical skills, know-how and external collaborators.

SCALING THROUGH IMAGINING THE IMPOSSIBLE

Johannes Vogl constructs imaginative experiments in urban settings and speculates about the concept of outer space; the design duo Adams & Itso experiments with radically different ways of living and constructs a secret home in an empty ventilation space under Copenhagen Central Station (fig 6). Both interventions attempt to construct images of future realities or opportunities as opposed to present realities. Agency is given to citizens through the staging of a speculative future and by making the participants engage in a game of make-believe mediated through, for instance, light beams (Vogl) or an inhabitable prototype (Adams & Itso).

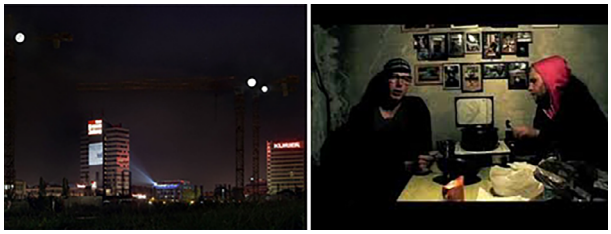

Figure 6: “Five moons” by Johannes Vogl (left), “Small house at track 12” by Adams & Itso (right)

"Five Moons" is meant to be experienced at night when citizens wander through the city and turn their gaze towards the stars. The work of Adams & Itso is to be experienced after the intervention itself, and here the citizens are encouraged to follow the traces left behind, and the maker’s journey into the urban jungle. In both cases, the maker is assigned the role of ‘travel-guide’, who leads the participant into imaginative futures or unknown territories. The participant thus becomes a co-traveller, who has no direct influence on the purpose of the journey, but who can be mentally or physically drawn into the speculation through different means. This type of strategy thus brings the notion of fiction and speculation in terms of experimenting with future

scenarios through imagining the "impossible" or "unthinkable". Scaling in this category can be used to experiment with our conception of the world as we think it may evolve or what we believe the future may contain. At one end of the scale we may have purely speculative proposals or utopian/dystopian thought experiments (e.g. materialized as models or images) and at the other end para-functional objects, working prototypes or entire inhabitable environments.

EXPLORATORY FRAMEWORK

Inspired by these exemplars, we propose an exploratory framework informed by Crawford's model – with an additional vertical list of dimensions that includes scaling in terms of strategies (the number of strategies being non-exhaustive); down-scaling as strategy; scaling through performative disruption of normality; scaling through activism; scaling through co-design; and scaling through imagining the impossible.

These strategies can be diagrammed as a framework (Fig. 7) as a means of exploring the dynamics between shared urban practices and applied strategies of scaling. By inserting the strategies of scaling into the framework we are able to provide the following overview:

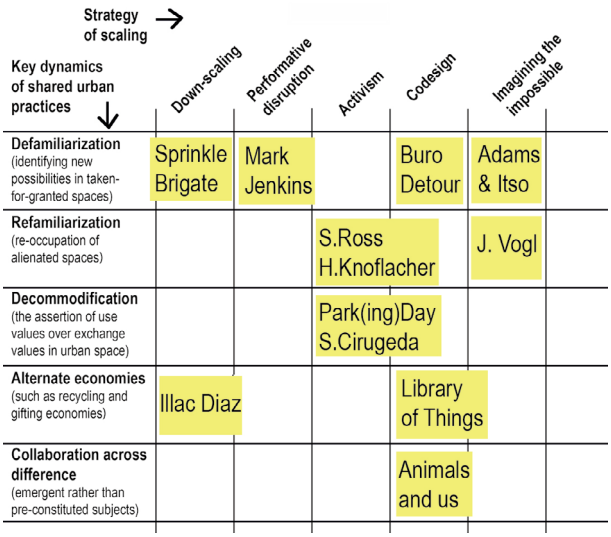

Figure 7: Exploratory Framework of Scaling

The framework allows free combinations of different vertical and horizontal features broadening the understanding of scaling. For instance, by looking at the horizontal line involving the key dynamic "defamiliarization" we find projects that try to define new possibilities in taken-for-granted places of the city – sites we do not think about, sites that are "just there". In reforming these sites, quite diverse scaling strategies are used; Buro Detour takes on the role as facilitator and sets up co-design meetings with local residents in an attempt to create a new shared space. The Sprinkle Brigade patrols the streets of the city looking for animal waste that has been left behind and transforms these "unwanted items" into sophisticated and humorous micro-worlds. Adams and Itso ponder a different future in a "hidden" space under Copenhagen Central Station, which has not been used for years and thus prototype a radical new way of living. Jenkins uses the city with all its everyday elements as a stage for his performative actions. All these examples embrace the concept of "defamiliarization", however with different design strategies, to scale narratives about the city, and its engagement of human and non-human actors.

REFLECTION AND CONCLUSION

By scrutinizing art and design work in urban space strategies of scaling and key dynamics of shared urban practices have been combined into a preliminary model. Accounting for scaling strategies offers an expansion of the repertoire of urban designers and curators. For the Nordes2021 exhibition, this work will be used to understand the proposals from a theoretical perspective and to better understand the dynamics that these proposals could reveal during the exhibition in the city of Kolding: How would they challenge the dominance of certain human or non-human actors in the urban context? What scaling strategies and key dynamics are at stake? Linked to these questions are the surrounding dialogues that are required to move an exhibition concept forward. In our case, dialogue with local and national authorities (e.g., the municipality, the administration of the railways, the harbour management and private proprietors) has been an essential part of the project. Not only to secure site access but also to negotiate intervention possibilities and constraints. The review and production process will lead to further levels of dialogue, possibly enabling, preventing or altering the realization of certain proposals. These levels of dialogue will further inform our understanding of scaling strategies.

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CLOSER TO EARTH: SCALES OF PLANNING FOR URBAN WATERS

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ABSTRACT

Climatic changes of waterbodies calls for new scales and approaches to planning of urban surface waters. Learning from a real-time case of planning practice, I display and discuss how limitations of sectorial logics, operational scales and schemes of planning, in addition to inherent epistemological prisons of dominant dichotomies, are obstacles of an actual *reorientation* of planning practice. On this background, I call upon further research – of a designerly and transformative kind, to explore novel approaches to municipal planning of surface waters. I speculate how this could evolve around a multidisciplinary rubber-boot approach with landscape architects performing as Sherpas, process instigators and compositing agents.

OUTLINING THE SCALAR PROBLEM OF INQURY

Scale originates from the Latin word *scala* meaning ladder or staircase, depicted from the verb *scandere* - to escalate (Det Danske Sprog- og Litteraturselskab et al., 2003). The meaning of *Scalable*, includes *"able to be scaled or climbed"* or *"able to be changed in size or scale"*(Pearsall, 1998, p.1656).

Scale is an essential geographic and cartographic concept. Cartographic or representational scale refers to the measured relationship between the extent of the representation and that which it represents. The notion of scale is loaded with an assumption, that earth can be viewed 'objectively' from outside and that (eco)systemic interrelations can be perceived through zooming in and out. Also, it is laden with an understanding, that the urban condition can be analysed and planned for in discrete scales of large (landscape), medium (urban) and small (building), as series of Russian Dolls.

"Modernity is distinguished by its concern with the human eye's capacity to register and to visualize materiality at every scale" (Cosgrove, 1999, p.18)

When we seek **to** produce an 'overview', we look at stuff in a larger scale. To do this we are climbing a ladder, or we hover in a satellite. But, this position is a 'view from no-where', as Thomas Nagel titles his book, in which he is questioning the intended objectivity of such a view (Nagel, 1989).

SCALES OF PLANNING FOR URBAN WATERS

In a Danish physical planning context, scale is decisive for the level of inquiry and influence. It is closely linked to different administrative borders. Moving from the municipal plan of **a** thematically differentiated 'main structure' (Hovedstruktur) at the range of the whole municipal region, to local plans (Lokalplaner), concerned with the quality and design of urban space for distinct urban areas and finally down to building permits for single lots (Post & Dansk Byplanlaboratorium, 2009, p.7). It was not until 2013, that surface-water-relation of the lot and the region was addressed as an actual urban planning question, when mandatory climate-adaption-planning of municipalities, focusing on risk management, was introduced together with some new tools for addressing surface water in 'local plans' (Naturstyrelsen et al., 2013). In these years municipalities, water-service companies and other urban actors are testing and establishing new practises in the field. In this process, I call upon close attention to be payed to the issue of scale in the planning platforms and analytical methodologies. Changed patterns of

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precipitation due to unstable changes in the atmosphere on a global scale, is in direct interplay with 'close-up' terrain elevation features, where only a few centimetres can change routes of flow paths and determine whether vast areas are flooded or not. When zooming in, the large structures and dependencies of up-stream watersheds, groundwater systems and down-stream recipients are not visible nor governable. When zooming out temporal material processes and exchanges like the circuit of waters fall, stall, flow, infiltration and recharge of largescale concern is not visible nor governable. Waters, i**t** occurs, is a true trickster of scales.

In this article, I will bring results from my research, displaying inherent struggles in practise attempts on shifting the urban water paradigm. On a backdrop of a philosophical call for a renewed ontology and epistemology in the Anthropocene, I will evaluate and discuss the efforts of *reorientation* in the planning practise, and further speculate on some methodological attempts to engage differently with the scalar problem of inquiry.

CALL FOR REORIENTATION: IN RATHER THAN ON EARTH.

The 'modern' ontological and epistemological domain, which has had great influence on the planning system of discrete administrative scales, is intensely disputed in the age of the Anthropocene. The concept of the Anthropocene induces us to consider human activities as a natural force in the process of destabilizing the climate and causing the 6'Th extinction of species, with unpredictable consequences for Earth's ecosystems (Steffen et al., 2011). This is not only changing the environment, it is also fundamentally changing humans, and in particular our understanding of the relationship between humans and environment (Latour, 2016). It establishes an understanding, that earth is not an 'object', and cannot be perceived as mere background for human culture. Life on earth does not consist of individual subjects acting on a stage of natural objects. It may rather be assessed as one embodied organism - Gaia – where geosphere, atmosphere and biosphere cooperates in performing and sustaining life on earth (Lovelock, 1995).

In this perspective, the view from above, is no view at all. The objective and largescale approach does not provide an overview, but devastatingly overlooks the site-specific material relationships. Latour et.al. is investigating and discussing how Gaia can be explored as a realm of Critical Zones – localities in the thin film from higher geosphere to lower atmosphere, stressing that these cannot be explored from anywhere but from the inside (Latour & Wiebel, 2020, p.14). This understanding leads us to appreciate landscape (geological, hydrological, climatic, biological) and cultural (societal, urban) conditions as processes of mutual influence. Culture / nature, city / landscape can no longer be understood as opposites, (Hagan, 2014, p.9) nor can the relation between them (such as urban development) productively be described as one between a subject-and-object, where one regards only humans with agency. As a result, it is necessary to *re-orient* ourselves in an earthly world, which our previous mental (plus legal and methodological) frameworks has placed us outside (Latour, 2016a). In this act of *reorientation*, we may insists on integration of scales. We may try to recognize landscape conditions and processes, such as surface waters, as actors, rather than passive parameters or interests in planning. Moreover, we may work to overcome dichotomist understanding of wet/dry and linguistically limited notions of water as a "thing", running in a "line", fixed at a "scale" need to be revised (Cunha, 2018).

NEW PRACTISE APPROACHES TO URBAN WATERS

In my PhD research, I have executed a real-time case study of the conduction of a novel theme plan, which is a part of the municipality plan revision 2021 in Aarhus Municipality. The theme plan can arguably be seen as a brave attempt on a changed approach to spatial planning of urban surface waters. In the following, I will firstly elaborate on the changed role of surface water. Secondly, I will display and discuss some examples on how the investigated case responds to this, and to the act of *reorientation* brought forward in the previous section. Thirdly**,** I will argue that transformative research in alternative methodological approaches, integrating multiple scales, interdisciplinary knowledge production and including designerly competences is urgently called for.

FROM URBAN WASTE TO URBAN ACTOR

Since the revolution of sanitation of Paris, led by Hausmann in the second half of the 19th century, sewerage of urban settlements has become a design-state in the DK. In 2019, the vast majority of urban settlements redirect rainwater from roofs and pavements into sewers (Miljøministeriet, 2019). This practise of treating rainwater as waste goes hand-in-hand with a wider regime of water control, made possible by the art of engineering, including drainage of wetlands, regulating groundwater tables, diking, canalling, etc. (Hooimeijer, 2015). The approach has gradually build an industrial regime of water-control (Wiberg, 2018), which continues to promote "landscape illiteracy" (Whiston Spirn, 2005) in connection to spatial planning and urban development. Urban water management in Aarhus as most other Danish settlements has in large been assessed below surface, and most days of the year, rainwater has simply "disappeared" into the

underground. I will argue that this practise has caused the removal of water-issues from spatial and urban-organisational concern, and therefore from the field and scales of urban spatial planning. Climatic changes, are largely questioning this approach. Increasing extreme rainfall and average annual precipitation, causes changing levels of streams and lakes and changes of groundwater tables. These are spatial issues with spatial effects. Some urban fabrics are no longer able to resist the changing waterbodies. All urban fabrics are links in a continuum of water networks, reaching from the pavements underneath our feet to the vast catchments of Aarhus Å, Egå and Giber Å, and further on to global weather systems, in which all areas are affected by and/or affecting the network. Though a given area is not likely to be flooded, it may play a significant role in preventing other areas of being so. Hence the infrastructures of surface water is being re-designed these years, still scholars suggests, it should rather be re-defined (Bergen Jensen & Fryd, 2009; Hoffmann et al., 2018; Wiberg, 2018; Wenningsted-Torgard, 2017)

NOVELTY OF WATER-THINKING ACROSS SECTORS

From the case study, it has become evident, that surface water has not prior been an issue with influence on the scale and scope of the spatial planning conducted.

"Landscape issues such as topography and waters flow has been out of municipality planning for decades" Planning Official, Aarhus Municipality, March 2019.

The waterscape 'illiteracy' reveals itself as a lack of methodologies to investigate surface water as an urban actor. To overcome the shortages the brave planners were seeking advice from the actors usually concerned with water-relations, only to find their questions returned. Actors here was equally inexperienced in addressing surface waters as questions of planning for urban space and function. The discussions that followed were somewhat perplex and the planners found it difficult to conclude or move forward. Further analysis show that the conversations were leaping between different discourses on surface water. I have tracked the discourses to different sectorial and disciplinary domains, considering surface water from very different positions. Hans Fink has described how different understandings of the concept of "nature", easily can lead to misunderstandings and malpractice in governing of such (Fink, 2003). I equally found the concept of surface water to be a contested one. Moreover the role of water as waste, a threat to health, a matter of anthropocentric control, and, in the wake of changing waterbodies, a flood risk towards existing urban structures seem to have greater impact. Though pursuing so called 'synergy effects' promoting environmental, recreational and aesthetic objectives in the climate adaptation efforts, these are still considered "add-ons", not motors of a redefinition of surface water infrastructure. I recollected, that greater leaps towards a collective understanding of the problem as well as possible novel solutions arose when the multidisciplinary actors were co-working in-situ on mapping activities and sketching (although this was not a 'usual' activity in this setting), than when merely discussing about maps and solutions.

To summarize, the case show a novel leap in redefining how urban planning deals with the issue of surface water. It shows strong efforts of inter-sectoral collaboration, but it also display some of the challenges on bridging different sectorial discourses and methods, in order to build a new **collective** understanding of and approaches to the future role of urban surface waters. This is no innovative discovery. Disciplinary integration may be one of the cornerstones mentioned across most literature concerned with ecological transition. Still, the recollection of a momentum emerging from working collectively with designerly methods of mapping and sketching gives hints towards ways to bridge the gap. The finding makes sense when consulting Design Theory, e.g. the concept of 'co-evolution' of solution and problem spaces from designerly methodologies, promoted by Nigel Cross (Cross, 2004, p.434) amongst others.

SCALES AND BOUNDARIES OF WATER

From the case study, I found that the geographical and administrative boundaries of the municipality plan, the municipal frames, the local plans, and the cadastral structure of Aarhus is quite arbitrary to pivotal landscape properties, those which guides waters flow, stall, infiltration, recharge and evaporation. Further, I found, that surface water issues tangles with the matter of scale and scalar interdependence in close connection to matters of material and the site-specific conditions, which challenges the scales (and scalar approach) of existing spatial planning platforms. **S**imilar conclusions can be found in the work of Krarup and Wiberg (Krarup, 2015; Wiberg, 2018, p.92). Following this finding, it seems that planning for urban waters are questioning the existing scales and levels of planning. Other scholars has suggested introducing new levels of planning according to watersheds (Wiberg, 2018, pp.396–399; Whiston Spirn, 2005, p.7). Such an approach could be productive, bearing in mind, that watershed themselves are not a stable entity, why I will stress, that the planning space and scale has to be flexible, as is reality.

SCALABLE WATERS

In order to plan for 'blue structures', the planners took on a rather novel GIS-based software, Scalgo Live, as primary method of urban surface water mapping. It was utilised to perform quick representations of water-flow**s**. With Scalgo Live it became possible for the planners to

visualize and represent flow paths, across urban and rural contexts, and across scales.

"It seem unrealistic to pursue such an idea of planning according to the flow paths." Planning Official, Aarhus Municipality, February 2019.

The maps suddenly represented former 'invisible' flow paths at the planning table. However, the flow paths were crossing administrative scales and functional as well as legal boundaries of the urban realm. These boundaries represent multiple actors, which the urban planners had (too) much experience in handling. Thus, the blue lines on the map seemed unrealistic to pursue as organisational structures of the urban. The politically constructed layers of organisation seem to appear more 'real', than the physically and climatically constructed ones. The maps from Scalgo Live gave a fraction of insight into the correlation of waterscapes and the urban realm. As a screening tool, it provides good insight, but it carries an embedded risk of over-simplifying. At least in my personal experience, on-site experiences of waters 'behaviour', is mandatory in order to understand what is represented in the maps provided, and even more important: what is not. Scalgo Live performs GIS analysis of a Digital Elevation Model – also called a 'glass model'. This represents the ground surface as pure shape with no materiality, which causes 100% runoff. Although the providers of the software are explicit about the inherent calculative limitations of this, it still promotes an embedded logic and understanding of 'environment' as a sum of objects, where form and substance are separable entities. Representing water as blue lines on a map, make them easily misinterpreted as singular entities, which are to be *handled*, *altered* and *redirected*.

Summarising, the utilised technologies seemed useful to ease readings of terrain and waters flow in connection to the urban layers. Still, methodologies that can provide tangible insight into both substance and states of wetness are necessary supplements. Such methodologies may be informed by 'climbing down' the largescale ladder, getting out of the office, putting on rubber boots and submit into subjective and sensational experiences of various water conditions, on-site.

IMAGINING REORIENTATION

I mapped the controversies of spatial planning of urban waters in Aarhus Municipality, only to *"realize the disconnect between the size of the problems we face and our limited grasp and attention span"* as Latour criticises scholarly efforts to map scientific and disciplinary controversies (Latour, 2016b, p.26). I noticed how designerly collaborative approaches seemed beneficial as means of 'co-evolution' of solution and problem spaces. I have also registered the scalar disconnect of the planning platforms and the waterscapes of influence, and noticed that other levels could be introduced, bearing in mind, that water is dynamic – why planning platforms may also need to be flexible. Finally, I have discovered how methodologies of visualising water-flow maintains a Cartesian and dichotomist gaze on wet/dry conditions, and I have hinted how such a gaze can be balanced by building situated knowledge of water. In conclusion, it seems that a *reorientation* of planning is out of scope of the case investigated. Still, if such turn lies beyond the municipal, then with whom does it belong? The effort investigated is one of many, conducted these years, across the country, slowly building a new paradigm of water management. I anticipate that the challenges reported here are recognisable, but not exhausted. On this note, I find it appropriate to call for further research on alternative methodological approaches of planning for urban surface waters, which is able to bridge the limits of sectorial logics, arrange new operational scales of planning and escape the prisons of dominant dichotomies.

In continuation of Latour's statement of the limited grasp of the sciences of today, he continues to recommend *Compositionism* as a way to move forward (Latour, 2016b, p.26). His collaboration with Alexandra Arènes and Jérôme Gaillardet on providing Critical Zone Observatories with new schemes of mapping and representation, embracing situational, sensational and site-specific data, are highly admirable efforts (Arènes et al., 2018). In this final passage, I will argue, that a transformative and designerly approach may hold a key to take a first small step forward into the messy realm of situated knowledge and planning. Martin Prominski argue, that design (defining design as an explorative process encompassing projection and proposals, not products) has the capacity to synthesize and project different future possibilities based on multidisciplinary knowledge input, and various types of data. He suggests research-through-design in real world labs, as transformative strategies (Prominski, 2019, p.45).

I imagine a planning-research setup, where the task is to compose various site-specific projections for future urban waterscapes, working across multiple scales. I imagine a task force of planning officials, local experts, property owners **and** scholars from a wide range of sciences. I imagine the team with their rubber boots planted in the soils and intensities of wetness, and landscape architects as site exploring 'Sherpas'. I furthermore imagine landscape architects as compositing agents, who aligns the cross-disciplinary knowledge production by negotiating the differentiated data into plan and design concepts, and as process instigators operating through their determination of generating proposals. I imagine, as fuels for such projections, a rich production of landscape-water-urban analysis on multiple scales and temporalities, utilising a variety of mapping techniques endorsing subjective and thick on-site data collection.

CONCLUSION

Municipalities and water companies across Denmark are establishing new practises of urban planning of surface-waters these years, as a response to climatic changes. I have undertaken a case study of an innovative attempt on a new approach to in Aarhus Municipality. I have mapped how different sectorial positions and gazes confuses the quest. I have recollected how existing scales and scopes of spatial planning platforms seem inadequate to address such a fluid-scaled and dynamic actor as surface water. And I have pointed towards one example of technology utilised in the planning process, and discussed its adverse ontological impact and shortage in providing tangible insight into both substance, scales and states of wetness. I have concluded that the endeavour of *reorientation* of surface water planning lies somewhat beyond the scope of the case examined. Still I have asked - if such turn lies beyond the municipal, then with whom does it belong? Finally, I have called upon further research – of a designerly and transformative kind, to search for an approach to municipal planning of surface waters, that is able to climb down the ladder of largescale objective analysis, into situated co-evolution of problem and solutions. Such an endeavour may advise the transforming practise on how to orient itself, just an inch or two, closer to Earth.

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NORDES 2021

Exhibition

Agency in the City of Kolding

Exhibition Chair
Eva Knutz and Kathrina Dankl

Introduction

This exhibition takes place in the city of Kolding from 15 - 18 August 2021.

NORDES is short for an open network society on design research that started with the first Nordic Design Research Conference in Copenhagen, back in 2005. Apart from organizing biannual conferences and summer schools for students, NORDES pro- motes the publication and dissemination of design research through the Nor- des Digital Archive (see nordes.org).

The exhibition format invites you – as a local or global citizen – on a tour through the inner city of Kolding to explore this year's conference theme - Matters of Scale.

So Where does it start for you?

It starts outside – at eight different public sites; some of these sites might be famil- iar to you – others may not. At these locations, artists, designers and researchers are exploring the concept of "scale" through temporary urban experiments that at- tempt to create a dialogue between you passing by – perhaps together with others - and the site itself. These experiments might involve urban animals, insects, plants, the texture of the street, sounds, voices or the air we breathe.

The common denominator is that all works try to negotiate, challenge, explore or relate to the term "scale" in relation to the city and its engagement of human actors, species, artifacts and everyday things.

Site 1: One square metre
By Ekaterina Feil

ONE square meter negotiates the terms of cultural and sustainable citizenship from the very specific perspective of a homeless man named Steve, who lived for years in the public parks of Berlin.

Site 2: I AM U
By Leah Ireland

I AM U, uses bean plants and poetry to discuss the participatory aspects of community relations and context specific modes of caring.

Site 3: Motion of Scales
By Marianna Czwojdrak and Mara Trübenbach

Motion of Scales uses a very narrow street as a performative stage to discover new spatial configurations and forms of encounters between people passing by.

Site 4: Scale the Change
By Maria Candela Suarez

Scale the Change encourages debate on public and private actions and invites the citizens of Kolding to share their ideas and raise their voices for sustainable change.

Site 5: Material as Playmate
By Karen Juhl Petersen

Material as Playmate invites children and adults to take part in a playful installation in front of the public library; it explores play as a form of sense making and new form of dialogue.

Site 6: Rewild
By Aymeric Delecaut

Rewild, at the station square, explores the possibility of "buying" parts of the city – for instance a pavement stone to replace it with plants – with the aim of rewilding the city.

Site 7: mAcrobiome
By Alison Mariñas

m A c r o b i o m e speculates about a synthetic microbiome as a new lifeform that we can touch and smell in the tunnel under the railway station.

Site 8: Forgotten Spaces
By Katharine Morag Graham

brings us down to the waterfront and to the unknown and hidden underworld beneath the surface of Kolding harbor.

Project Descriptions

Site 1: ONE square metre

Artist | Ekaterina Feil

This project centers on Stephen Robinson who was a homeless man living in Berlin, known locally as 'Steve on the bench'. His everyday life was lived out on one particular public bench in the city. His living space measured 195cm in length and 55cm in width with a total area of 1.03 squaremeters. The installation is intended to be a tribute to Steve as an acknowledged member (i.e. not an outsider) of society by position- ing him through his words, mindset and perceptions. The work asks the question: how can Steve's way of living and dwelling reflect, teach us or mediate certain forms of citizenship participation, sustainability and gratitude for life?

The installation questions ways of being in the world to elicit empathy, care and understanding of the sacrifices and sustainable actions Steve was living and making.

Ekaterina Feil, born in Semey, Kazakhstan, grew up in eastern Germany. She studied BA Integrated Design in Dessau, Germany and MA Design+Change in Växjö, Sweden and works as a freelance designer with a focus on sustainability, interdisciplinarity and equality. She is based between Berlin and Leipzig, Germany.

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Site 2: I AM U

Artist | Leah Ireland

As a slow intervention, 'I AM U' is a project that will grow and become a work of living art throughout the summer. As a norm-creative piece, it involves playful trellising and bean plants - making relations visible and explicit by experimenting with scale and site-responsive language. Local citizens, designers and gardeners will be involved in the process of helping with necessary gardening and maintenance work.

As the summer progresses, the bean plants will climb upwards in a special formation, collaboratively authoring a form of spatial poetry: I AM U. The work questions:

How can collaborative urban gardening challenge us to reflect on our relation to urban space: how we move through it, how we live with it and how we care for it?

Leah Ireland, born in Canada, lives in Växjö and works with regenerative urban design projects, local food systems and culture through VXO FARMLab, the Feminist Farmers and Under Ekarna.

Site 3: Motion of Scales

Artist | Marianna Czwojdrak and Mara Trübenbach

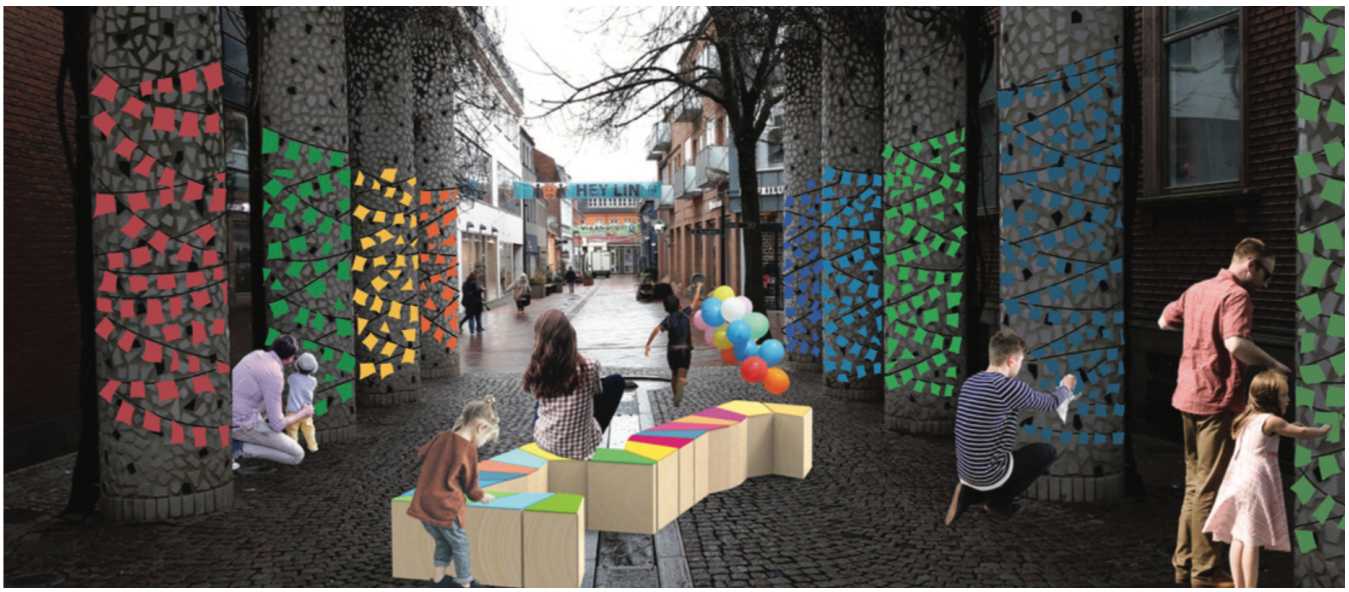
This experimental work is installed in the inner city, in a narrow path that connects two popular cafe areas. 'Motion of Scales' incorporates the site to transform it into a stage. By referring to the notion of a canyon as a relic of the past and a product of time-related rock weathering process, the installation reflects upon scale of time and a life cycle. It challenges the embodied knowledge of scale of passers-by that become actors and agents of change, and it rediscovers the narrow path through new spatial connections by layer- ing large surfaces of translucent fabric.

The work questions: How do we experience scale in motion? How can performative elements be implemented to disrupt habitual movements of human bodies in narrow spaces? Do we dare to pass each other as strangers in limited urban sites and to rediscover new spatial calibrations?

Marianna Czwojdrak, born 1991 in Poznan, lives and works as a designer and researcher in Poznan.

Mara Trübenbach, born 1991 in Cologne, lives and works as an architectural designer and PhD fellow in Leipzig and Oslo.

www.wunderforma.com



Site 4:
Scale the Change

Artist | Maria Candela Suarez

Scale the Change, is an invitation to playfully reflect on the UN Sustainable Development Goals (SDGs) to encourage individual action and increase engagement in the global challenge.

The SDGs's global scale can be overwhelming, making the goals look unreachable from an individual perspective, thus, provoking a passive attitude. 'Be the Change Kolding' proposes an inverse strategy: to

look at the SDGs from the little actions that everyone does in daily life. By scaling down the big goals, it is possible to unveil and highlight what citizens are already (conscious or unconsciously) contributing to, increasing their motivation and encouraging them to do more actions.

The work questions: How can the ambitious SDGs be more tangible and operational for the average citizen?

Maria Candela Suarez (Argen- tina-Portugal, 1973). Architect (UNMdP, Argentina); PhD in Architectural Projects (ETSAB- UPC, Spain); Play designer (Designskolen Kolding, Den- mark). Her research focuses on two axes: 1) the critical genetic analysis of Le Corbusier's creative process; 2) the improvement of the architectural design process through play.

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Site 5: Material as Playmate

Artist | Karen Juhl Petersen

Outside the public library, next to a parking lot, large scale foam elements in different density and shape, are placed in different formations.

'Material as Playmate' turns a public city site into an unexpected playground and invites citizens of all ages, to physically explore scale and materials in relation to their own body.

The big scale design acting as a common third or 'playmate', to explore and define, through collaboration and open-ended play exploration.

The work questions:

How can big scale, weight, flexibility, and density – and other interaction qualities offer new opportunities for collaboration, sensemaking and playful exploration in open-ended play with materials?

The project is made in collaboration with TEMPUR sealy.

Karen Juhl Petersen, born 1992, lives and works in Denmark, educated play designer from Designschool Kolding. In her practice Karen explores the role of materials in play, and how open-ended play can support collaboration and sensemaking processes. Her work ranging from research projects, installations, and process facilitation.

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Site 6: Rewild

Artist | Aymeric Delecaut

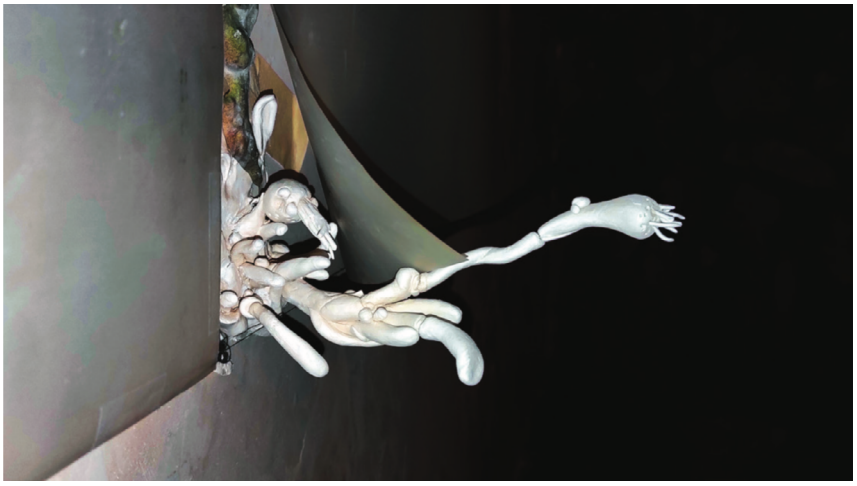
‘REWILD’ is rooted in a speculative scenario that attempts to construct images of a future reality in which we can “buy” parts of the city – for instance a pavement stone.

When interacting with the work citizens become part of a “pavement sponsorship” aimed at making our planet green (again) by replacing pavement stones with plants.

The work question:

What if we can protect our precious biodiversity and enhance it in urban space through the purchase of “pavement-sponsorships?”

Born in 1998 in Belgium. Studied industrial design for three years at ESA Saint-Luc Liège. Living in Kolding since 2020 and currently student at the Design for Planet MA program, Design School Kolding. His interest are ecological transition, nature research and virtual versus real.



Site 7:
m Ac r ob i o m e

Artist | Alison Mariñas

In the darkness of the Kolding railway tunnel a speculative future is staged, mediated through the implant of a synthetic microbiome, a post-pandemic project that will strengthen human's immune system. This measure not will only provide health safety but building resilience and sustainability on Kolding by reducing the bio-deterioration of the building materials of main city. However, as most genetically modified experiments this lifeform has prolefeed and growing out of the damaged walls and ceilings in an enlarged form getting out of the control of specialists.

The work questions:

What if the microbiome starts to grow to unimaginable dimensions and spread rapidly through the city of Kolding? Will we be able to face and accept a macroscopic microbiome beneficial for the citizens?

Alison Mariñas (1994) is a multidisciplinary designer based in Kolding. After graduating in Holistic Design in Madrid, her fascination for nature made her focus in explore ways to join science, biology and design through interdisciplinary research projects. Currently she is pursuing a master's degree in design for Planet at Designskolen Kolding.

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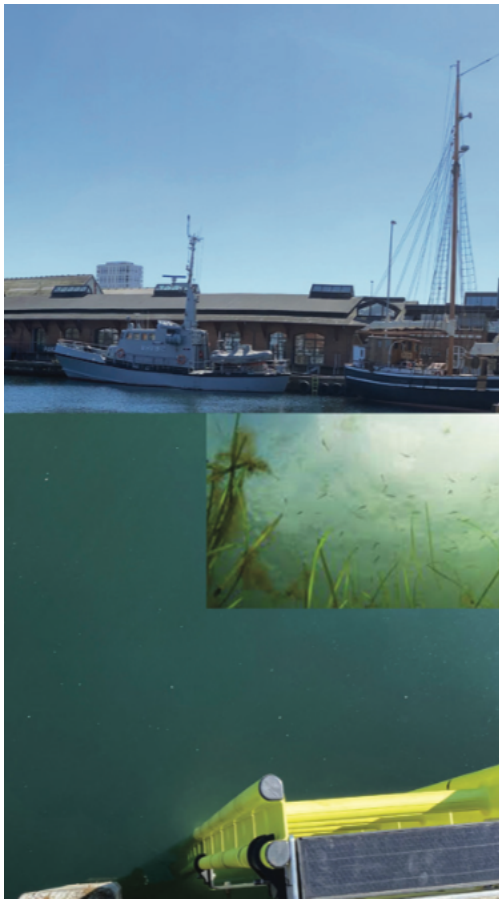

Site 8: Forgotten Spaces

Artist | Katharine Graham

What lives underneath the surface of the harbor water-front? What things have been hidden, or completely forgotten? A car used in a murder? Loads of rubbish? A rare fish? An unfamiliar sound?

The intervention invites par- ticipants to speculate about the under-water world and takes them for a walk under the sea level of the habor to discover what lies beneath.

The work questions: How can we re-occupy alienated spaces of the city? How can we bring the unknown underwater world of Kolding harbor to surface and thereby scale citizens' attention?

Katharine Graham was born in Western Australia but has been living in Denmark since 2016. Katharine has been studying a Master's of Design for Planet at Design School Kolding and now works in the field of corporate social responsibility for LEGO.

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NORDES 2021

Workshops

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Jocelyn Bailey, Lucy Kimbell, Patrycja Kaszynska and Christian Nold

Designing Scales of Domestic Mending in Fashion
Louise Ravnlykke og Iryna Kucher

Stories for Collaborative Survival
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Residue of Interaction: Scaling participatory Experience
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NORDES 2021

DESIS PHILOSOPHY TALK #7.5

DESIGNING *DOWN TO EARTH:* INTRODUCING *RE-WORLDING*

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ABSTRACT

Today's socio-environmental challenges have been made more evident by the current COVID-19 crisis, with implications on various scale levels, intensifying cultural, social, political and environmental questions. Those questions must be addressed in a combined and not distinct way, requiring specific efforts in terms of thinking/acting in designing. In this DESIS Philosophy Talk, we want to explore which of our design competences we need to strengthen in order to create shared worlds that span different scale levels by developing what we call here "*Re-worlding* platforms". It will build on a rich cultural tradition in Participatory Design of bridging people and groups together, including silent and silenced actors (human and non-human ones). While in the last years some attention has been paid in how to care for the non-human to be part of the political discourse, with the idea of *Re-worlding* we also underline that many silent and silenced human actors still need to be given a voice.

THE PHILOSOPHICAL CONTEXT

The COVID-19 crisis we are currently experiencing shows it more clearly than ever: societal challenges on a large scale (vaccination plans, a destabilised climate, the displacement of people and material insecurity) are dividing groups locally and globally, rather than creating solidarity across Europe. French sociologist Bruno Latour (2018) describes this moment of societal division and insecurity as an important juncture, urging us to create shared worlds by: working together;

tackling tangible socio-environmental issues that have implications on various scale levels, in specific locations; and not separating, but combining - in this case - cultural, social, political and environmental questions. Besides than the rich and well documented participatory design discourse in Ant theory (see for instance Storni et al, 2015 and Andersen et al. 2015), who has been exploring the potential of non-human agents for participatory design processes, the Nordic Participatory Design tradition has in the past years being often researching on what a more-than-human design might concretely mean today, and working with questions concerning design and the more-than-human discourse (from Jönsson, 2014 to Lindström & Ståhl, 2019, Veselova 2019 and Westerlaken, 2020). This workshop builds on this conversation and aims to further enrich it by articulating on the idea of *Re-worlding*.

Instead of being the victim of the current polarisation, we build on a rich cultural tradition in Participatory Design of bridging people and groups together. In this DESIS Philosophy Talk, we want to explore which of our design competences we need to strengthen in order to create shared worlds that span different scale levels by developing what we call here *Re-worlding platforms*. This needs clarification of two concepts: *Re-worlding* and *platforms.*

We explore the idea of *Re-worlding*, as a design practice that is focussed on bringing together social, political, cultural and environmental questions. It follows the idea of Bruno Latour to enhance the potential of collectives in the construction of a common world, contributing to a sense of politics *Down to Earth*, being a politics acknowledging the radical interdependency connecting humans and humans with non-human agents. This brings also questions, for instance, on the role "representatives" might have in bringing all points of view on the table - also for instance of silent and silenced actors (human and non-human ones) and questioning also the role of the translator (and balancing matters of power). While in the last years some attention has been paid in how to care for the non-human to be part of the political discourse, with the idea of *Re-worlding* we also underline that many silent and silenced human actors still need to be given a voice, represented, enabled and supported. Latour's perspective on the needed itinerary *Down to Earth*, that recognizes humans as being just terrestrials amongst others, might help us also to better acknowledge the radical interdependence connecting the environment and the social, recognizing behind environmental issues (such as the COVID-19 pandemic and the climate crisis) also social ones.

Furthermore, Latour invites us to not be overwhelmed by scale, or to abstract ourselves from what is *Down to Earth*, by starting from our own context, identifying the radical interdependence within a specific situation (what he calls *a Critical Zone*). It is the act of defining a smaller scale in which to operate to enable all actors, also the silent ones, to have a stake in the public realm, identifying our actions (also, of us as designers) as just one of the many players inter-acting within a given context, a given Critical Zone: in other words, as not being an outsider to, but being part of an engendering process (Latour, 2019), that follows other logics than simple production processes. To think design from within this perspective might help us to better shape what design can do in a specific time of polarisation.

What we question is how we can offer people an entry into this critical zone from which a *Re-worlding* practice can be engendered. Here we explore the idea of *platforms* as socio-technical assemblages of [digital] tools, individuals, groups and places that allow people to come together in relation to issues that divide them. In this way we concretise the meaning of *Re-worlding* as a practice of researching and (re)building *platforms* comprising diverse actors (human and non-human), and therefore connecting environmental and social innovation, linked to specific locations and networks and growing caring relationships and inclusive practices, as a way of improving sustainable mechanisms for creating shared worlds.

How can these *platforms* support us to start to plan and construct together the public realm - in other words, a (more-than-human) common world - and how can it support the experience of a deeper understanding of the complexity behind environmental and social issues and of how they inter-depend upon other agents)? In other words; can it enhance the experience what de la Bellacasa (2017) talks about, according to which once you acknowledge the radical interdependence connecting us all, you need to care for it and re-weave the polarisations we are experiencing today?

THE WORKSHOP DESCRIPTION

In this DESIS Philosophy Talk, we want to explore how designers can enable this (re)discovery of care and relationality, by making us all experience it. The creation of *Re-worlding platforms* is in our opinion a very concrete first step in connecting us all and making us experience this direction *Down to Earth*. The aim of the talk is to understand how Latour's and de la Bellacasa's thinking can give us some indications on designers to concretely act to gather those voices, and to identify some guiding principles for design as politics of the terrestrial. We invite people to reflect on how they create these "*Re-worlding platforms*" in practice.

RE-WORLDING AS AN APPROACH FOR DESIGNING DOWN TO EARTH

In detail, we will thus explore how this philosophical framework might inspire a new approach – called *Re-worlding* - in which to design *platforms* that can bring social and environmental actors (and their agencies) together, in order to act on a larger and more complex level. Do not include other page numbers, headers or footers in your paper submission. Leave these as they appear on this template.

The question that is central is what is necessary to generate a strong 'ecology' of *platforms* with the potential to *Re-world*, to reinvent itself by enabling collectives' working together within and across scales, tackling tangible cultural and socio-environmental issues in specific locations, and not separating, but combining - in this case - social, political and environmental questions.

Our hypothesis is that Participatory Design research offers great potential approaches to further re-create *platforms* in a way that enables them to connect different collectives in tackling socio-environmental challenges. We will propose four different competences the designers should develop to imagine *Re-worlding* as a strategy to bring actors and groups together and explore how these functions and be redefined in a context of *Re-worlding* cultural platforms. The challenge will be that to read them in a non-anthropocentric perspective, in the light of trying to open up for *Re-worldling* PD practices. This might mean to concretely shift those PD competences, re-framing, possibly re-imagining them and opening up the perspective to re-addressing, re-naming them from a more-than-human perspective. In the DESIS Philosophy Talk, we will invite four PD researchers (one for each step) to articulate on how they translate Latour's and de la Bellacasa's philosophy into their own *Re-worlding* practices:

1. RE-DISCOVERING THE WORLD

An important approach in creating strong *platforms* for *Re-worlding*, is the participatory design process of trying to surface daily life culture: knowledge about people's and non-humans' own ways of being in the world in the contemporary context of unsustainability (Willis, 2006; Winograd and Flores, 1986; Fry, 1999) together with the contemporary context of 'populism' and unsustainability. This requires design research to engage with methods like collective mapping and embedded research in the specific context that *platforms* are engaging with, specifying the *Re-worlding* ambitions of the organisations behind the platforms, documenting the (online/offline) tools that *platforms* use to work on their ambitions, tracing the alliances of between different *platforms* and the trajectory of *platforms* in relation to their ambitions.

Invited lecturers: Cristiano Storni and Mark Marshall, Limerick University

2. RE-CONNECTING

Another possible approach for creating *platforms* for *Re-worlding* is the experience in Participatory Design to develop practical knowledge to shift from engaging with current ways of being in the world (re-discovering) to finding opportunities for people and collectives to connect with each other within and across scales around things they care about (re-connecting) (Escobar, 2018). It is key here to explore the (strategic) alliances that can support the *Re-worlding* ambitions of platforms. This includes for instance exploring the capabilities of identifying opportunities for people and collectives to connect with each other based on what they care for, make these opportunities tangible to allow exchange among potential platform-partners and critically reflect on potential (re-)connections between platform partners in diverse organisational forms.

Invited lecturers: Ann Light and Anna Seravalli (Malmö University), Chiara Basetti (Trento University)

3. RE-IMAGINING

Another very central approach to Participatory Design of *platforms* is tapping into the potential of diverse actors to collectively re-imagining systems, organisations etc. Re-imagination is a way to imagine how diverse collectives can create *platforms* that make "the transition from the hegemony of modernity's one-world ontology to a pluriverse of socio-natural configurations; in this context, designs for the pluriverse becomes a tool for reimagining and reconstructing local worlds" (Escobar, 2018). It is key here to reflect on how to re-imagine the organisations' *Re-worlding* ambitions for their *platforms* - their collective expressions and propositions for organisational forms of care for the world- through collective design action. These actions develop the capabilities of designers to engage with either future needs or marginalized needs for which there is no time nor budget within the current functioning of platforms, by materialising these needs through artefacts: e.g. the creation of digital environments, spatial proposals, alternative mappings, photography, oral (hi)stories, performances, prototypes, scenarios, etc.

Invited lecturers: Seppe De Blust and Freek Persyn (ETH Zurich, Switzerland)

4. RE-INSTITUTIONING

The fourth approach one could hypothesize to integrate the developed *Re-worlding* ambitions (re-connecting) and actions (re-imagining) in the existing organisational structure of *platforms*. This supports sustaining the *Re-worlding platforms* and embedding them within existing

networks and structures. This requires that designers enhance their capabilities to develop a diversity of modes to interact with existing networks, translate abstract *Re-worlding* ambitions in concrete steps and projects (short and long-term actions), hand over the experience and insights of their action research back to the case as well as their partner organisation.

Invited lecturers: Maurizo Teli and Ann-Marie Kanstrup (Aalborg University)

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THE WORKSHOP PRACTICAL OVERVIEW

TITLE

DESIS Philosophy Talk #7.3 Designing *down to Earth*: introducing *Re-worlding*

DURATION

Half a day

TENTATIVE PROGRAMME

10:00 - 10:30 Welcome & Philosophical positioning and link to design (the organizers)

10:30 - 11:15 Presentation of the four design competences - round of discussants presentations

11:15 - 11:30 Small break

11:30 - 12:15 Four parallel working sessions

12:15 - 12:45 Open interactive discussion and wrap up

THE PROGRAM IN DETAIL

The Talk will open with a position paper/presentation from the Workshop organizers that articulates the organizers' perspective on the matter of the potential of Latour's and De la Bellacasa's philosophies for designing in the Anthropocene, particularly focusing on how their philosophies might inspire a *Re-worlding* approach. After this philosophical framing, the organizers will also personally invite eight Participatory Design researchers (for details, see in the previous section) currently researching on the subject of *Re-worlding,* to articulate as discussants on how they are currently exploring in their own research one of the 4 competences we identified for *Re-worlding*, and how they weave there back Latour's and de la Bellacasa's philosophical insights to participatory design practices. After the discussants' presentations, who will help to weave the philosophical reflections presented in the first part of the Talk back to practice, we will have the hands on session: the discussants will lead four parallel tables (one for each competence), in which they will prototype together toolkits/tools for the competence of Re-worlding they addressed in their presentation, discussing it in small groups. Participants are asked to react/interpret/reflect/give feedback to the discussants' proposals, addressing the research question: "Does this competence practically really enable us to go *Down to Earth*? Which is its potential/criticalities?". They will discuss the approaches with the workshop participants, who will bring their own experiences in PD and Design for social innovation on the table and question the approach from within their own experiences/perspectives. At every session the conversation will be mapped, and a series of guidelines for Re-worlding will be developed and shared at the end of the workshop and discussed together in the final open conversation. The guidelines will also be tracked on video, to be shared later on social media (NORDES, DESIS Network, DESIS Philosophy talks). Those guidelines will afterwards be shared in the plenary session with the other NORDES attendees (and possibly also on the conference website/social media). At the end of this second part of the DESIS Philosophy Talk, we will have an open discussion (and a wrap up session moderated by the workshop organizers), highlighting the concrete outcomes of the discussion and the potential value of Re-worlding for PD research to come *Back to Earth*. The session will end by asking all the participants to record a small podcast (maximum 3 minutes) providing their own definition of design for Re-worlding. These podcasts, together with the videos produced during the parallel sessions, will be shared on the DESIS Network website, DESIS Philosophy Talk website and social media, and can be served as a basis for putting together a proposal for a Design Journal Special Issue on "Re-wording" (to be discussed).

ACCEPTANCE PROCESS AND CRITERIA

A limited number of attendees (max 25 people, registering before the conference), who will sign in through the NORDES 2021 website, will be invited to actively participate in the discussion. The call will be also spread by other channels (such as for instance DESIS Philosophy Talk, DESIS, POLIMI Desis Lab, DESIS social media and to the PhD-Design community and our PhD programmes larger network). We will require interested attendees to sign up and provide their name, role, affiliation, contact and short statement with their motivation to join the workshop session. We will share with them the position paper in advance, to allow a more active participation to the workshop.

PHYSICAL LOCATION / ONLINE FORMAT

If possible, we imagine holding the workshop in a location allowing to work in our parallel groups, thus, please check the number of tables and chairs (+/-30 chairs) available. The space also needs to allow a plenary session (as indicated in the program above).

If the COVID situation will not improve, the format can be easily adapted to an online setting (for instance, via Zoom) and a tech support will be needed by the NORDES organization.

Online format will guarantee data privacy through a closed access participation. A consent form for the use of images and videos will be also submitted to participants.

NORDES 2021

12 PRINCIPLES OF SOCIAL DESIGN

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ABSTRACT

The goal of this workshop is to facilitate a rich discussion of the field of social design, which is increasingly becoming a contested space. To support this, we have drafted '12 Principles of Social Design', which we want to share with the NORDES community as a starting point for an open conversation about the goals of social design as an area of academic inquiry and a field of reflective practice. Our plan for the workshop is to have a discursive structure that allows us to dig deeper into the Principles and the issues that sit behind them. Participants will be invited to bring their own case studies to see how the Principles perform against practice. The workshop will thus be used to test the principles and improve them, to build and strengthen the connections between design researchers working in this area, and ultimately to influence the direction of social design.

INTRODUCTION

In the design research literature, there have been productive intersections between studies of design and work in the social sciences. This has included using concepts from social science to analyse what happens in designing, including the construction of new 'socials'. Researchers have analysed the social in design (Keshavarz, 2018), different socials operating in design (Tonkiss, 2017) and used concepts from social research such as 'infrastructuring' (e.g. Björgvinsson, Ehn and Hillgren, 2010) or 'institutional logics' (e.g. Arico, 2018).

In regard to explicitly 'social design', Koskinen and Hush (2016) characterised different types of social design as molecular (small-scale), utopian and sociological. Others noted that social design practice may be optimised to 'work' at smaller scales (Chen et al 2015). Tonkinwise (2019) mapped out several ways that the 'social' is activated in research and practice in social design. Some researchers have highlighted the conditions in which social design has emerged. Julier (2017) pointed to the conditions shaping ongoing developments in design such as neo-liberalism. Kaszynska (2021) distinguished between different genealogies in social design. Building on research in service design, Kimbell (2021) argued that versions of social design practice exist within distinct institutional logics. In reviewing this emerging literature, we note a lack of coherence in defining the social, a focus on the methods for operating on the social, a normative intent to change the social world in particular directions, and evidence of reflexive, critical and historical perspectives to account for social design's emergence and consequences.

The ambiguity over what is meant by the social may be holding social design back. The problem is that the word 'social' seems, on one hand, to imply physical proximity and conviviality with others - something that design in the last decades has increasingly been successful in supporting via participatory and co-design. Yet on the other hand, 'social' also invokes a language of sociology and institutional structures that invites a

bird's eye view on society as an organism that has its own structure. In this sense the problem of social design is a matter of scale in terms of how to reconcile these different notions of social scale within design practice.

So far, the most successful way of cutting through this scale problem has been the 'sociology of associations' (Latour, 2005), also known as Actor-Network Theory, which offers a concept of the social that is made up of both humans and nonhumans and collapses notions of micro and macro scale (Callon & Latour, 1981). This socio-material approach has been popular with design theorists such as Binder et al (2011) who propose design as the making of socio-material 'design things'. Yet it has proved difficult to embed them within everyday social design practices. One of the challenges seems to be that much of the world is caught in rigid scalar distinctions that focus on either human-centred design or on institutional framings of systems as technocratic entities. How can those advocating and developing social design practices engage meaningfully with these tensions of socio-material rhetoric and mundane institutional practices?

To address this challenge, we propose a workshop in which we offer 12 principles as a starting point for an open discussion about social design. We are academics involved in social design research and practice who are members of the Social Design Institute at the University of the Arts London. We have a number of motivations for this workshop: to nurture a social design field of inquiry; to support and regulate the development of design practice; to enable practitioners to understand, assess and critically reflect on their practice; to open up dialogues and build connections with colleagues; and to support teaching and learning. We have an online version of the principles that anyone is invited to edit and improve, share thoughts and offer counterarguments.
https://pad.riseup.net/p/LclTxq5rloll_VTzvgmu-keep

The first draft of the Principles are as follows:

12 PRINCIPLES OF SOCIAL DESIGN

This series of principles defines what social design 'is' and, in our opinion, what it should 'be'. The current 12 principles are divided into four areas.

THE SOCIAL AS AN OBJECT OF DESIGN

1. Social Design claims there is a distinct 'social' that is made through and with things.

2. Social Design acknowledges that there are many possible ways of operating on the social.

3. Social Design claims a hybrid space of social practice between technical systems and human-centred design.

METHODS AND PRACTICES

4. Social Design is an anticipatory socio-material practice that proceeds through intervening into and reconfiguring sites and worlds.

5. Social Design engages multiple perspectives, knowledges, and disciplines: no single one has a privileged methodology for operating on the social.

6. Social Design shifts and translates across object and planetary scales, domains and sites.

NORMATIVE INTENT

7. Social Design is underpinned by normative intentions and undertaken with a view to creating social transformation.

8. Social Design forms issue-publics by creating shared, open-ended endeavours with communities through collective discussion about purposes, needs, values, and consequences.

9. Social Design builds new forms of democratic relations between places, living beings and things.

CRITICAL REFLEXIVITY

10. Social Design problematises the traditional modes and historical achievements of professional design, its Eurocentric assumptions, and its racialised and unequal consequences.

11. Social Design tries to mitigate against the unintended and damaging outcomes of designing.

12. Social Design is critically aware of its political, systemic, institutional and environmental situatedness.

We would like to invite colleagues with a common interest in social design as a field of practice and research to join us and share their perspectives on what social design is, could be and should be. As well as participating in an intervention that aims to influence the direction of travel and development of this field of research and practice, the workshop also represents an opportunity to build and strengthen relationships among a network of social design researchers. During the workshop we will discuss, challenge and iterate the principles together, test them against participants'

project examples, and end with a reflective discussion about the nature of – and rationale for – definitional work such as this. Following the workshop we will invite contributions for a special issue on defining social design.

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NORDES 2021

DESIGNING SCALES OF DOMESTIC MENDING IN FASHION

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ABSTRACT

This workshop explores mending practices as a personal and domestic response to the overwhelming problems of fast consumption and waste within the fashion industry. Participants are asked to bring one garment, which has holes, tears, stains, or other kinds of damages, and to co-explore domestic mending in fashion with other attenders and researchers. The aim of this practice-based workshop is to further substantiate the ongoing discussion of how to engage people in mending. In particular, it seeks to understand how design for different scales of engagement can meet personal preconditions and ambitions.

During the workshop, we will test a pre-defined mending spectrum, consisting of aesthetic parameters such as structure, colour, materials and the most versatile mending techniques, swiss darn and needle weaving. By using redesigned mending tools, we will explore how design can facilitate scales of engagement with contemporary mending practices in fashion.

WORKSHOP DESCRIPTION

The workshop aims to address an alternative present and future of fashion by using design to re-introduce mending as a practice of care and finding deep joy in already existing clothing. There is a rich tradition in mending practices which comprising techniques, equipment and tools. This set of practices in contemporary Western societies is virtually dying, while in the past, these practices were strongly tied to local identities and cultures, and the knowledge of repair was maintained within educational school programs, and across generations. Re-introduction of mending practices, facilitated by artefacts (see figure 1), can enable people to raise their individual and collective capability and capacity, and become a joyful way of engaging with clothing. Moreover, it can be seen as an alternative to the desire for purchasing new items.

Figure 1: Re-designed enabling artefacts: 3D printed mending mushroom and darning tool.

MENDING: STATE OF THE ART

The fashion industry, in the last several decades, has been dominated by fast rhythms of low-quality production and fast-changing collections (Allwood 2006; Fletcher & Tham, 2019; Fletcher & Grose, 2012).

As a consequence of environmental and social impacts caused by the fashion industry, younger generations have started to adopt de-materialisation as a strategy of resistance to capitalism and consumer culture, which have resulted in a gradual transition from fast to slow rhythm of consumption (Klingseis,2011; Gurova, 2015).

The slow rhythm of consumption with its characteristic features (popularity of handmade locally produced fashion products, upcycling, recycling, personalisation, circulation, repair, and maintenance) results in increasing the lifespan of clothing and returning to a more frank recognition of actual, tangible objects, not just their symbolic value (Clark, 2008). Furthermore, fashion is a form of communication capable to facilitate social interactions within a specific social group. It allows individuals to construct abstract meanings, established and socially recognized, through the visual language of the dress (Chon, 2013). The body surface is seen as an interface, which projects a desired self onto the external world (Gurova, 2011), and links the relationship between human persona and body to body and society (Barthes, 2006). Consequently, the circular process of interaction between individuals and society affects the emotional responses of others by the agency of fashion objects. Therefore, the fashion object creates an aesthetic code (Simmel, 1998; Gurova, 2011), which allows us to cultivate and communicate an aesthetic value and develop a form of social identity.

Within this landscape, the growth in popularity of mending is a personal response to the overwhelming problems of fast consumption and waste (Brayshaw, 2020). At the same time mending opens up an opportunity to engage with textiles and clothing – and might even create personal expressions in fashion (see figure 2).

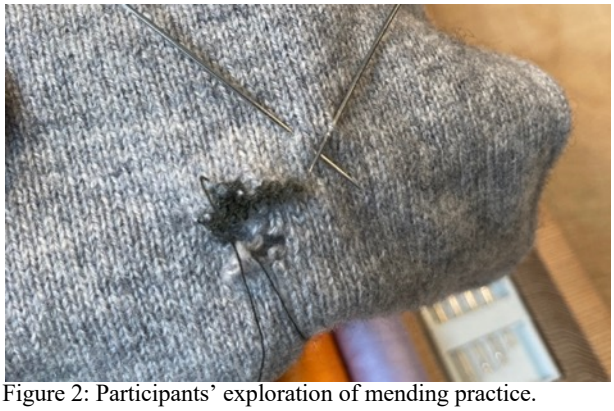

Figure 2: Participants' exploration of mending practice.

The main obstacles of garment mending are the lack of skills, time and equipment (Clark, 2008; Gwilt, 2014; McLaren & McLauchlan, 2015). As a consequence of fast rhythms of consumption and the abandonment of mending practices, also the mending tools went into disuse. Today most of them are not produced anymore and are difficult to find. As a part of an ongoing PhD study in mending practices, author 2 has redesigned a series of traditional mending tools to be 3D printed for local production. This offers an easy reproduction with the potential to act as vehicles for challenging perspectives, gathering voices, encouraging new behaviours. In continuation hereof, we are interested in how design can accommodate the main obstacles of garment mending and initiate the engagements with these practices.

DESIGNING SCALES OF MENDING

Designers in fashion have a well-developed set of skills in working with textiles and aesthetics colours, patterns, textures, shapes etc. (Ravnløkke, 2019). We propose to utilize this knowledge in combination with traditions in mending practices to generate a pre-defined set of aesthetic parameters of different scales of engagement with clothing. Mending comes with challenges in relation to the individual mender's preconditions and ambitions (Twigger Holroyd, 2018; Durrani, 2019). This research illustrates how design approaches can guide, support and inspire at different levels. Does one for example prefer an invisible mending, a more visible one (see figure 3), or mending that stands out and add decoration as a part of the result?

Figure 3: Authors own exploration of mending practice.

The workshop Designing Scales of domestic mending in fashion aims to address an alternative present and future of fashion by using design to make mending an activity in fashion which may cultivate other interests than the dominant market-driven fashion.

On these premises, the workshop intends to gain knowledge of the participants' understanding of mending practices, while testing the prototype of our mending spectrum and its aesthetic parameters (structure, colour, materials), which has been developed

to explore how design can contribute to other relations and engagements with clothing and fashion.

The spectrum of mending concepts builds upon the initial mapping of possible typologies of garments' damages, corresponding to the range of repair treatments, combining the techniques, materials and colours. The spectrum consists of 9 mending concepts; all are flexible in terms of expression, aesthetics and finish, and correspond to multi-functional mending tools. Moreover, to meet the menders' different scales of engagement, the spectrum has been developed at 3 levels of ambition and skill-set. The authors' approach to investigating the scalability through design aims at understanding to what extent do people want to engage with mending. Consequently, the study is focused on the growing number of people who would like to engage with mending practices. The authors aim to raise a possibility for cultivating activities related to slow fashion, while simultaneously obtaining more knowledge on the possibilities and limitations for scalability.

The intent of the workshop is to gain knowledge of the participants' understanding of mending practices, and co-explore the spectrum of mending concepts and aesthetic parameters. In that way, the co-exploration of the workshop will contribute to generating data for ongoing research projects at LAB for Design and Sustainability at Design School Kolding which focuses on the study of slow rhythm of consumption in the field of fashion.

WORKSHOP OVERVIEW

The workshop is based on participatory textile making principles: informed participation, inclusivity and mutual respect, and appropriate planning and resourcing (Twigger Holroyd and Shercliff, 2020). On the practical level, the participatory mending workshop will take place online from Design School Kolding with a maximum number of 10 participants.

Workshop participants will be asked to bring one garment to mend, which have holes, tears, stains or other kinds of damages. This garment will be the basis for the making activities and co-explorations with other participants. All necessary equipment, tools and materials will be provided by the workshop facilitators and posted to the participants before the workshop. These will consist of a set of guidelines as well as physical artefacts such as textile samples, several typologies of threads and yarns, available in different colours, and 3D printed mending tools.

During the workshop, participants will be guided to use the equipment, tools and materials to explore the presented concepts of domestic mending while engaging with their brought along garment. The explorations of the workshop are to be used as a study of how design can encourage contemporary fashion activities which cultivate other experiences compared to the more market driven fashion. Workshop participants will contribute to ongoing research by challenging perspectives, discussions on encouraging new behaviours, and enabling the exploration of the most versatile mending techniques: swiss darn and needle weaving.

Facilitators will support participants along the making-mending process, which is scoped for half a day (3 hours), and will be divided into 3 main sessions of introduction, mending practice and common reflections.

PROGRAM

09:00 – 9:30
Welcoming the participants

Introduction to the ongoing research and finding, constituting the base of the workshop.

09:30 – 10:00
Introduction to the concepts of domestic mending, as well as the posted equipment, tools and materials, including a short warm-up activity using breakout rooms.

10:10 – 10:40
Making a diagnosis of the brought along garment

Initiate mending activity by employing the provided guidelines.

10:40 – 11:30
Engaging with domestic mending. Participants will individually work on their mending project (with the supervision of 2 workshop facilitators in breakout rooms).

11:30 – 11:55
Reflection and evaluation, drawn on different perspectives, both of participants and facilitators.

11:55 – 12:00
Concluding remarks and thank you for participating.

PRACTICAL INFORMATION

Finally, we hope that some of the participants will wish to continue the development of their mending project initiated during the workshop. Therefore, we will exchange the contact information, aiming to inform the participants about their contribution and the development of further research process.

Shortly after subscribing to the workshop, participants are invited to contact the facilitators of the workshop and to provide their address, where all the necessary equipment will be posted. Moreover, participants are invited (but not required) to send a statement of interest, and shortly describe their research area, expectations and motivations in taking part in the workshop.

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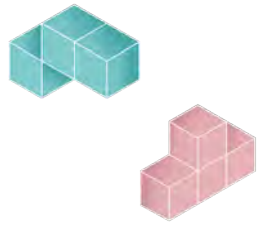

STORIES FOR COLLABORATIVE SURVIVAL

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ABSTRACT

What if this abstract was actually the middle of the story? And instead of it being a summary of what we try to do in this workshop, by individual 'heroes' that summarize the whole text, this section would be a collective account of why the text is worth reading and sharing. What if this section was not the beginning of a linear story, but a passage in a circular (re)telling of a shared experience? What if experimenting with such non-linear stories might change the way we tell stories in and through design? In this workshop we invite the design research community to explore how to situate sustainability through storytelling. In this workshop we explore how to bring forward individual neglected stories, dislodging heroic and universalist narratives, to explore how we can collectively listen, share, co-create and tell stories that can contribute to survival across individual and social scales.

INTRODUCTION

We need new kinds of stories to prepare for life in the ruins of modernity, however "(n)ot all stories are equally useful in engaging us with collaborative survival" (Tsing et al. 2017). How do we know which stories are useful? Do we need to create other and better stories for surviving on a damaged planet? And how can such stories survive? How can storytelling bridge different scales, connecting the local with the collective? How can we explore this through participatory design? In this workshop we invite participants to join us in exploring mundane neglected stories through telling, creating and sharing, with a critical eye toward what makes stories "useful in engaging us with collaborative survival". The goal of the workshop is to explore starting the questions of collective survival from the smallest scale possible: our everyday stories, our disorganized messes and from there explore how changing the narrative, from heroic global narratives to interconnected local messy stories may change the way we approach matters of survival. As a form of exploration, we take as our starting point mundane objects and behaviours from our everyday lives, and work towards developing collective stories of collaborative survival, experimenting with different practices of foregrounding and backgrounding, material forms, and narrative styles. In the workshop we will listen, learn, suggest and explore stories that relate to our ability to survive a planet in crisis. The collective stories made will be shared in the group, and we will explore how and whether those stories should be carried further by others, connecting the small to large scales of

stories and collective survival. Large scale is here figured as the global question of collective survival and of heroic storytelling, whereas small scale refers to the everyday, the mundane, the unheroic, the level at which we can connect to ‘our local’. Stories scale easily, but what if situated stories lose their relevance, their wisdom if they are scaled up? What if we refuse to scale, to break the smoothness in scalability?.

CLIMATE ACTION AND STORYTELLING

To stay within planetary boundaries, and to meet social foundations, our societies need to transform radically (Raworth, 2012; Rockström et al. 2009). While this has been known since the 80’s, we are nowhere near making the needed reduction in carbon emissions to stay within the 1.5-degree limit on global warming. According to Nightingale et al. (2020), the reason for this failure to act is the framing of climate change itself. By focusing on technical climate research, not linking the global aspect to local action and by disconnecting nature from society, other ways of knowing, such as those embedded in our lived experiences and cultural memories, have been marginalised. How we share these knowledges is important, scientific studies often attempt to disentangle natural cycles from anthropogenic causes, whereas oral traditions have an ability to merge natural histories of landscape with local social histories (Cruikshank, 2012). In order to comprehend climate change as a direct risk and to motivate ourselves to take it up more vigorously, Nightingale et al. (2020) urge for a reframing of climate change in a way that it becomes inclusive of people and their places. Further to this issue of connecting the social and local to the technical scale of climate change action, has been the issue of navigating and connecting the local versus global scales of climate change and climate action. In what we see as an attempt of connecting these scales, the phrase “think global, act local” has been a guiding motto in climate action. However, this way of connecting these scales encourages an universalist view of humanity, which is not only problematic from an imposition of a western worldview, but it also makes the local and the personal become less important by implying that a thinking globally - in general - could be equally applied every place - in specific (Mignolo, 2012; Vazquez, 2017). Hence, in this workshop we explore how to situate climate action, exploring ways of connecting and relating local and global, social and technological scales. We explore these multi scale connections through storytelling. Stories and thus storytelling is an act of communication, stories travel and connect people through meaning and time. That is, stories that are seen as relevant to life get shared further through webs of people. Also, stories, carried through time can connect us back to the past and point to different futures, allowing us to relate to different scales of time.

Storytelling is an act of connecting between individual and collective, between local happenings and wider issues that can inform life choices. However, we also need to pay attention to which stories are told and how they can frame different ways of being and acting in the world in relation to climate action and in relation to the type of narrative and culture they carry. We believe we have to move away from the focus on universalist stories that pose individual solutions and thus we also need to move away from heroic, saviour, stories which highlight individuals over collectivity

HEROIC VERSUS UNHEROIC STORIES

By introducing the titan Prometheus, who defaced the ruling gods and gave fire to humanity as a symbol of modernism, science scholar Bruno Latour (2008) has called for the opposite to such heroic gestures in the name of design. If the Greek titan enabled progress by radically breaking with the past and avoiding the consequences, the opposite he says, to take the qualities of design, of adding to something in a modest way, is to revolutionize progress. Design could thus be thought of as the anti-hero, or as a post-Prometheus. However, if we look at contemporary stories and the narratives being created in the Western world and in our field of design, we learn about many titans; we hear narratives of heroism centered on the figures of a conqueror, a problem-solver, a saviour that individually stands above all other humans and, alone change the course of history. In 1988, the science fiction writer Ursula Le Guin explains in the 'Carrier Bag Theory of Fiction' (2019) that heroic stories are centrally concerned with conflict, strategies and victories, and on carrying a central hero in its front. They are linear, finite stories. Heroic and universalist narratives are dominant in the Western progress-driven story of our time. This individualistic focus - on people or solutions - goes against the ideals of collective survival and of collaboration that is argued by many to be the most important aspect to reach the sustenance of life on earth (see for example Grinspoon, 2016; Latour, 2017; Lovelock, 1995). Moving away from the heroic and universalist way of storytelling, we believe shining light into everyday life and on the actions and stories that we perform, stories and practices that are hidden and hindered by global writings of history from a heroic Wester progress-driven perspective, can reveal diverse ways of being with the planet and of contributing to individual and collective survival.

UNHEROIC EVERYDAY LIFE: NEGLECTED STORIES

The unheroic stories, neglected in heroic narratives, happen in a different time and scale. These neglected stories are small, local, mundane stories. As Le Guin

puts it, these stories are "the other story, the untold one, the life story" (Le Guin. p.33. 2019). According to her, these neglected everyday stories are non-linear, they don't end with a climax, instead, they are a knotty handful of threads that connect you to ever more stories. These stories relate to local skills in living, to the delight in being part of the world and to an awareness of belonging to the world. These might, for example, involve knowing our kinship as animals with animals or plants, the landscape and/or with natural phenomena. Le Guin (2019) argues that stories of hunting and killing have made readers to imagine that individual heroism is the point of a story:

"[W]hat we actually did to stay alive and fat was gather seeds, roots, sprouts, shoots, leaves, nuts, berries, fruits, and grains, adding bugs and mollusks and netting or snaring birds, fish, rats, rabbits, and other tuskless small fry to up the protein. And we didn't even work hard at it […]. The average prehistoric person could make a nice living in about a fifteen-hour work week. Fifteen hours a week for subsistence leaves a lot of time for other things. So much time that maybe the restless ones who didn't have a baby around to enliven their life, or skill in making or cooking or singing, or very interesting thoughts to think, decided to slope off and hunt mammoths. The skilful hunters then would come staggering back with a load of meat, a lot of ivory, and a story. It wasn't the meat that made the difference. It was the story." (p.25. 2019)

Neglected stories are stories that attempt to bring forward mundane local actions that include knowledge attentive and inclusive to place and people. As Cruickhank (2012) said about the role of (oral) storytelling: 'I recognised how narrators were using these narratives to explain choices each had made in her own life. They spoke about transitions from childhood to adulthood to middle and old age in ways that demonstrated how such foundational narratives provide the intellectual and narrative scaffolding for achieving a well-lived life. The stories provided a framework that enabled these women to tell stories of coherence about their own lives 'as though the world were inherently transformational and intrinsically subject to change' (Gow 2001, 10). In a similar path, Haraway (2016) suggests that stories of fiction and nature-cultural facts need to give room for both conflicting and messy tales that can be used for retelling as well as re-seeding narratives. In other words,it is not just our ability to tell stories that is important, but also our ability to listen.

Le Guin's story of the carrier bag is, more than a story about early humans who would survive by carrying more than can be held in the hand, also a method for storytelling, story-making and story-gathering. Unlike the spear, which follows a linear trajectory towards its target, kind of linear way we have come to think of time and history in the West, the carrier bag by LeGuin is more like a sack of potatoes, a mess of stuff where a thing is entangled with another, with contradiction, difference and simultaneity. In this kind of story-making, gathering and telling,, stories should never end, but rather lead to further stories through connection and gathering, like a forager putting various things in a bag to guarantee their survival rather than a hunter waiting for the big kill. In this workshop we explore how to bring forward unheroic neglected stories from our everyday lives and how we can collectively listen, share, co-create and tell stories that can contribute to collective survival across individual and social scales.

WORKSHOPPING STORIES

The participatory design workshop is divided into four moments: sharing, moving, connecting and carrying. Together these moments represent a process of moving between scales, elevating the mundane of everyday life, the potentially neglected or forgotten, into view of each other, a level of interaction and finally to a moment of sharing, of sending the stories to others. Throughout the day we will use a variety of senses through audio and video tools to support our explorations into different ways of framing our everyday life spaces, objects, and experiences.

Sharing: We start the trust-building process through engaging in partial glimpses of the neglected aspects of our daily life spaces and situations, exploring what has been left unkempt and appears messy. We are not merely asking what we can experience through different modes of engagement by enhancing some senses, while removing others, but rather we are exploring our resistances, our urges to paint a favorable picture as we give extra attention to the neglected. We practice listening and explore how the materials and stories connect us to scales of time (past present and future) and to social scales (between individuals and the collective). This will be done in groups so that every story can be heard and shared. Through this sharing, the groups will begin to develop a vocabulary of survival in the present, making connections between the diverse stories of each other.

Moving: Taking sharing as a departure point, in this moment of the workshop we will connect stories into collaborative accounts that we make relevant to be shared forward for collaborative survival. After forms of collaborative stories are assembled in the groups, we will focus on practicing collaborative unheroic storytelling through different performative forms. Guidelines and inspiration will be made available by the organisers.

Connecting: In the third moment, we will explore different examples of storytelling from non-Western perspectives that focus on collective survival and

relation to place, people and non-human aspects. We will use these examples to reflect on the stories we have created during the workshop to see how they connect us to place, as well as to non-humans.

Carrying: Finally, we will conclude by jointly identifying relations between design, storytelling, scales (local/global) and sustainability. The collaborative stories made in the groups will now be communicated back to all workshop participants, literally trying to scale up stories to be carried further by others. Together these moments represent a scaling process, elevating the mundane of everyday life, the potentially neglected or forgotten, into a level of interaction between and among, and finally a sending off to others. This part resembles the carrier bag, where we collect stories that offer more complexity but can also be used and travel beyond the space of the workshop.

PRACTICAL OVERVIEW

DURATION: The workshop runs as a full day online engagement.

PREPARATION: A few weeks before the workshop, participants will receive a mail asking them to prepare their introductions on a Mior board, do some light reading, and get familiar with workshop tools.

THE WORKSHOP: The workshop moves through four moments: sharing, moving, connecting and carrying. In the first moment (sharing) we give an introduction to the theme and to the schedule of the workshop. We then divide into groups of 3 to 5 people. The participants explore their stories within their groups through guided activities. In the second moment (moving) we explore the combination of the stories in the group and ways to tell them through different formats. For this we will provide material for writing and for creating material representations of the stories. After this, we provide inspiration, through video, from different storytelling traditions to inform a reflection on the collective stories that were created (connecting). In the final moment of the workshop (carrying) we join the whole group for a final reflection and for sharing the final stories among the participants and, if possible, share with other conference participants.

PARTICIPANT ACCEPTANCE PROCESS: by signing up

PLACE: Online via Zoom and Miro as a base.

MATERIAL & TECHNOLOGY: During the workshop we will be exploring different online tools using our own accounts when possible. We are interested in access to Spatial Chat or other collaborative conferencing tools if they become available.

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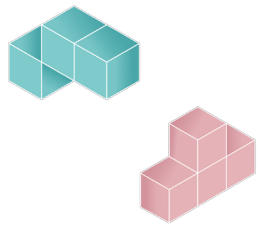

RESIDUE OF INTERACTION: SCALING PARTICIPATORY EXPERIENCE

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ABSTRACT

Situated within both design research and design education and learning, the *Residue of Interaction* workshop is proposed as a means to begin a discussion on the residual influence of participation on the designer-researcher and how these one-off experiences individually scale up to influence future practice. Based within participatory-based research practice, the rich experiences had by design researchers is often translated into insights and design requirements required by project partners. In some instances, however, participation leads to insights (even after a project is complete) that do not have a space to be documented or shared within the scope of the research at hand. The workshop will document, reflect and discuss how experience can be scaled into meaningful and accessible resources and how they can be shared in a way that it becomes useful for others. A collective documentation and dissemination workshop, it will gather narratives of how participation has impacted researchers themselves and how these insights continue to impact how they design or their teaching practice. The aim of this workshop, then, is to identify ways to integrate reflection into the design process and best practices for articulating, documenting or disseminating experience as knowledge. The workshop will result in a collection of media resources and artifacts that can be used for continued research in this area as well as a resource within education.

INTRODUCTION: TURNING TOWARDS PEOPLE

Increasingly over the last decade, the notion of working together (co-design, co-creation, participatory design, user-centered design, human-centered design, etc.…) with users or participants has become well integrated into the design process both within industry as well as tertiary design education. This *turning towards people* has allowed design to become concerned with contexts of use, communication of use and the consequences of designed objects as well as the influence of these design objects on people (Frascara 2002) which in principle leads to a "better informed design" (Taffe & Barnes, 2010, p. 211). Quite different to the process of designing to second-hand accounts or what Tomico refers to as third person in which people are designing *for* instead of with (Smeenk et al. 2016) the value of participation is well documented.

In the *Routledge International Handbook of Participatory Design*, participatory design is defined as:

> "a process of investigating, understanding, reflecting upon, establishing, developing, and supporting mutual learning between multiple participants in collective 'reflection-in-action'… the designers strive to learn the realities of the users' situation while the users strive to articulate their desired aims and learn appropriate technological means to obtain them" (Simonsen & Robertson 2012, p. 2).

It is here where a gap begins to form. The definition above speaks of exertion; those doing the investigating, the reflecting on, etc. (the designers) are *striving* for understanding and the participants equally are *striving* to meet their expectations. In collaborative making, the striving together results in a designed thing that shows impact of the collaboration. The participant sees themselves reflected in it; in some cases they can even see traces of their influence in the end result. Equally the designer remains in control of how the participation results are shared, thus they too see their own design decisions (based on the participation) reflected in the designed artefact.

But what of the *labour* that the handbook describes above? How does this manifest and documented? Often the struggle evidenced in literature is about the search for methodologies that match not only the needs or abilities of the participants, but the requirements or limitations imposed by the project.

Literature is rife with stories of the strife mentioned above and covers project successes, methodology creation and adaptation as well as highlighting the challenges faced by applying methodology in demanding contexts. From expressing the benefit of collaboration for the participants(s) (Bratteteig & Wagner 2016; Vines et al. 2013; Sanders 2008; Spinuzzi 2005; Schuler & Namioka 1993) to articulating the importance of their voice being heard (Peters et al. 2018; Ehn 2008; Muller 2002) academics publish research on the struggle between participant and design researcher. There is participatory design literature focusing on ways to include participants with impairments (Barendregt et al. 2014; Hendriks et al., 2015; Hourcade et al. 2014) as well as discussions about methodology adapted for personalized or bespoke participation (Dreessen and Schoffelen 2016; De Couvreur and Goossens 2011; Padfield 2011) among others.

Although the perceived strife of the designer is documented in each of the aforementioned articles, in terms of their formal experience and the preparation, execution and analysis of work is validated, their personal *experience* often remains sidelined as being informal or unreliable. Although there is literature suggesting that participatory methods may lead to empathy on behalf of the designer (Hess & Fila 2016; Kouprie &Visser 2009), these too focus on how empathy manifests within designed product (Redström 2006; Sanders 2002).

The knowledge generated and documented within these participatory approaches are limited to the expectations of academics and journals as well as limited by the requirements outlined by the project the research is situated within. However, in acknowledging the relevance of both, there is also the need to be aware of other forms of knowledge generated through these processes. They are not the focus of papers and they exist within the fringes of formal design processes, but they are powerful drivers of the way in which designers design.

BEYOND THE ANALYSIS OF RESEARCH: A SPACE FOR OTHER TYPES OF KNOWLEDGE

What this limited literature study intends to highlight is a gap not in knowledge creation on behalf of the design researcher, but highlight the lack of platforms for discussing and disseminating knowledge that is generated between these spaces, knowledge that lacks the methodological framework to ground it to participatory practice, yet is a knowledge that exists within backstage relating, within a designer's *way of being* as well as within their reflective practice.

PLACING KNOWLEDGE IN THE BACKSTAGE

One place where this sort of knowledge could place itself would be within Star's "going backstage" (Star 1999). Linked to this idea of infrastructuring in which invisible structures are acknowledged and validated for their role in enabling future collaborations to take place, these infrastructures are often ignored. One of the key aspects of backstage infrustructuning relies on the orchestrated relationships within participatory design and how they could be counted as objects of design. As valuable as worksheets used within workshops and as tangible as the workshop context itself, the relationships that are formed are "a phenomenon that is malleable" and formed in function of design and influence the success of the participation (Dindler & Iversen 2014, p. 43, Seravalli 2018). Within this backstage space, the designer moves in and out of different functions; there is 'non design' work as well as work that is seen to in function of the 'design research' (interviews, shadowing, mapping, workshops, etc.). Backstage work helps to establish the designer-participant relationship and is crucial to the success of the following design process. "Whereas the backstage is often hidden chaos of conflict and turmoil" this is contrasted against what Bødker et al. describe as the formal and often well documented design activities which offer the "pretty image of success" (2017, p. 250).

PLACING KNOWLEDGE IN A DESIGNERLY WAY OF KNOWING

Likewise these personal experiences could be placed within a designer's *modus operandi*. In Cross's influential text on *Designerly ways of knowing* he suggested that the confidence with which a designer moves from decision to decision is based on both their previous experiences as well as new experiences and that this way of operating is a designer's way of *being in the world* (1982 p. 224). This construct of continually making connections within a mental constellations is

what von Glasersfeld defined as *knowledge* creation: “a kind of compendium of concepts and actions that one has found to be successful, given the purposes one had in mind” (2012 p. 4). What makes this appealing as a place for alternative design knowledge is Cross’s *Designerly ways of Knowing* is not merely the knowing that is presented as design research results: qualified and quantified within power point presentations to other members of a design team, where interviews are reduced to one-liner quotes presented in board rooms to clients as a means to validate the research carried out, but it is seen to be *embedded* within the designer’s ongoing experience, not simply in their analysis of the results.

PLACING KNOWLEDGE IN REFLECTIVE PRACTICE

For designers working closely with participants, the distance between analysis and research validation can be blurry. A designer stepping into a person’s world does so it expressly: they are *experiencing* it, as a means to become *aware* of it. For Boud et al., experiences like these are not happenstance, but rather *meaningful encounters*. They are not “just an observation, a passive undergoing of something, but an active engagement with the environment” (1993, p. 6). Schon, specifically called for make “tacit knowledge explicit” (1992, p. 123); expressly grounding these meaningful experiences “in the external world…through internal reflection about the attributes of these experiences and ideas” (1983, p. 52).

As with the knowledge that situations itself in the backstage and in a designerly way of being, these meaningful encounters, however, do not all manifest as insights that are relevant for the research at hand thus remain ambient reflections on incidents, encounters, challenges, confrontations, unexpected outcomes etc. until they are are mulled over and reflected upon.

DISSEMINATION THROUGH NARRATIVE

As these knowledge-making moments are seen to be found embedded in the work a designer-researcher does, then what tool(s) exist to evidence them? Narratives or storytelling is often the way that very personal, experienced knowledge is transferred (scaled) to others. Often dismissed as minor narratives, anecdotes are a means to make tacit knowledge explicit and they possess a powerful performative, reflective nature: "the making and enactment of anecdotes is a means of interrogating the research process itself" (Lury & Wakeford, 2012, p. 33). Used within design education, for example, firsthand experiences by a lecturer are made *memorable* and *known* through storytelling. So too does storytelling fit within the spectrum of knowledge acquisition. Within a traditional classroom setting, a professor can be seen to be the gatekeeper of knowledge; the teacher has the goods and need only to deliver them (Wilson 1996). On the other end of the spectrum is a form of anthropology; knowledge to be gained is inexplicit, intangible and an individual is only able to gain access to it through enculturalisation and becoming part of the community itself. Making experiential knowledge accessible through narrative (sharing anectdotes), the transfer of knowledge falls somewhere inbetween the experience of enculturalisation and gatekeeping (Wilson 1996). Although on this spectrum there are tools such as thick descriptions (Ponterotto 2006) used within research analysis as well as persona development (Pruitt & Adlin 2010) in which narrative storytelling supports the understanding of a persona’s experience, the knowledge that goes unmentioned, the tacit and latent knowledge that is seen to be almost necessary or irrelevant at the time, but yet is a part of a designers way of being is where this workshop situates itself.

SCALING THE RESIDUE IMPACT OF INTERACTION: THE WORKSHOP FORMAT

Rooted in experience, humour, failings, conversations, exchanges…these knowledge fragments are the residues of interaction; the leftover bits that are chewed on, mulled over and recalled as examples. They stick with the designer for the way it was confronting, for the way the interaction was impactful, the way the relationship challenged them, for the way in which it shifted the way they teach practice to others…

INTENDED AUDIENCE

The intended audience of this workshop is designers in various capacities with a specific focus on designers who also see themselves as researchers and are therefore familiar with this translation. Specific knowledge or interest in co-design/participatory design or design education is not necessary as the workshop has specifically been created to welcome the voice of a wide range of participants.

WORKSHOP FORMAT

This workshop will run across one full day or two half-days. This workshop will be built from the actual voices and experiences of participants, with the specific goal of creating access to, archiving, listening, reflecting and disseminating not only designer-research stories but a means to give them a place in practice as sharable knowledge.

PREPERATION BY PARTICIPANTS (HOMEWORK)

To facilitate this, participants are asked on the forehand to consider the impact of interaction. When did a participatory exchange challenge them? What are moments as designers, researchers or participatory facilitators in which they learned the most? Who were the participants that without much intention, instigated this learning?

An online worksheet will be provided that participants can use to gather their thoughts on this topic. They will not be limited to one moment but will be asked to provide a collection of insights. Examples will be provided as a means to trigger recollection about knowledge generated from experiences across a broad range of reference points: anecdotes often told during lecturers, stories told as examples within presentations, challenges discussed between colleagues, images that are used as props, etc.

DAY 1 (SMALL GROUP SESSIONS):

Participants will be divided into small, intimate groups which will gather together with the workshop organisers to share their stories. These sessions will be during a 'workshop time slot' during one of the first days. – 45 minutes per session

DAY 2 (PARTICIPANT EXPERIENCE):

Participants will begin the second part of the workshop by receiving a 'bundle'. This bundle will be the gathered stories received on the first half day but presented in different ways in terms of physical artifacts, installations, etc. The walk will be in teams of two or three and each team will arrive a 'destination' in which they will carry out a predermined task together before returning to campus. – 1 hour and 30 minutes

MAPPING

On their return to the primary workshop location, the participants will group together in teams for a mapping. A tool to facilitate "participants' exchanges and disagreements" (Schepers et al. 2013), the mapping will focus on different challenges, from materialisation of knowledge to incorporating this into teaching practice. – 1 hour and 30 minutes (30 min. per session)

SCALING EXPERIENCE:

Ways in which direct (observational, first-person design research) can be scaled so that they are able to be offered to others as knowledge. Are these able to be grouped thematically? What medium works best for accessing these stories? What platforms already exist that could host this time of knowledge? What audiences will be receptive and how will they be used?

REFLECTIVE PRACTICES:

Best-practices for reflection within design processes. What are the ways in which reflective practice can be taught within design curricula so that meaningful experiences and the learning resulting from these experiences are acknowledged? How is this related to learning outcomes and expectations around coursework?

CHALLENGES IN ACADEMIA:

Challenges to scaling (disseminating) reflective experiential knowledge within an academic context. What might need to shift within academic practice in order for narrative-based, anecdotal contributions to be welcomed? What changes can be proposed?

FUTURE PLANNING:

After the groups have completed their map, they will present their group's top proposals for each section and collectively discuss ways to further this research. Are there themes that cut across the groups? Are there leaders within the group that might already be experts in this area? – 45 minutes per session

What will be 'left over' from the workshop will be a framework for further research (interviews) highlighting the critical challenges related to scaling experiential knowledge in design practice as well as a plan for where this research should best be published. These collective results (as well as the collected stories) gathered in the workshop will be made available for design researchers and practitioners engaged in this space for future research.

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RESIDUE OF INTERACTION: SCALING PARTICIPATORY EXPERIENCE (PRACTICAL OVERVIEW)

MOTIVATION

Situated within both design research and design education and learning, the *Residue of Interaction* workshop is proposed as a means to begin a discussion on the residual influence of participation on the designer-researcher and how these one-off experiences individually scale up to influence future practice. Based within participatory-based research practice, the rich experiences had by design researchers is often translated into insights and design requirements required by project partners. In some instances, however, participation leads to insights (even after a project is complete) that do not have a space to be documented or shared within the scope of the research at hand. The workshop will document, reflect and discuss how experience can be scaled into meaningful and accessible resources and how they can be shared in a way that it becomes useful for others. A collective documentation and dissemination workshop, it will gather narratives of how participation has impacted researchers themselves and how these insights continue to impact how they design or their teaching practice. The aim of this workshop, then, is to identify ways to integrate reflection into the design process and best practices for articulating, documenting or disseminating experience as knowledge. The workshop will result in a collection of media resources and artifacts that can be used for continued research in this area as well as a resource within education.

LENGTH OF WORKSHOP:

A full day spread across two days
(ideally day 1 of the conference and day 3)

DAY 1 SMALL GROUP SESSIONS:

Participants will be divided into small, intimate groups which will gather together with the workshop organisers to share their stories. These sessions will be during a 'workshop time slot' during one of the first days. The groups will not intermingle. This can be seen to be a 'mini-podcast' production session and privacy issues will be addressed and those who do not want to be recorded are still able to participate.
– 45 minutes per session

DAY 2 PARTICIPANT EXPERIENCE:

Participants will begin the second part of the workshop by receiving a 'bundle'. This bundle will be the gathered stories received on the first half day but presented in different ways in terms of physical artifacts, installations, etc. The walk will be in teams of two or three and each team will arrive a 'destination' in which they will carry out a predermined task together before returning to campus.

This facilitates small teams and allows the participants to explore Kolding while carrying out part of the workshop. The 'task envelope' will include a set of questions and will include enough money for the team to get a drink together (coffee, have cake, etc.) This will later be discussed as residual knowledge that was developed directly from participatory design research by two of the workshop organisers. In this way, the participants come in direct contact with the intention of the workshop.
– 1 hour and 30 minutes

MAPPING

On their return to the primary workshop location, the participants will group together in teams for a mapping. A tool to facilitate "participants' exchanges and disagreements" (Schepers et al. 2013), the mapping will focus on different challenges, from materialisation of knowledge to incorporating this into teaching practice.
– 1 hour and 30 minutes (30 min. per session)

SCALING EXPERIENCE:
Ways in which direct (observational, first-person design research) can be scaled so that they are able to be offered to others as knowledge. Are these able to be grouped thematically? What medium works best for accessing these stories? What platforms already exist that could host this time of knowledge? What audiences will be receptive and how will they be used?

REFLECTIVE PRACTICES:
Best-practices for reflection within design processes. What are the ways in which reflective practice can be taught within design curricula so that meaningful experiences and the learning resulting from these experiences are acknowledged? How is this related to learning outcomes and expectations around coursework?

CHALLENGES IN ACADEMIA:
Challenges to scaling (disseminating) reflective experiential knowledge within an academic context. What might need to shift within academic practice in order for narrative-based, anecdotal contributions to be welcomed? What changes can be proposed?

FUTURE PLANNING:

After the groups have completed their map, they will present their group's top proposals for each section and collectively discuss ways to further this research. Are there themes that cut across the groups? Are there leaders within the group that might already be experts in this area?
– 30 minutes

WORKSHOP OUTCOME:

What will be 'left over' from the workshop will be a framework for further research (interviews) highlighting the critical challenges related to scaling experiential knowledge in design practice as well as a plan for where this research should best be published. These collective results (as well as the collected stories) gathered in the workshop will be made available for design researchers and practitioners engaged in this space for future research.

WORKSHOP NEEDS REQURIEMENTS:

Day one will require a room that is silent as to aid in the recording of the storytelling.

Materials: Between Day 1 and Day 3 printing will need to be done in order to make the 'bundles' required for the walk. This can also be done at a local print-shop facility. If one of the stories lends itself to other forms of artefacts or installations, this will be discussed on with the conference organisers (ie. it might involve hanging a poster or setting an object on a plinth with accompanying wall text, etc.)

All participants will be made aware of their story being recorded and will have provided the correct and applicable privacy forms for the use of their words, voice, submissions or for photography.

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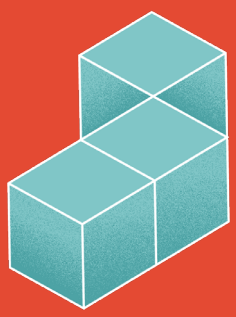

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