Explorative Museum Experiences

a collaborative experience design process for explorative museum exhibitions

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EXPLORATIVE MUSEUM EXPERIENCES

- A COLLABORATIVE EXPERIENCE DESIGN PROCESS FOR EXPLORATIVE MUSEUM EXHIBITIONS

BY
KRISTINA MARIA MADSEN

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DENMARK

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- a collaborative experience design process for explorative museum exhibitions

by Kristina Maria Madsen

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AUTHOR CV

Kristina Maria Madsen received her master's in information technology and experience design from Aalborg University in 2015. Shortly thereafter, she started working as a research assistant before beginning work as an exhibition and communications assistant at an art institution. In 2016, she became a PhD Fellow at the Department of Communication & Psychology at Aalborg University, which is affiliated with the research centre for Interactive Digital Media & Experience Design (InDiMedia). Her research interest is in the intersection between experience design and exhibition design for cultural heritage. Kristina's research focuses on exploring experience design as a design approach for designing exhibitions that enhance learning potential through exploration. She has published on such topics as 'experience design', 'museum exhibitions', 'exploration', 'emergent narratives', 'experiential learning', 'collaborative design' in international journals and conferences.

During the past three years, Kristina has been teaching and supervising bachelor's and master's students at Aalborg University. She has disseminated findings from her PhD research for both academic peers and stakeholders.

In her PhD dissertation, Kristina studied the use of experience design in a museum exhibition context as an approach for designing explorative exhibitions.

ENGLISH SUMMARY

Through this dissertation, I have approached the challenges of balancing the enlightenment and experiences presented to museum institutions by the experience economy from an experience design perspective in collaboration with a smaller Danish museum. In the dissertation, it is my hypothesis that designing for explorative user interactions in exhibition design, enlightenment and experience can be balanced. Furthermore, I hypothesise that IT-based experience design can be a useful design approach for said explorative interactions due to its holistic characteristics and inclusive scope, which borrows design criteria from other fields of design. As such, the research was guided by the following research question:

How can principles of IT-based experience design guide the design, implementation and evaluation of an explorative museum exhibition?

The goal was to identify key criteria and principles for these types of design processes through a series of experiments that collectively sought to expand and add to the existing field of knowledge within museum experience design. Thus, knowledge was generated that can bridge the gap between theory and the practice of applying experience design as a collaborative design process for exhibition making.

Through my research, and in collaboration with the Limfjord Museum, I have explored the potentials of learning through experiences via an experience design perspective and a collaborative design process, one which was informed and guided by principles of experience design. Furthermore, through this research, I have applied criteria of emergent narratives – *user-mindset, agency, storification* and *narrative closure* – to the exhibition design to create a space for exploration, with the argument that users should be more active participants in creating their own experiences and narratives to encourage informal learning, instead of more passively receiving predefined and structured narratives. The criteria for exploration defined in the dissertation both created the foundation for designing for exploration and identified and evaluated explorative user interactions through four strategies for emergent user interactions: two were design-driven, *by Design* and *by Redesign;* and two were design user-driven, *Creative Play* and *by Hacking*.

In the dissertation, I have shown how collaborative design processes can be guided with experience design for exhibition making and how collaboration in this process creates a foundation for balancing content and form for exploration by integrating the work of museum professionals and design researchers throughout the design process.

I have shown how explorative museum experience has the potential to both balance enlightenment and experience and support the informal learning experience. When designing for exploration, is not a third perspective in the enlightenment–experience dichotomy, but an approach to dissolve the conflict and balance enlightenment and experience to avoid disneyfication and formal learning. Thus, designing purposeful exhibitions provides users with the opportunity for meaning making through their active participation in the museum experience. These contributions are condensed into a theoretical framework, the ExD-framework, which is grounded in my experiments and aimed at designing for exploration with experience design.

This research was conducted for a PhD project partly funded by the Department of Communication & Psychology at Aalborg University, in association with the research centre, Interactive Digital Media and Experience Design; and partly funded by the national research programme, *Our Museum*, which consists of 13 research projects representing five Danish universities and eight museums, one of which was the collaborative museum explored in this research project: the small Danish maritime museum, Limfjordsmuseet (the Limfjord Museum). Part of the research was conducted during a research stay at the Royal Melbourne Institute of Technology (RMIT University) in Melbourne, Australia.

DANSK RESUME

Igennem denne afhandling undersøger jeg udfordringen i at afbalancere oplysning og oplevelse, som museumsinstitutionerne er blevet stillet overfor i forlængelse af oplevelsesøkonomi fra et oplevelsesdesign-perspektiv i samarbejde med et mindre dansk museum. I afhandlingen er det min hypotese, at hvis der designes udforskende brugerinteraktioner i udstillingsdesign, skabes der potentiale for at afbalancere oplysning og oplevelse. Derudover antages det, at IT-baseret oplevelsesdesign kan være en nyttig måde at designe udforskende brugerinteraktion, på grund af oplevelsesdesigns holistiske designtilgang, der låner kriterier for design fra andre designtilgange. Baseret herpå guides forskningen af følgende forskningsspørgsmål:

Hvordan kan principper for IT-baseret oplevelsesdesign guide design, implementering og evaluering af udforskende museumsudstillinger?

Ambitionen har været at identificere kriterier og principper for disse typer designprocesser gennem en række eksperimenter, der kollektivt søger at udvide og tilføje til det eksisterende vidensområde inden for museum experience design. Herigennem blev der generet viden til at forbinde teori og praksis, i applikationen af oplevelsesdesign til en kollaborativ designproces for udstillingsdesign.

Jeg har udforsket disse udfordringer ud fra et oplevelsesdesignperspektiv i samarbejde med Limfjordsmuseet for at undersøge mulighederne for oplevelsesbaseret læring. En samarbejdsproces informeret og guidet af principper for oplevelsesdesign. Desuden har jeg gennem denne forskning appliceret kriterier for emergent narratives: *user-mindset, agency, storification* og *narrative closure* til udstillingsdesignet for at skabe rum for opdagelse og udforskning. Argumentet er at gøre brugerne aktive deltagere i deres egne oplevelser for at skabe deres egen erfaring og fortælling for at fremme uformel læring fremfor passivt at modtage en foruddefineret og struktureret fortælling. Kriterierne for opdagelse defineret i afhandlingen skabte både grundlaget for at designe for opdagelse samt identifikation og evaluering af udforskende brugerinteraktioner gennem fire strategier for emergent user interactions. To er design-drevne: *by Design* og *by Redesign*. Og to er bruger-drevne: *Creative Play* og *by Hacking*.

I afhandlingen har jeg vist, hvordan kollaborative designprocesser kan guides ved hjælp af oplevelsesdesign til udstillingsudvikling, og hvordan samarbejdet i denne proces skaber grundlag for at afbalancere indhold og form for opdagelse ved at have museumsfagfolk og designforskere til at samarbejde gennem hele designprocessen.

Jeg har vist, hvordan opdagende museumsoplevelser har potentialet til både at afbalancere oplysning og oplevelse og understøtte den uformelle læringsoplevelse. Ved at designe for opdagelse, er ikke et tredje perspektiv på oplysning-oplevelses dikotomien, men en tilgang til at opløse konflikten og afbalancer forholdet mellem oplysning og oplevelse for at undgå disneyficering og formel læring. Dette gøres ved at designe formålsbevidste udstillinger, der giver brugerne mulighed for at skabe mening igennem den aktive deltagelse. Disse bidrag er kondenseret til teoretisk framework, ExD-framework, som er baseret på mine eksperimenter og har til formål at skabe rammen for at kunne designe udforskende udstillinger ved hjælp af oplevelsesdesign.

Dette Ph.D.-projekt er delvist finansieret af Institut for Kommunikation og Psykologi på Aalborg Universitet i samarbejde med forskningscentret Interaktive Digitalemedier og Oplevelsesdesign; og delvist finansieret af det nationale forskningsprogram *Vores Museum*, der består af 13 forskningsprojekter i et samarbejde på tværs af fem universiteter og otte museer i Danmark; hvoraf et er dette projekts samarbejdsmuseum, Limfjordsmuseet. En del af forskningen blev udført under forskningsopholdet ved Royal Melbourne Institute of Technology (RMIT University) i Melbourne.

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TABLE OF CONTENTS

1.Introduction 1

1.1. Experience Design: From Theory to Practice 1

1.2. The 'Our Museum' Programme 3

1.3. The Limfjord Museum 5

1.4. Museum Design Research 7

1.5. Expanding the Field 15

1.6. Working Hypotheses 16

1.7. Research Questions 17

1.8. The Design Research Experiments 18

2. Research Design 23

2.1. A Strategy of Inquiry: Constructive Design Research 24

2.2. An Explorative & Hypothesis Based Research Design 30

2.3. A Worldview: A Practice Based Design Research Paradigm 40

2.4. Research Methods: Design Experiments 42

2.5. Summarising the Research Design 61

3. Papers 66

3.1. [P1] REDOing the Museum Exhibition Design 68

3.2. [P2] Retningslinjer for Udviklingen af IT-Baseret Oplevelsesdesign 76

3.3. [P3] The Gamified Museum 116

3.4. [P4] Designing for Emergent Interactions 136

3.5. [P5] How to Design for Exploration 153

3.6. [P6] Learning through Exploration at Museum Exhibitions 155

4. Connecting the Dots 160

4.1. Designing Explorative Exhibitions 160

4.2. Implementing Explorative Exhibition Design 164

4.3. Evaluating Learning through Exploration 176

4.4. Summarising Contributions 178

5. Conclusion 186

6. Further Perspectives 192

Bibliography 197

Appendix Overview 208

LIST OF FIGURES

Figure 1: An Illustration of the Limfjord Museum
Figure 2: This Research Design's Components and Their Interaction
Figure 3: The Drive Wheel of Constructive Design Research
Figure 4: The Drive Wheel Model for this Research Project
Figure 5: Overview of the Research Process
Figure 6: The Methods of the Five-Phase Design Process
Figure 7: Images of Workshop Settings, Visualisations and Generative Tools
Figure 8: Moodboard for the Exhibition, *The Amazing Eel*
Figure 9: Design Research Map
Figure 10: Pictures of the Exhibition, *The Amazing Eel*
Figure 11: Simplified Version of the XD-Framework as Presented in [P2]
Figure 12: The Emergent Narrative Model for the Exhibition, *The Amazing Eel*
Figure 13: Venn Diagram for Visualising the Iterative Process of Creating ExD
Figure 14: The Flowchart Narrative Model and the Vector with Sidebranches Model
Figure 15: The ExD-Framework Modified
Figure 16: The *Our Museum Game* at Play
Figure 17: The *Our Museum Game's* Gameboard
Figure 18: Findings and Contributions

LIST OF TABLES

Table 1: The Typology of Five Distinct Methods of Knowledge Production

Table 2: Overview of the Design Experiments Conducted in the Research Project

Table 3: Overview of Review Topics, Methods and Examples of Work

Table 4: Overview of Design Workshops, Their Objective, Tools and Data

Table 5: Overview of the Three Iterations of the [Ex_C] Design Insights Experiment

Table 6: Communication Approaches in Museums

Table 7: Methods Used in the User Study

Table 8: Overview of the Research Question and Experiment Connected to [P1]

Table 9: Overview of the Sub-Question and Experiments Connected to [P2]

Table 10: Overview of the Sub-Question and Experiment Connected to [P3]

Table 11: Overview of the Sub-Question and Experiments Connected to [P4]

Table 12: Overview of the Sub-Question and Experiments Connected to [P5]

Table 13: Overview of the Sub-Question and Experiments Connected to [P6]

PREFACE

This dissertation is based on the results of a three-year-long PhD study at the Department of Communication & Psychology at Aalborg University, in association with the research centre, Interactive Digital Media and Experience Design, and as part of the national research programme, *Our Museum,* which consists of 13 research projects in collaboration with five Danish universities and eight museums. The dissertation consists of six original papers and a framing text with the dissertation's research questions, research design and summary of contributions.

The following original papers are included in the dissertation:

[P1] **Paper 1:** Madsen, K. M. (2017). REDOing the Museum Exhibition Design. In A. L. Bang, M. Mikkelsen, & A. Flinck (Eds.), *Cumulus REDO Conference: Proceedings Design School, Kolding* (pp. 690–695). Kolding: Cumulus. (published)

[P2] **Paper 2:** Madsen, K. M. (2019). *Retningslinjer for Udviklingen af IT-baseret Oplevelsesdesign* [Guideline for Creating IT-based Experience Design]. In J. F. Jensen (Ed.), *NN* (not named yet) (p.). Aalborg: Aalborg University. (in press)

[P3] **Paper 3:** Madsen, K. M. (2019). The Gamified Museum - A critical literature review of gamification in museums. In T. Jensen, C. Rosenstand, & O. Ertløv (Eds.), *GameScope: The potential for gamification in digital and analogue places* (p.). Aalborg: Aalborg University Press. (in press)

[P4] **Paper 4:** Madsen, K. M., & Vistisen, P. (2019). Designing for emergent interactions: Strategies for encouraging emergent user behaviour & serendipitous research findings. *The Design Journal, 22*(1), 1807–1820. Taylor & Francis. (published)

[P5] **Paper 5:** Madsen, K. M., Skov, M., & Vistisen, P. (2019). How to design for exploration through emergent narratives. *The Design Journal*. Taylor & Francis. (under review).

[P6] **Paper 6:** Madsen, K. M., & Jensen, J. F. (2019). Learning through exploration at museum exhibitions. *Visitor Studies*. Taylor & Francis. (under review)

Reprints of the papers are included and referenced in this dissertation. The original publications were resized to fit the layout of the dissertation, without alterations to the content or original layout. The papers are referenced as [P1] to [P6], and excerpts are referenced and used throughout this framing text.

The structure: This dissertation is divided into six chapters: *1. Introduction,* which introduces and frames the research project and research question. *2. Research Design,* which presents the strategy of inquiry and the experiments conducted. *3. Papers,* which contains the original papers. *4. Connecting the Dots,* which discusses the contribution. *5. Conclusion,* which addresses the working hypotheses and answers the research question. And lastly, *6. Further Perspectives* which reflects on further research.

“When you're curious, you find lots of interesting things to do.”

- Walt Disney

1

introduction

1. INTRODUCTION

The area of interest for this dissertation was experience design in a museum exhibition context and how it can be used as an approach for designing explorative exhibitions. The general purpose of the dissertation is to investigate the above-mentioned domain. To explore these perspectives, the research was conducted through a collaborative design process with the Limfjord Museum. The goal was to identify key criteria and principles for these types of design processes through a series of experiments that collectively sought to expand and add to the existing field of knowledge within museum experience design. Thus, knowledge was generated to bridge the gap between theory and the practice of applying experience design as a collaborative design process for exhibition making.

The following sections outline the motivation and foundation for the area of concern and for the research question, from personal motivation to a research programme with a collaborative museum and lastly to the theoretical positioning of the research project. These sections describe the foundation for expanding the field, generating working hypotheses, formulating the research question and, lastly, conducting the experiments of the research project.

1.1. EXPERIENCE DESIGN: FROM THEORY TO PRACTICE

In December 2014, my study partner and I were discussing different subjects for our master's thesis in Experience Design. We both had just finished our internships, where we had put our theoretical knowledge and tools from experience design to the test in practice. This experience left us both with a feeling of missing a more tangible toolbox or framework for how to deploy experience design into a design practice. Experience design is one of the newer traditions and design approaches within *Human–Computer Interaction,* or HCI (Jensen, 2013), and borrows theory and principles from other traditions, such as *usability, interaction design, user experience design* and so forth. Jensen (2013) described experience design as a design approach closely connected to the traditions of user experiences and user experience design. Experience design, however, diverges from user experiences and user experience design in its focus on holistic experiences: i.e., the interaction between user and object in a given context, not isolating one or two elements of an experience. Another difference is that user experience design is specifically directed towards the domain of IT systems, whereas experience design is directed at all domains that can relate to experiences.

Multiple theorists are working on defining *experience design*. Amongst others, Jantzen, Vetner and Bouchet (2011), who focus on experience design in a broader perspective,

have defined ten criteria for 'the good experience' based on case studies. Hassenzahl (2010) as well as Forlizzi and Battarbee (2004) have focused on the digital aspect in experiences and how experiences can be optimised through a digital layer. Pine and Korn (2011) have defined levels of digital technology infused or supported experiences from reality to virtual, as a means to improve user value. For their part, McCarthy and Wright (2004, 2010) have examined user experiences with digital products. These approaches are all focused on elements of what is required to identify the complexities of experiences, with or without a digital layer, and how we can understand these complexities. Yet, this framing is still in flux and is missing clarification as to what characterises design in IT-based experience design.

Experience design and user experience design are described as both practices (Hobbs, Fenn, & Rasmini, 2010) and design approaches as well as fields of knowledge (Roto, Law, Vermeeren, & Hoonhout, 2011). Hobbs et al. defined the casual practice of user experience design as a '*practice outside of a formal, institutional discipline framing it*' (2010, p. 41), further describing user experience design as a practice still in flux. In the same year, both Wright and McCarty (2010) and Hassenzahl (2010) wrote publications on experience-centred design and experience design in which they each presented models of experiences and different aspects of analysing people's experiences to put into practice through personas and scenarios. They further described how these understandings of how people experience can be used to inform design. Jensen (2013) provided a thorough discussion of paradoxes in user experiences, experience design and user experience design to reach an understanding and definition of the three concepts. Jensen described experience design as a design approach whereby users and the quality of their experiences are central, whereas user experience design focuses on the system's interaction potentials. In broader terms, user experience design is a subset of experience design, with the former being more focused on the IT field. The latter, experience design, is more generally oriented towards product and service experiences.

Without a doubt, as a theoretical field, experience design gives much attention to understanding user experiences in a broader sense and how these understandings, derived through analysis, can be employed into design matters. That said, none of the above-mentioned work provides a designer or design researcher with any framework or guideline as to how to apply experience design as a design approach, except for keeping the user's experiences at the core of the design and borrowing methods and design principles from other design traditions. Thus, the transition from theory to practice and vice versa is rather broad and vaguely defined. Studies that have focused on this transition were often set in user experience design and within an agile development process, e.g., Ferreira, Sharp and Robinson (2012), who researched the transition from theory to practice and the design approaches' effect on the collaboration between designers and developers. These researchers pointed to a missing link between tools for the development of user experience design and the practical development process and approaches (Ferreira et al., 2012). Furthermore,

Da Silva, Silveira, Maurer and Hellmann (2012) have researched the transition between theory and practice in relation to user experience design by defining a literary framework to test in a specific design setting. Their experiment supported their hypothesis about a gap between theory and practice (Da Silva et al., 2012). Apart from Ferreira et al. (2012), Da Silva et al. (2012) and Jensen (2013), few publications on experience design have been written since 2013. Rather, another tendency has emerged, one in which experience design has become an approach in specific contexts, such as *tourism experience design* (Kim & Fesenmaier, 2015), *sport experience design* (Funk, 2017), *service experience design* (Gruber, De Leon, George, & Thompson, 2015) and *museum experience design* (Calvi & Vermeeren, 2015). The last context is central for this dissertation and will be explored in detail in section 1.4.

Nevertheless, the gap between theory and practice has led to a journey by which I have sought to define a theoretical-based framework for deploying experience design in design practice through my master's thesis. Consequently, the experience design framework and gap between theory and practice were my initial steps into this PhD fellowship – an opportunity to further explore the potentials of experience design as a design approach for design practice.

1.2. THE 'OUR MUSEUM' PROGRAMME

This PhD project was conceptualised as part of the national research and development programme, *Our Museum*, and is one of 13 projects, comprising five Danish universities and eight museum partners. The *Our Museum* programme facilitates new forms of citizen engagement by developing and studying how museums interact with the public in innovative ways. Through the *Our Museum* programme, we are keen to understand how museums' innovative practices of public interaction handle the concepts of enlightenment and experience, since these concepts operate as key dimensions of museums' societal engagement in the past as well as in the present. Through the programme's 13 projects, we design, document and evaluate how forms of public interaction and societal engagement have changed – and can change – to benefit citizens and society at large. *Our Museum's* research and development goal is to contribute to the theoretical, empirical and practical development of Danish and international museums' knowledge dissemination to enhance local and regional development by involving both large and small museums (appendix A1.1 & A1.2).

The premises of *Our Museum* originate from the fundamental challenges that the landscape of dissemination in museums is facing. Throughout the last 20 years, there has been an ongoing discussion in regard to the enlightenment-experience relationship in museum dissemination (e.g. Christensen & Haldrup, 2019; Floris & Vasström, 1999; Kirschenblatt-Gimblet, 2000; Sæter, 2004; Skot-Hansen, 2008) - a discussion based on different positions ranging from dichotomic to symbiotic.

Museum communication and practice is influenced and stimulated by enlightenment–experience tensions and configurations, and thus that museum practices have always interwoven these aspects, yet one always tends to predominate. The discussion on the enlightenment–experience relationship positions enlightenment as being linked to the factual, informative, formative, and educational, whereas experience is related to the engaging, involving, emotional, narrative, imaginative, and entertaining. The museum is institutionally responsible for selecting what will be displayed and for enabling enlightenment through labels and via audio, video and interactive media, thus navigating the tensions and configurations between enlightenment–experience. However, when museums enter the experience domain, they also enter a competition with, e.g., entertainment parks and other cultural institutions, which produce additional user expectations (Mossberg, 2003; Skot-Hansen, 2008). With the rise of personalised technology, new demands by the users of cultural institutions have emerged. Consequently, users accustomed to personalised experiences expect more from their museum experience (Drotner et al., 2011), a change that has increasingly become a process of integrating digital technology into communication design to create greater opportunity for participation and personalisation. With increased user participation in the museum experience, it is relevant to discuss whether our current models of user experiences are sufficient to describe a much more diverse landscape of interactive museum experiences, one which must still be able to enlighten the user. Thus, dissolving the tension between enlightenment and experience through new models of approaching dissemination.

Our Museum is not the only programme or project concerned with this topic. At the frontier of research and praxis in this field, which seeks to inform design and improve practice as well as to contribute to the research community, we can point to European initiatives, like EuNaMus, meSch, MeLa and Europeana (network); and to Nordic projects, such as NordLac (Network), The GIFT Project and DREAM.

When I applied for this PhD fellowship, the project was framed under the title, '*Design and evaluation of experiences as agents for learning in a museum context*' ([A1.1] - translated from Danish). My premise was to approach the project through the lens of an experience design approach to design for museum experiences that supported informal learning. The specifics of which type of experience potentials for learning I should design, implement and evaluate were not clear until I visited and conducted initial research at and with the project's collaborative case museum: *the Limfjord Museum*.

1.3. THE LIMFJORD MUSEUM

Along the fjord running through the northern part of Denmark, *the Limfjord Museum* (Figure 1) lies tucked between the beach to the fjord and the artificially excavated channel, completed in 1856. The museum is surrounded by miles of water and beautiful, wild nature, with historically preserved boats swaying in the water. The Limfjord Museum is a maritime cultural history museum which, as with many other museums, communicates their heritage field through exhibitions. Since this museum is obligated to preserve and communicate the cultural history connected to this body of water, 'Limfjorden', the museum has, apart from exhibitions, an array of activities managed by nature guides in the museum's surrounding landscape. Here, the guides communicate the cultural and natural heritage of the Limfjord and what makes the surrounding terrain, including Limfjorden, biologically significant and distinct throughout time.

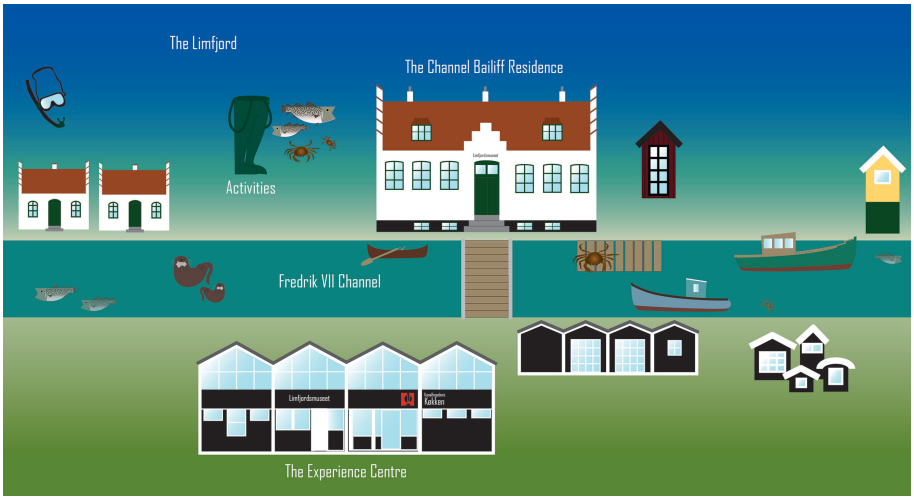


Figure 1: An illustration of the Limfjord Museum's buildings, surroundings and activities.

Outdoor activities in the Limfjord include, e.g., catching crabs, exploring the underwater world in waders or by snorkelling, touching and interacting with marine creatures, and attempting to make food from natural resources – these activities stand in contrast to the museum's exhibitions. The exhibitions are placed indoor and are quite classic in design, with texts and objects in glass displays presented in a structured pattern through the exhibition building. The outdoor activities demand a higher degree of engagement from users, since they can catch crabs, row boats, snorkel or catch fish; users can also interact by touching and doing as well as by obtaining information about what they find interesting by asking questions of the nature guides.

The initial premise of the Limfjord Museum's participation in the *Our Museum* programme was grounded in the museum's intention to develop a new, permanent exhibition about the history of the Limfjord's seafaring under the working title, '*Kurs & Kompas*' (Course & Compass). Conceptually speaking, the exhibition was intended to focus on interactive digital media as a means to create learning possibilities through fascination and wonder instead of just facts. The case collaboration provided an opportunity to impact and co-design an actual exhibition and to subsequently evaluate the effects of the users' experiences. The initial research questions were formulated as follows: *How do you, with digital interactive media, design engaging experiences that are able to optimise communication and learning in connection to the maritime cultural heritage – and to what extent does learning occur?* The project was described under the title, '*Design and evaluation of experiences as agents for learning in a museum context*'; and methodologically, the design project should focus on research through design, action research and experience design, while evaluation would occur through ethnological methods like participatory observation and qualitative user surveys. The project should especially focus on *Our Museum's* overall representation and user dimensions, and the research project results should have great relevance for the many museums that use digital technologies and media as a means towards experienced-based learning.

This initial project description created a rather clear and specific framing for the project and collaborative effort, but there were still quite a few remaining questions, mainly revolving around contextualisation, that needed researching in order to set the stage for the project before defining the research question within the given frame. These questions included the following: How do visitors use the Limfjord Museum? Are they visitors, guests or users? How do the employees interact, think about and approach the people who come to the museum? And, from my perspective: How can this context be approached through experience design, and how can experience design help understand the museum as a context for experiences?

Thus, in the summer of 2016, I went to the Limfjord Museum to observe and talk to guests and employees (appendix A4.1). It was a typical Danish summer, with shifting temperatures, some days with radiating sun and blue skies, other days with sun and hard winds, and other days with warm summer rain. No matter the weather, the museum was well-visited, especially for a small museum far removed from large cities. But what makes this museum special? What is working and what is not? Through these observations, it quickly became clear that the museum's main attractions were the activities happening outside. Here, visitors could interact with nature, history and the nature guides who told fact-based stories about the area. All these activities relegate the exhibitions to a secondary part of the museum experience. But why are these activities more attractive? Within a few weeks of observations, it became clear that there was a rather large difference between activities and exhibitions in terms of the way in which visitors interacted with history. When I observed the visitors outside, they were active, touching, sensing and

asking questions of each other and of the nature guides. But when they entered the exhibitions, almost everyone became quiet, like they had just walked into a study hall or library. They put their hands behind their backs and slowly made their way through the exhibition, looking, reading and maybe discussing objects, pictures and paintings. What is the difference between these two significant parts of the museum experience? The outdoor activities demand a higher engagement from the users, since they can only derive an experience by active interaction. In these activities, we can observe the essence of exploring the museum's natural and cultural history, for both adults and children, which stands in contrast to the more passive and quiet behaviour observed in the exhibitions. The contrasts at this museum between the exhibition spaces and outdoor activities are quite striking. It might not be a problem or a crucial issue for users at the museum, because users are very different and are visiting the museum for many different reasons (Falk & Dierking, 2013/2016). Nevertheless, the difference between the outdoor activities, which encourage a more free-form, exploratory and inquisitive user interaction, and the more structured and passive exhibitions illuminates a rather significant contrast. Thereby, this begs the questions: *How can we, through experience design, design for explorative museum experiences?* and *How does free exploration affect learning potential in museum experience*?

But why is this premise relevant in the research context of *Our Museum* and to my initial interest in the project? With experience design, I have a design approach and tools that can bridge theory and practice, which a field such as museums can benefit from through research on how design, implementation and evaluation can change via new approaches to dissemination. The Limfjord Museum is particularly struggling with their exhibitions becoming passive, secondary experiences to users. This stands in sharp contrast to their outdoor activities, which, as the word emphasises, are filled with activity and explorative interactions. But how does the above area of interest position this research project within a broader field of research?

1.4. MUSEUM DESIGN RESEARCH

The above section set the stage for positioning the problem area in the cross section of design research and exhibition design, posing the question of whether experience design can be applied as a design approach for designing museum exhibitions, for researching new ways of handling enlightenment through experience. The goal for this section is to outline in which research area this research project positions itself, as well as its contributions. The broader field of *Museum Design Research* will be described first, before moving on to the sub-area of *Museum Experience Design*, a context-specific approach within experience design, as mentioned in section 1.1. Here will be positioned the contributions of this research project. Consequently, this section will start by outlining the current state of the landscape of exhibition design. MacLeod, Dodd and Duncan (2015) described the cross section of design research and cultural heritage exhibition design as *museum design research* (p. 314), an area

which includes design fields such as museum architecture, exhibition design, and experience or interpretive design. Museum design research has, according to MacLeod et al. (2015), matured significantly since 2000 and continues to unfold. Research areas within museum research are being shaped and continuously developed by a growing number of museum design researchers who are representative of the diversity of museum design (Hughes, 2015). Most interestingly, MacLeod et al. (2015) described museum design research as a small, dynamic research community which comprises:

> … a whole range of people from museums, the creative industries and academia and who span fields as diverse as architecture, various design disciplines, visitor studies, learning, theatre, animation, film and museum studies. The cross-sector and multidisciplinary nature of the network means that it is populated by professionals of all career ages with exceptional thinking and research skills, highly sophisticated design skills as well as museum-based skills, knowledge and, importantly, agency. (p. 314)

In a description of a cross-disciplinary research area which is still unfolding in both practice and research, Hughes (2015) wrote that exhibition design requires an army of exhibition professionals orchestrated by an exhibition designer to ensure an environment that transforms a collection into an inspiring experience for users to connect with, making exhibition design a collaborative effort. MacLeod et al. (2015) pointed to six areas as being the most significant within this area of museum design research: *Analytical studies of exhibition making*, *Theoretically informed approaches to understanding museum experience*, *Narrative approach to museum design*, *Understandings of the place of physical stuff in museums experiences*, *Historical analyses of exhibitions and visitor embodiment* and *Research produced by design practitioners*.

Even though both MacLeod et al. (2015) and Hughes (2015) recognised the interdisciplinarity or multidisciplinarity of exhibition design teams, none of the six research areas dives deeper into collaborative studies. In a newer study, Knudsen and Olesen (2018) wrote a chapter on the *complexities of collaborating*, about which they argued that museum studies on collaborative design can be divided into three constellations: *internal collaboration across different museum staff groups; collaboration across museum staff and external design professionals;* and *collaboration across museum staff and museum users (*Knudsen & Olesen, 2018). Furthermore, in the anthology, *The Future of Museum and Gallery Design*, MacLeod, Austin, Hale and Hing-Kay (2018) asked contributors to explore experimentation, participation and collaboration between designers, visitors, museum specialists and researchers in various formations to find new ways of creating museum designs. Since these studies on collaboration in exhibition making are of an analytical character, they could be placed under *Analytical studies of exhibition making*. Nevertheless, if, as Hughes (2015) described it, exhibition design requires an army of exhibition professionals to ensure an inspiring experience for users, as well as studies on collaborative effort and how

to orchestrate it, then this begs the question of why this area in museum design research is not more prominent. For *Analytical studies of exhibition making* MacLeod et al. (2015) referred to four anthologies, each focused on the analysis of different aspects of exhibition making (Macdonald & Basu, 2007; MacLeod, 2005; MacLeod, Hanks, & Hale, 2012; Marshall, 2011). What characterises these studies, apart from offering a broad look into exhibition making in the twenty-first century, is that they discuss museums as an architectural object and therefore approach exhibition making from an architectural perspective. MacLeod (2005) underlined that everyone involved in the process of making museum spaces must shift their attention from object making to experience making; the author also highlighted the malleability of museum spaces. Since *analytical studies of exhibition making* is an area clearly grounded in the analysis of exhibition making, it was important to add MacDonald (2002) to this area. Even though MacDonald's analytical study was set in science museums, it nonetheless explored agendas and assumptions of exhibition making through an ethnographic study and described what lies behind the making of an exhibition.

When discussing *analytical studies of exhibition making*, another relevant aspect is museum communication and the use of media and technology in exhibitions. In 2011, Drotner et al. published a Danish anthology on the subject of interactive museums. One of its contributions focused on analysing different aspects of interactions between people and as supported by technologies. One of the contributors to this publication was Simon, who contributed with a translated chapter on principles of participation from her own book, *The Participatory Museum* (2010). Participation, she argued, goes beyond interaction by requiring active participation from the users. The museum provides potential for interaction and participation, but it also demands the users to give back by being active. Simon encouraged two-way communication with her participating approach, between both users and museum practitioners and users. Hughes (2015), who we will return to later, has a chapter focused on 'Interactives' (pp. 155–166), which describes and exemplifies technologies, media and user perspectives of interaction in exhibition making. Another anthology on media and communication was published in late 2018, *The Routledge Handbook of Museums, Media and Communication* (Drotner et al., 2018). In this handbook, the authors focus on mediated communication, which has taken over with the rise of technology. The anthology explores different aspects of what it means to have the concept of *mediated communication* as the key concept of museum studies. This work has provided a broad scope of analytical and theoretical museum studies with mediated communication at its core. It is within this anthology that Knudsen and Olesen's (2018) study on the *complexities of collaborating*, mentioned earlier, can be found. These studies underline that exhibition making is not only a question of gestalt and architectural aesthetics but also one of mediated communication.

Museums and exhibitions exist to '*provide opportunities for the appreciation, understanding and promotion of the natural and cultural heritage'* (ICOM, 2011), meaning

that museums and their exhibitions should enlighten the public, making the users' experience an important aspect of exhibition making. Consequently, the user perspective is present in one way or another in the before-mentioned publications, but as MacLeod et al. (2015) pointed out, there is within museum design research a body of literature focused on the understanding of *museum experience* (Bedford, 2014; Falk & Dierking, 2013/2016; Roppola, 2014). What characterises these studies are user-cantered approaches to understanding experiences, meaning making and learning from the users' perspectives in order to enhance the discussion of how museum experiences and exhibitions should take shape to optimise museum experiences. Bedford (2014) discussed the potential of viewing exhibitions as pieces of art that provide users with aesthetic experiences, catalysing thinking and learning through user imagination. Education and experiences become one in *an* experience, in reference to Dewey (1934/2005). Falk and Dierking (2013/2016) discussed users' experiences and user types based on their contextual model of learning before, under and after a museum experience, creating a thorough picture of why people go to museums, what they do there, how they learn, and what museum practitioners can do to enhance these experiences. Roppola (2014) sought to understand the interface between visitors and exhibition environments through the analysis of visitors' meaning-making accounts. Roppola offered an evidence-based conceptual framework for understanding what goes on as visitors wander around exhibitions. Hooper-Greenhill (1994) also made a significant contribution to the understanding of museum experiences by examining the ways in which museums need to develop their communicative functions and explore the power of objects to inspire and stimulate as well as to analyse the use of language in museums and galleries.

The above-mentioned areas of museum design research represent two different approaches to museum design: exhibition making as an aesthetic endeavour, often from an architectural point of view, versus exhibitions' effects on user experiences in meaning making and learning. A liminal, i.e., transitional, area is presented by Hughes (2015), Dean (1994/2002) and Dernie (2006). They all contributed to analytical and theoretical perspectives on exhibition making, as did the previous studies, but what makes them stand out is that they each offered a thorough guide to exhibition making. Hughes (2015), for instance, exemplified each design principle and approach in order to visually emphasise the power of design, ending each section with a list of *dos* and *don'ts*. Alike, Dernie (2006) addressed different approaches and technics of exhibition design analytically and practically by exemplifying through international exhibitions. Dean's (1994/2002) work on exhibition design is addressed to the *students of the art of exhibition* and is therefore akin to a handbook or manual. Dean walked the reader through everything from types of exhibition to design decisions to evaluation and computers in exhibition design. This work is thus the most practically oriented of the three, but it still takes a theoretical approach to explaining what and why. In the mid-1990s, Dean's work was considered the only textbook of its kind for approaching exhibition development from an integrated approach, from theory to practice. In continuation of the

analytical, theoretical and practical perspectives on exhibition making, one area that keeps emerging in the literature is narrative approaches and perspectives on exhibition design. MacLeod et al. (2015) described this area in museum design research as a narrative approach to museum design based on the understanding of users as narrative, meaning-making beings who make sense through both body and mind. The authors referred to MacLeod et al.'s (2012) anthology, *Museum Making: Narratives, Architecture, Exhibitions*, which examines the creation of new, purpose-built museums and galleries, suggesting that a fundamental re-evaluation of the processes of designing and shaping museums has evolved throughout the last decade. In this publication, MacLeod and colleagues explored the spatial character of narratives in museums and its potential for meaning making in human perception and imagination. The wide variety of contributions in this anthology approach narratives in museums from the lens of perception, embodiment, space, identity, media and mediation. Bedford (2014) discussed how story and imagination together constitute an important part of users' aesthetic experiences in exhibitions for their meaning making. Amongst others, Dernie (2006) described how exhibitions are narrative spaces, even defining exhibition design as narration and using a narrative approach to order objects in a space. Hughes (2015) described narrative design as the current, and most popular, method for arranging content in exhibition making – a method for scripting an over-arching story in an exhibition. Explaining that narrative design dictates an exhibition's content by putting together a story sequence, one with a beginning, middle and end, Lupton (2017), from the Cooper Hewitt Museum, wrote *Design is Storytelling*, emphasising that human beings seek and create patterns when navigating the world, feeling intrigued, stimulated and sometimes frustrated when these patterns break. *Design is Storytelling* is, as Lupton (2017) described it, a playbook for creative action. The tools and concepts presented in the book address a dynamic, user-focused design practice, one which is seen in exhibition making today.

The above outlines and indicates that research within *museum design research* has a wide scope, from architecture, communication, mediation and narrative approaches to user studies on meaning making and learning to practical guides on exhibition making. These studies highlight that exhibition making revolves around experience making for users. Both MacLeod (2005) and Dernie (2006) directly argued that exhibition making has shifted from object-focused to experience-focused, recognising the role of experiences in contemporary exhibition design. Designing more experience-oriented exhibitions requires attention to narrative structures for meaning making and learning (Bedford, 2014; Dernie, 2006; Hughes, 2015; Lupton, 2017; MacLeod et al., 2012; MacLeod et al., 2015) and an understanding of the users' motivation, learning style and actions in museum spaces (Bedford, 2014; Falk & Dierking, 2013/2016; Roppola, 2014), as well as collaborative effort between, as Hughes (2015) described it, an army of exhibition professionals (Hughes, 2015; Knudsen & Olesen, 2018; MacLeod et al., 2012). As *museum design research* represents a broader area of research, we will, as stated in the beginning of this section, look more closely at a more specific area of research, *museum experience design*, below.

1.4.1. MUSEUM EXPERIENCE DESIGN

In 2018, Vermeeren, Calvi and Sabiescu (2018) published the anthology, *Museum Experience Design: Crowds, Ecosystems and Novel Technologies,* indicating a sharpened focus on experience design, user-centred approaches and technologies in exhibition design and exhibition making. What sets these publications apart from the other studies presented under *museum design research* is their focus on experience design in regard to technology, interaction design and storytelling, which in some ways builds bridges between the constructive approaches to exhibition making (Dean, 1994/2002; Dernie, 2006; Hughes, 2015;) and the understanding of user experience (Bedford, 2014; Falk & Dierking, 2013/2016; Hooper-Greenhill, 1994; Roppola, 2014) by focusing on technologies that can mediate, initiate and enhance interactions between exhibitions and users to enrich the overall museum experience. The interactive museum and the heightened focus on mediated communication are also the heart of the anthologies by Drotner et al. (2011) and Drotner et al. (2018), discussed earlier. Vermeeren et al. (2018) included studies that took a user-centred design approach in designing for experiences in the context of museums – therefore, *museum experience design*. This term is mentioned by Galani in a 2003 publication, where it is referred to as a 'current practice' (p. 9) without further description or elaboration of the term. Galani's (2003) study focused on user learning through social experiences in- and off-site of museums and how to design for such experiences; the study also referred to the design of museum experiences in general. In 2004, Russo and Watkins published a paper, 'Creative New Media Design: Achieving Representative Curatorial Practice Using a Cultural Interactive Experience Design Method', in which museum experience design is mentioned in regard to '[…] the role of new media in the transition from the traditional, curator-driven modernist museum to the community-based post-museum' (p. 1). They introduced a work-in-progress method, called *Cultural Interactive Experience Design*, in which they described a table with strategies for a post-museum environment called 'TD(t), post-museum experience design' (p. 10). They did not elaborate further on post-museum experience design as such, but rather focused on the cultural interactive experience design method. The term *post-museum* refers to Hooper-Greenhill's (2000) description of the future of museums as a community space for events, workshops, performances, etc., in contrast to the more classical museum space with displays, text placards, etc.

Despite little research in the early 2000s, studies on museum experience design have steadily increased since 2015. Calvi and Vermeeren (2015) presented an approach to designing museum experiences for small museums by introducing a method for end-users and stakeholders to collaboratively design these experiences, based on DIY technology, to realise their design ideas. One idea that Vermeeren and Calvi (2018) further explored in their chapter on how to get small museums involved in digital innovation for Ciolfi, Damala, Hornecker, Lechner and Maye's (2018) anthology, *Cultural Heritage Communities: Technologies and Challenges*. Vermeeren, Calvi, Sabiescu, Trocchianesi, Stuedahl and Giaccardi (2016a) hosted a workshop for CHI 2016 that

was intended to explore the implications of involving the public in the design of museum experiences. Consequently, they were interested in how future museums will relate to their public as a result of museum experience design: '1) dialogical engagement of the public; 2) addressing crowds as audiences; 3) the use of Internet of Things (IoT) and Do-It-Yourself (DIY) technology in museums; and 4) designing for museum systems and institutional ecologies instead of for individual museums only' (Vermeeren et al., 2016a, p. 3347).

The current trends of museum experience design are further explored in Vermeeren, Shih and Yoon's 2016(b) publication, *Design for Experiences Beyond the Museum*. In this publication, they explored the functioning of museums as changing from single museums to museums as part of large institutional ecosystems, explaining that designing for experiences is no longer designing only for visitors' experiences before, during and after a museum visit; rather, a more holistic approach to designing is required, one which extends beyond individual museum visits.

Apart from these individual studies focused on museum experience design, Vermeeren et al. (2018) published their 16-chapter anthology, *Museum Experience Design: Crowds, Ecosystems and Novel Technologies*, presented in the beginning of this section, which touched upon the design for museum experiences, as a continuation of Vermeeren et al.'s (2016a, 2016b) CHI 2016 workshop, which was organised based on the four trends of museum experience design previously described, with a slight change in wording: (1) engaging the public, (2) cultivating diverse audiences, (3) availing ourselves of the benefits of digital technology, and (4) leveraging museums' roles as players in larger economic and cultural ecosystems. The anthology takes its point of departure in the notion that museums have much to learn from HCI and the literature about user experience. If they are willing to do so, then museums can benefit from the impact of human- or user-centred design approaches. Another publication focused on museum experience design was published in 2017 by Dal Falco and Vassos. The paper, titled 'Museum Experience Design: A Modern Storytelling Methodology', proposed museum experience design as a new methodology for interaction design, interactive storytelling and artificial intelligence in relation to cultural heritage, arguing that the interdisciplinarity of these design traditions offers opportunities for users to gain knowledge, focusing on the use of modern technology when designing these types of interactive museum experiences.

Here, *museum experience design* studies explicitly focus on different aspects of museum experience design as both a discipline and a specific design approach within museums with a HCI perspective. Nevertheless, this does not mean that no other study on design for museum experiences in an HCI tradition has been conducted or published; rather, the goal for this section was to outline this particular area of museum design research, e.g., Vermeeren et al.'s (2018) anthology, which includes different studies on museum experience design. Not all studies discussed here employed the term *museum experience design*; some presented different examples

thereof. Through the above, it becomes evident that this research area is dominated by Vermeeren and Calvi, who either authored or edited most of the literature on museum experience design in earlier years. Both coming from an HCI tradition and defining their field of research as being in museum experience design, MacLeod et al. (2015) pointed to experience design as one of several design approaches within museum design research. However, as one museum design research area, experience design has seen an increase in activity within the last five years. As mentioned earlier, museum experience design is in many ways bridging constructive approaches to exhibition making (Dean, 1994/2002; Dernie, 2006; Hughes, 2015) with the understanding of user experience (Bedford, 2014; Falk & Dierking, 2013/2016; Hooper-Greenhill, 1994; Roppola, 2014) by applying methodological traditions of HCI to museum exhibitions to initiate and enhance interactions between exhibitions and users to enrich the overall museum experience. It is clear that museum experience design as a research area has its origin in HCI (Calvi & Vermeeren, 2015) in contrast to museum design research, which is contextualised in an HCI tradition (Calvi & Vermeeren, 2015; Dal Falco & Vassos, 2017; Galani, 2003; Russo & Watkins, 2004; Vermeeren et al., 2016a; Vermeeren et al., 2018).

Since this project was initiated in 2016, Dal Falco and Vassos' (2017), Ciolfi et al.'s (2018) and Vermeeren et al.'s (2018) work have been published; thus, these studies were not part of the initial problem definition. Nevertheless, the increase in research within this area indicates growing interest in the potential of experience design as a design approach in museum exhibition and experience making – yet there are still facets to explore. Increased research in museum experience design also refers back to the initial reference to the development of research within experience design, which is becoming a more context-directed design approach within different fields of research. In this instance, museum design research is triggering an interest in transitions of HCI and in the practice of experience design.

1.5. EXPANDING THE FIELD

My motivation for researching this topic is not to claim to have discovered a new field of research within museum design research, but rather to add to the expanding field of museum experience design. As mentioned in section 1.4.1, trends in museum experience design point towards it being a design approach from HCI that incorporates interaction design and technologies into the modern- or post-museum (Russo & Watkins, 2004), and thereby also an approach that can support both collaboration and design in smaller museums (Calvi & Vermeeren, 2015; Vermeeren & Calvi, 2018) as well as a new methodology in cultural heritage that can offer users opportunities to gain knowledge through interactive museum experiences (Dal Falco & Vasso, 2017).

This dissertation aims to contribute to the area of museum experience design by applying experience design to the design process of exhibition making in collaboration with a small Danish museum. Thus, this work employs Samis' (2018) notion of museums having much to learn from HCI and incorporates the scientific literature around experience design to consequently introduce the collaborative museum to experience design as a design approach that deploys HCI methodologies through a design process. Therefore, museum experience design in this instance will not be an issue of only optimising user experiences by manipulating communication and interaction design through technology but rather integrating them into the core of the exhibition design.

The *Our Museum* programme set out to research the implications of handling the tensions and configurations of enlightenment and experience, one which refers to a struggle between the museum's role as a protector of objects and facts of our cultural and natural history and its role as a site of experiences. It is therefore relevant to explore the potential of using experience design for exhibition making – not to design for disneyfied exhibitions, but rather as an approach to balancing the continuum between enlightenment and experience, to designing purposeful exhibitions that provide the potential for learning and meaning making through experiences (Bedford, 2014; Kolb, 2015, foregrounding learning and meaning making as the purpose for the experience design and, furthermore, achieving balance through collaboration in the design process. I, therefore, hypothesise that exhibition making through IT-based experience design – not as an add-on or separate layer of technology and communication, but as the design itself – has the potential to balance the continuum between enlightenment and experience in exhibition making, which I will explore further in the following section.

1.6. WORKING HYPOTHESES

When correlated, the motivation for this work, the *Our Museum* programme, The Limfjord Museum's potentials and issues, and the current theoretical landscape of museum experience design together illuminate the potential of exploring experience design as an approach for designing exhibitions that encourages exploration. This potential constituted the foundation for the two working hypotheses explored throughout this dissertation.

The assumption, inherent in these hypotheses, is that IT-based experience design as a design approach can support a purposeful and collaborative exhibition design process due to its holistic, multidisciplinary quality to balance enlightenment and experience in a final exhibition. Experience design, as a design approach from HCI, has seen increased application in the context of museums, both to support collaborative processes and to develop exhibitions and communication designs by taking advantage of methods from the HCI field (Samis, 2018). Thus, the first working hypothesis is as follows:

IT-based experience design can be a useful design approach to design for explorative interaction in exhibition design due to its characteristics of approaching design holistically and borrowing design criteria from other fields of design.

Furthermore, the second hypothesis claims that if we design for explorative interactions as the purpose for the exhibition, then there will be a greater potential for learning. The veracity of this assumption will be consequently based in the collaborative case partners for the project, who should be inspired by the contrast of user behaviour in activities versus exhibitions, a notion familiar to the field of museum studies and learning. Falk and Dierking (2013/2016) pointed to seven different user types – one being '*Explorers*', described as being a curiosity-driven user – that fuel learning through curiosity and exploration. Kolb (2015), who described experiential learning, defined an essential part of learning through experiences as '*active experimentation*'. This indicates a potential for learning through both exploration and experiences and thus implicitly states that there is a correlation between explorative interactions and balance between experience and enlightenment in an informal learning setting, such as a museum. Thus, the second working hypothesis is as follows:

In designing for explorative user interactions in exhibition design, enlightenment and experience can be balanced.

1.7. RESEARCH QUESTIONS

Based on the working hypotheses, and on the above introductory framing of the research project, this dissertation has been guided by the following research question:

How can principles of IT-based experience design guide the design, implementation and evaluation of an explorative museum exhibition?

The research question was examined through an explorative study, one which experimented with different perspectives on the research question through a design process with the collaborative museum, the Limfjord Museum. The collaborative case and working hypotheses have both informed and constrained the examination of the research question; thus, the sub-questions have been arranged around the theoretical foundation for the research question's practical examination. To support this examination of the hypotheses further, the research question was divided into three sub-questions:

[SQ1] What theoretical principles and criteria can be identified for IT-based experience design and exploration?

Designing explorative exhibitions: To be able to apply principles of IT-based experience design to a design process within a museum, the first sub-question seeks to define principles of experience design to apply to a design process as well as to address which principles can be applied to specifically encourage and design for explorative user interaction in an exhibition. Since experience design borrows principles and design criteria from other design traditions, this sub-question explores theories on experience design, learning, game design and gamification to understand what design criteria can encourage an explorative user interaction. This sub-question was addressed and researched in [P2] *Retningslinjer for Udviklingen af IT-baseret Oplevelsesdesign*, [P3] *The Gamified Museum - A critical literature review,* [P4] *Strategies for designing emergent interactions* and [P5] *How to Design for Exploration through Emergent Narratives.*

[SQ2] How can experience design principles and criteria for exploration be implemented in an exhibition design?

Implementing an explorative exhibition design: The second sub-question focuses on the implementation of experience design principles and on the criteria of exploration into the design process with the collaborative museum. This sub-question seeks to discuss and exemplify how the principles of experience design and the criteria of exploration, addressed in [SQ1], can be applied in a co-creative design process between design researchers and museum professionals. This sub-question is

addressed in [P5], *How to Design for Exploration through Emergent Narratives - Steps in a Collaborative Design Process for Cultural Heritage Exhibitions,* and also in Chapter 2 of this dissertation, *Research Design.*

[SQ3] How can exploration support informal learning?

Evaluating learning through exploration: The third and final sub-question focuses on the learning potential of an experience-based exhibition design that encourages explorative user interactions. Thus, what do users take away from these types of exhibitions, and how do the exhibitions affect their learning? This sub-question is addressed in [P6], *Learning through Exploration at Museum Exhibitions*, which is a case study on an exhibition designed for exploration-driven user interactions at the collaborative museum. Furthermore, a discussion of the potential of exploration as a balancing point between enlightenment and experience in exhibition design is provided.

In the project, focus is directed towards clarifying the theoretical foundation for designing with experience design and for exploration, as well as experimenting in practice with the approaches in an interwoven process. Thus, the sub-questions are qualified by practice experiments exploring the primary research question, and vice versa. These experiments were conducted in and with the collaborative museum.

1.8. THE DESIGN RESEARCH EXPERIMENTS

To answer the research question, sub-questions and examining the hypotheses, mainly six experiments throughout the design process has been conducted, which are presented shortly in the below;

[Ex_A] **Reviewing, Defining and Clarifying Problem Area**
Through this experiment, the state of the art in making exhibitions was reviewed through literature on experience design, gamification and co-design in order to identify gaps and potentials for museum design research and museum experience design. Furthermore, reviewing and defining represent an ongoing experiment in researching and defining the criteria for exploration and the principles of IT-based experience design.

[Ex_B] **Collaborative Design Process**
Through the three-year-long collaboration with the Limfjord Museum, I explored how experience design can be applied as a design approach in a museum practice, as the facilitation method for collaboration between design researchers and museum practitioners as well as for the application of the criteria for exploration. This experiment was mainly informed by [Ex_A], [Ex_C] and [Ex_D].

[Ex_C] **Design Insights**
This experiment was fundamental to understanding the collaborating case partners' context and to initially defining the problems and potentials of the museum context regarding users (interaction, use and segmentation), context (spaces, exhibitions, communication, activities and historical heritage), work routines (design approaches, employees and communication). This experiment informs [Ex_B] and [Ex_E].

[Ex_D] **Mapping Communication Approaches**
To understand the current state of communication approaches in exhibition design, I have through this experiment categorised what technologies and communications approaches are implemented in exhibitions, mainly in Denmark, Australia, New Zealand and Scotland. This experiment further informs [Ex_B] and [Ex_E].

[Ex_E] **Exhibition Design: 'The Amazing Eel'**
Through this exhibition design experiment, how design criteria for exploration can be implemented in an exhibition design was explored through the experience design-based design process; additionally, how the criteria take shape in the final exhibition design was also addressed.

[Ex_F] **A User Study of the Affects of Exploration**
To understand exploration effects on users' learning experiences, this experiment studied the learning effects of exploration on users in two exhibitions, both designed for explorative interactions: *The Amazing Eel* and *Anguish & Fire*. This experiment's goal was to identify the learning potentials of exploration based on the criteria for exploration identified in [Ex_A] and [Ex_E].

The research design, methods and tools applied to each experiment are detailed in section 2.5 in the following chapter.

“Think and wonder,
wonder and think.”

- Dr Seuss

2

research design

2. RESEARCH DESIGN

In this chapter, the research design of this project is presented. The purpose of this chapter is to describe how the insights obtained through experiments were structured to answer the research question. Thus, this chapter describes the selected strategies of inquiry for this research project. To structure and organise the research design, Creswell's (2009) description of the levels of research and the interactions between them has been used: *philosophical worldview*, *selected strategies of inquiry* and *research methods*. Creswell (2009) visualised the research levels in a triangular formation (see Figure 2). The model has two-way arrows that illustrate the constant interaction between the levels of research throughout a research project. Creswell juxtaposed philosophical worldview and selected strategies of inquiry and placed research methods at the bottom for a research design. This underlines the continuous interconnection between the three levels and how they affect each other. We can summarise this dissertation's research design based on Creswell's framework:

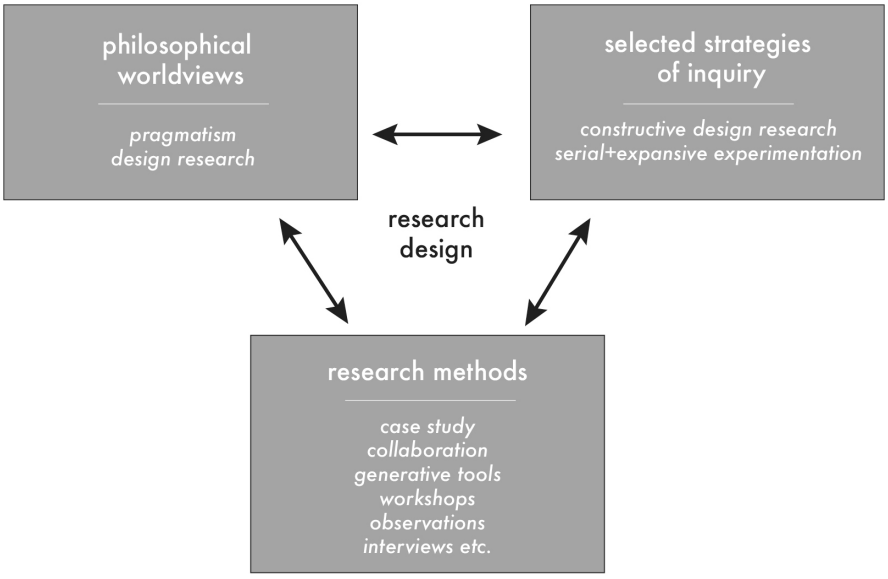


Figure 2: This research design's components and their interaction can be visualised as shown above in a redrawn version of Creswell's (2009) framework.

In this dissertation, the research design's philosophical worldview is grounded in *pragmatism* and *design research*, which interact with *constructive design research*, which in turn seeks to expand on museum experience design through *serial* and *expansive* experimentation, as the selected strategies of inquiry. These experiments and the pragmatic worldview ultimately interact with research methods such as *case study*,

collaboration, *generative tools*, *workshops*, *observations*, and *interviews*. This research design chapter is structured based on Creswell's framework, which also represents how the different levels of research are interconnected and inform each other continuously. Furthermore, the framework helps to both correlate and distinguish between differences in philosophical worldview, selected strategies of inquiry and research methods. However, distinguishing between levels meant that selected strategies of inquiry and research methods were separated, which was at times a delicate balance, since they are typically highly interdependent and intertwined.

Nevertheless, to bridge the introductory chapter and research question to the construction of the research design, we will start with the *selected strategies of inquiry*. Creswell (2009) described strategies of inquiry as approaches to inquiry or research methodologies that provide specific direction for procedures in a research design. Therefore, for this research project, the fundamental aspect of this research design is the overarching structure and logic of *constructive design research* through *serial* and *expansive* experimentation, both of which directed the exploration of the research questions. An important distinction here is between *research design* and *design research*. The former refers to the structure of the research project, while the latter constitutes a theoretical field in which a research project is grounded. Following this, I reflect on *pragmatism* as the philosophical worldview and paradigm from which the selected strategies of inquiry take shape.

Lastly, I will describe the research methods and tools used for the six experiments throughout the constructive design research process. These experiments were named from [Ex_A] to [Ex_F]. For each of these experiments, different methods and tools were used to gather data. In each of the experiment sections, I seek to show how the experiments were constructed and conducted, what insights were generated, and how these insights guided the design, implementation and evaluation of an explorative museum exhibition.

2.1. A STRATEGY OF INQUIRY: CONSTRUCTIVE DESIGN RESEARCH

As mentioned, the overarching structure and logic of the research design was centred in *constructive design research,* thus categorising the overall research design as a project that explored its hypotheses and research questions through *serial* and *expansive experiments*. This section of the research design chapter aims to clarify and argue for constructive design research as a strategy of inquiry, mainly based in Koskinen, Zimmerman, Binder, Redström and Wensveen (2011) and Krogh, Markussen and Bang (2015). Following this, in section 2.2, we will dive into a specification of the process of constructive design research and how the experiments of a research project inform hypothesis, research question and knowledge production, and vice versa. First, however, it is important to discuss why it was relevant to apply constructive design research as a strategy of inquiry for this research project.

In 1993, Frayling suggested that *design research* can be distinguished into three perspectives on research in art and design: *into*, *for* or *through* art and design (Frayling, 1993). More specifically, these three approaches can be described as research *into* design as the most straightforward approach, one exemplified as manifesting in historic, aesthetic and theoretical research (Frayling, 1993); research *for* design, which, as Frayling (p. 5) described it, is a thorny approach whereby knowledge and research is embodied in an artefact, which is the end result; and research *through* design, which entails the creation of knowledge through the construction of a design. Frayling exemplified research through design studies as materials research, development work and action research (p. 5). Research through design, which is the perspective on design research that served as the basis for constructive design research, will be returned to later. Frayling's concepts of research design have become widely acknowledged in the field, as evident in the multiple references to these concepts (e.g., Bang, Krogh, Ludvigsen, & Markussen, 2012; Gaver, 2012; Koskinen et al., 2011; Zimmerman, Forlizzi, & Evenson, 2007).

Within design research there are multiple methodologies and methods, many of which are referred to by central researchers within IT-based experience design (e.g., Hassenzahl, 2010; Hobbs et al., 2010; Zimmerman et al., 2007). In general, we can identify central and significant research methods in design research for IT-based experience design within the field of HCI (Kjeldskov & Graham, 2003). As clarified in sections 1.1 and 1.4.1, this research project focused on understanding how principles of IT-based experience design, as a tradition within HCI (section 1.1.), can be used in collaborative design processes with a museum for exhibition development, an approach which is supported in the museum experience design research area (section 1.4.1.), i.e., Samis' (2018) notion of museums having much to learn from HCI, and taking advantage of the scientific literature about experience design.

Some examples of design research methods within HCI can be found in Zimmerman et al. (2007), who proposed a new model for interaction design research through a research through design approach. In this approach, they focused on the development and evaluation of systems based on the system's original context. Koskinen et al. (2011) applied constructive design research as a methodology to define three contexts of design research – *lab, field* and *showroom* – which they presented in connection to design research. Hobbs et al. (2010), on the other hand, approached design research based on practice-led research. These methodologies and methods focus on knowledge creation through practice and reflection on the development of design.

This research project builds on Koskinen et al.'s (2011) *design research through practice from the lab, field and showroom*, which, as a methodology, is grounded in constructive design research: a research *through* design methodology. In contrast to both Hobbs et al. (2010) and Zimmerman et al. (2007), Koskinen et al. used a methodology with a broader approach to design research; whereas Hobbs et al.'s practice-led design

approach was focused on information architecture and user experience. Nevertheless, Koskinen et al. (2011) took a practice-led approach, which is also relevant in this project. Zimmerman et al. (2007) presented a method for approaching interaction design as research through design and formalised a model with four lenses for evaluation. Koskinen et al.'s methodology was more elaborated and not focused on one tradition of design so much as its broader applicability. Another example of a strategy of inquiry could be Dourish's (2004) *Where the Action Is - The Foundations of Embodied Interaction*, in which a phenomenological approach was taken to embodied interactions within HCI. Nevertheless, collaboration in practice and research through design was the heart of this research project and was therefore chosen as a strategy of inquiry focused on constructive design research.

Koskinen et al. (2011) described constructive design research as '*design research in which construction - be it product, system, space, or media - takes center place and becomes the key means in constructing knowledge*' (p. 5). Thus, in *Design Research through Practice*, the authors focused on knowledge creation through the construction of design. They further described the practice of constructive design researchers as follows:

> Constructive design researchers do not try to analyze the material world […] nor do they see design as an exercise in rational problem solving. Rather, they imagine new realities and build them to see whether they work. (Koskinen et al., 2011, p. 42)

Thus, such a design strategy creates knowledge through practical ideation and production, about which Koskinen et al. (2011) further argued that knowledge is generated through multiple activities in the construction of a design: in planning, production, theoretical argumentation and application. Within this methodology based on Koskinen et al. (2011) three contexts for knowledge creation can be differentiated: *lab, field* and *showroom*. Each of these contexts is shaped by different research cultures adapted from other fields of research, and each defines the setting in which the construction of a design or experiment for design research will occur, a topic which will be returned to below.

The current research project sought to explore how IT-based experience design can guide the design, implementation and evaluation of museum exhibitions that encourage explorative user experiences. By using constructive design research to explore this research question, it was possible to imagine new realities for museum exhibitions and build them to see whether they worked; a process for which Krogh et al. (2015) defined a typology for experimentation with five methods of knowledge production through design experimentation to describe the different types of design experimentation, whose core inquiry is conducted as research through design. Their typology provided an outline of characteristics for how different types of design experimentations facilitate knowledge building. They described the processes of development through design and its parts as similar to a babushka doll, to layers of

an onion, or to ontologies of ideas (Krogh et al., 2015). The five methods are *Accumulative, Comparative, Serial, Expansive* and *Probing* (see Table 1).

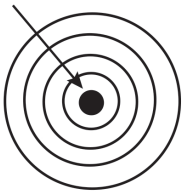
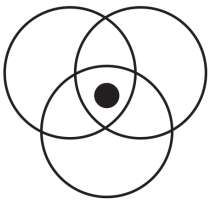
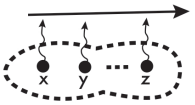
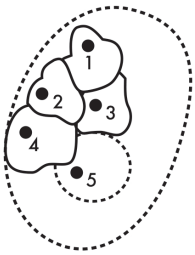
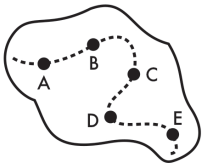
Method	Graphic Model	Keywords	Exponent(s)
Accumulative		Depth, stacking	Frens
Comparative		Acknowledging complexity	Ross, Fogtmann
Serial		Systematising local knowledge	Lynggaard, Bang
Expansive		Broadening, extending	Dindler, Trotto
Probing		Illogical, artistic, impact oriented	Busch, Worbin

Table 1: The typology of five distinct methods of knowledge production through design experimentation: Accumulative, Comparative, Serial, Expansive and Probing. The table was re-drawn based on Krogh et al. (2015). The table includes a graphical representation of the methods, keywords and exponent authors whose theses were analysed to exemplify the different methods.

Apart from categorising and graphically representing different methods of knowledge building in design experimentation, Krogh et al. (2015) also used these

methods and their characteristics to describe and visualise how research through design can create drifting when experimenting, and how these drifts can gain insights unintended by the original pursuit. In other words, when experimenting, opportunities emerge from constructive design research which might lead the intended design pursuit adrift and create new experiments or extend existing experiments. These drifts might provide new, valuable insights for the research project, or they may stray outside the scope of a research project. Drift also happened in this research project, which will be discussed in section 2.4. Based hereof, Krogh et al. (2015) described knowledge production in research through design as fallibilistic; the impossibility of attaining absolutely certain empirical knowledge because the statements constituting it cannot be ultimately and completely verified. As such, research through design, or constructive design research, becomes a question of examining parts or a whole of a hypothesis for abductive reasoning through design experiments. The interaction between research question, hypothesis, experiment and knowledge will be reviewed in section 2.3.

With this typology, it is worth shedding light on how knowledge was produced and hypotheses examined in this research project through the structures and logics of constructive research design. The methodological approaches for this typology focus on knowledge creation through practice and reflection on the development of design. In Krogh et al.'s (2015) model, PhD dissertations that used strictly one of the five methods were included – but as they disclaimed in their paper, many research projects will inherit a multiplicity of methods. Thus, an important aspect of creating knowledge through these structures is also interaction between methods. Even though this research project seeks to *expand* the field of *museum experience design* and the way in which we approach exhibition design from that perspective, it cannot be claimed that this research project is a strictly expansive study, but rather a research project that combines *serial* and *expanding* experiments. Krogh et al. (2015) described the serial method as one which, through serial design experimentations, indicates that the sequences in which the design experiments are being carried out are influenced by one another. Knowledge is produced in serial experimentation through insights or questions raised between experiments in a chronological order. The serial design experiments are the structure of the design process for the collaborative case study.

The seriality of the design experiments gave a structure to this collaborative design process. Through this process, five phases were used to design, implement and evaluate a new exhibition design, one which encourages user exploration. Therefore, there was a serial structure to the design experiments, in the pursuit of expanded knowledge. The collaborative design process was in itself part of the design experiments in the research project, experiments which sought to gain insight to answer the overall research question – *how can principles of IT-based experience design guide the design, implementation and evaluation of an explorative museum exhibition?* It might have been beneficial to either combine or replace the serial experiments with

comparative experiments, i.e., to conduct a comparative study with multiple cases and design processes in order to generalise effects and potentials. However, the one case study with the Limfjord Museum, as a collaborative design process, was very time consuming. Therefore, given the time constraints of the PhD project, I did not have time to either repeat or conduct the process simultaneously with one or more cases.

Expansive experiments were essential complements to the serial experiments performed in this research project in regard to what is interesting to incorporate into the exhibition design to encourage user exploration. Krogh et al. (2015) described the expansive method as a methodological approach that broadens and expands on knowledge through experiments. Expansive experiments are often categorised as a research pursuit that widens our perspective rather than deepening our knowledge in a domain (Krogh et al., 2015). Furthermore, unlike serial experiments, expansive methods do not have a strict order. Expansion in this research project was more akin to a process of exploring and defining theoretical criteria for creating explorative user experiences in exhibitions. Inspired by the initial insights from the serial experiments, expansive theoretical perspectives to design for user exploration became a curiosity-driven pursuit of exploring theories on learning, gamification, narrative models and game design in an attempt to broaden understanding of how to design for museum experiences. Thus, some of the experiments were conducted serially to explore and expand. It could be argued that these experiments could be identified as probing experiments rather than expansive experiments, since probing is a method for exploiting opportunities and exploring design ideas as they emerge through design work (2015). Which the notion of designing for explorative interactions is an example of. But expansive experiments were chosen as a complementary method of experimentation since the purpose of the research project was to expand on the research area of museum experience design.

The serial experiments of the collaborative design process continuously inspired expansive experiments, which in turn further inspired more serial experiments. This interactive process between serial and expansive experiments was, in this research project, connected to the interaction between the lab and the field from Koskinen et al.'s (2011) constructive design research. Expansive experiments mostly occurred in a lab, where theoretical potentials and criteria to test in the field were explored. In contrast, serial experiments were mostly conducted in the field, at the Limfjord Museum and in collaboration with the museum practitioners there. Thus, the research project had two methodological approaches represented in its constructive design research inquiries: First, the collaborative design process guided by IT-based experience design, whose methodological approach was constituted through serial experiments and which gave a structured foundation to the research project. Second, the theoretical expansive experiments, which sought to explore criteria for user exploration in museum exhibitions. This in turn informed the serial experiments to explore new directions and design ideas for the final exhibition design. The six

experiments and their methods will be further elaborated in *2.4: Research Methods: Design Experiments.*

The findings from the expansive experiments ultimately served as the centre of attention in the majority of papers published or submitted throughout this research project. Nevertheless, the expansive exploits were utilised through serial experiments in the field, and thus the papers represent a mere fraction of the serial and expansive experiments that were conducted. Krogh et al. (2015) remarked that in design research, there is a slight tendency to be mostly interested in the final design. Based on Gaver and Bowers (2012), Krogh et al. (2015) argued that declaring how one got to the final design and how a project drifted and gained unintended insights are of greater importance. This research project's exploration of its hypotheses and research questions was not highly focused on the final product, an exhibition, but rather on the process of getting there, which was underlined in the above-described methodological approaches.

2.2. AN EXPLORATIVE & HYPOTHESIS BASED RESEARCH DESIGN

Koskinen et al. (2011) provided a thorough description and exemplification of constructive design research and how to approach this methodology in different contexts; that said, they did not clarify the role of constructive experiments in regard to either hypotheses or research questions in a research project. As to how these experiments inform hypotheses, research questions and knowledge production, and vice versa, I chose to use Bang et al.'s (2012) 'wheel' model to both break down the process of research through design and demonstrate how knowledge is generated through this strategy of inquiry. This process model, called *the drive wheel of constructive design research* (Bang et al., 2012), has emerged as a tool for discussing and visualising the role of hypotheses in constructive design research and as a tool for bridging gaps between techniques and methods in a constructive design research design process. This drive wheel process model seeks to give designers and design researchers a foundation to produce knowledge grounded in their profession and capacities for their design field (2012). Furthermore, the goal of this model is to both guide a design research process and visualise the different research levels in design research.

The process model consists of seven research levels: *relevance*, *motivation*, *hypothesis*, *research question*, *experiment*, *evaluation* and *knowledge* (Figure 3). The arrows moving between the different levels illustrate the iterative process of a research project, with a wheel in the centre. Motivation is at the top of the model, with an arrow pointing down towards the hypothesis, thus highlighting motivation as the point of departure for a hypothesis. Additionally, a thinner arrow, illustrating relevance, points back and forth between experiment and motivation, thereby indicating that the hypothesis, defined by motivation, is tested to ensure its relevance. From hypothesis, an arrow

moves down towards the research question. The research question is described as the specification of what the hypothesis wishes to be researched. Furthermore, an arrow moves from research question to evaluation. Through evaluation, the research question and experiment are evaluated, thus finally being able to define knowledge generated through the iterations. From hypothesis, research question, evaluation and knowledge, doublet arrows move back and forth from experiment, which is where the four levels of the study can be tested or researched. Lastly, an arrow moves from knowledge back to hypothesis, indicating a re-evaluation of the initial hypothesis or answer thereof. The arrows in the model represent the interactive process as well as the levels and interactions between the levels of design research. Thus, when knowledge is generated, it can re-evaluate the hypothesis and open up even more research questions, tests thereof, evaluation and knowledge. The drive wheel of constructive design research (Bang et al., 2012) visualises both the process of knowledge production in constructive design research (how to approach both serial and expansive experiments for inquiry) and the role of hypotheses for experimentation in the creation of knowledge through design.

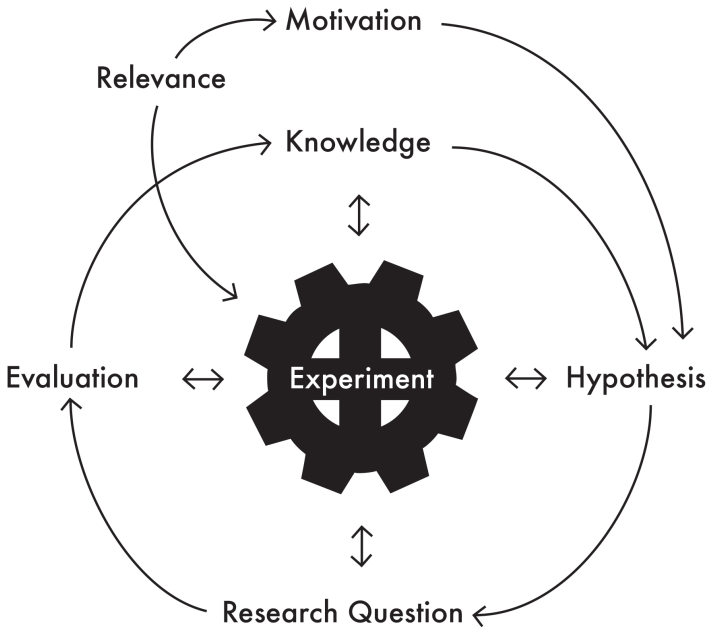


Figure 3: Process model of constructive design research redrawn based on Bang et al. (2012, p. 6).

Thus, the drive wheel of constructive design research becomes an effective tool in structuring the knowledge production of experimental inquiries and interactions between experiments, by keeping the levels of the model in mind whenever moving from experiment to experiment. As well as keeping the research aspect of design

front and centre in constructed research design, especially when drifting in the exploration of the research questions many possibilities. If we dwell on the model for a bit in regard to this research project as a whole, the way in which I have constructed the research project can be transferred to this model. The drive wheel of constructive design research repeats itself whenever I zoom in or out in the research project. An experiment in the wheel represents one of the six experiments within this research project, and each of the six experiments included several smaller experiments. As such, the drive wheel repeats itself depending on the level of the research project and its iterative processes.

Motivation took shape in Chapter 1, where the stage was set for framing the project. This motivation resulted in two working *hypotheses*, each of which framed a *research question* with three *sub-questions*. Following the initial chapter and the three first steps of the drive wheel, I move on to the *experiments* and *evaluation*. Each of the six experiments' processes and methods unfold throughout Chapter 2. This leads to *knowledge* in the drive wheel, which is collected in Chapter 3. Thus, can the wheel of constructive design research, for this research project be visualised as in figure 4:

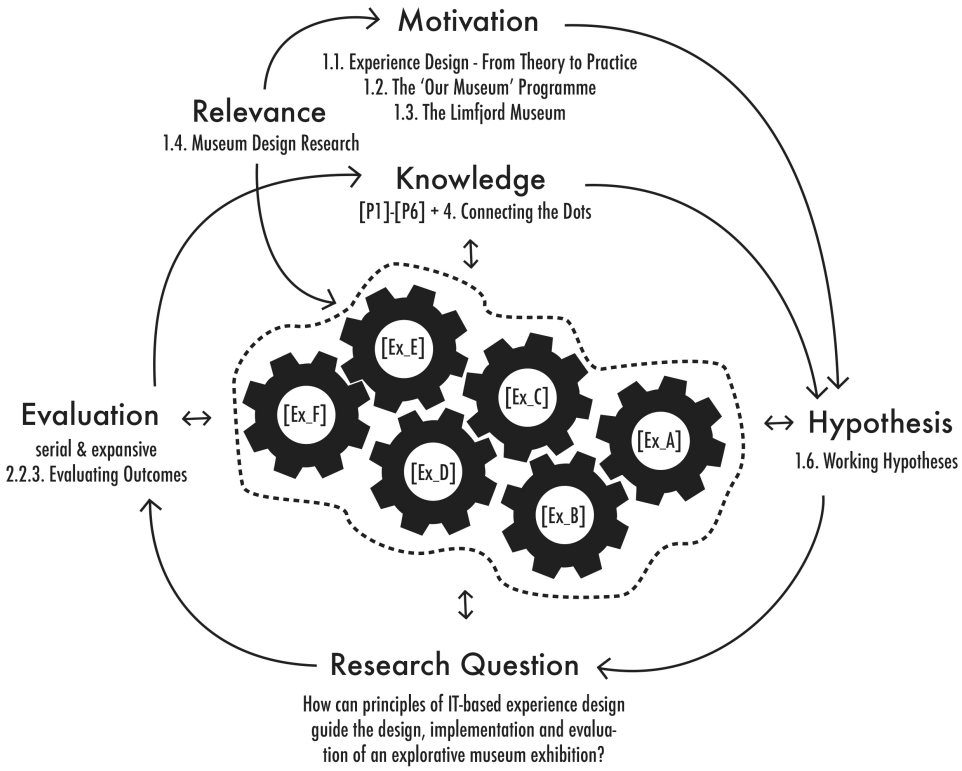


Figure 4: This model visualises in which sections each level of the drive wheel of constructive design research mainly unfolds and how the six serial and expansive experiments are at the core of the research project.

When describing how each level of research in the drive wheel is present in the dissertation, these descriptions are polished version of the constructive reality of the research process and design process, which has had many iterations, modifying and extending hypotheses, research questions, experiments and knowledge, which I will unravel by diving into the individual research methods of the six experiments in section 2.3. Before getting to the individual experiments, it is important to understand how the hypotheses, experiments for data collection and evaluations to generate knowledge in a constructive design research methodology were developed.

2.2.1. HYPOTHESIS FOR ABDUCTIVE REASONING

What was the purpose of using hypotheses in this research project? Bang et al. (2012) described hypothesising, in their wheel of constructive design research, as an ongoing process, one which is framed by the motivation of the research project, that continuously develops through experimentations. Thus, an experimental process of *abductive* reasoning involves constructing and qualifying hypotheses through experimentation. Abduction stands in relation or contrast to *induction* and *deduction*. Cross simply described these three ways of thinking and their reasoning: 'Deduction proves that something must be; induction shows that something actually is operative; abduction suggests that something may be' (2011, p. 27). In this research project, interest lies in suggesting that something *might be* (section 1.6: Working Hypotheses), even though Langergaard, Rasmussen and Sørensen (2006) explained that abduction is not as strong as induction or deduction. Nevertheless, the logic of discovering knowledge is not only a question of confirming or falsifying from a pragmatic perspective; rather, with abductive reasoning, knowledge can be deductively transformed into a theory and researched inductively. But the point of departure in constructive design research are hypotheses, hence abductive reasoning. Abductive reasoning is closely related to creativity and design, because it involves finding a possible explanation or solution for a problem, not proving it is the only possible solution. Kolko (2009) described abduction as 'the argument to the best explanation' (p. 20), placing the role of hypothesis as a core element in design thinking by being a leap to best guess based on insights from design practice or an idea to put together what we had never before dreamed of putting together. Thus, making the hypothesis a suggestion for a possible solution for the given problem for abductive reasoning. Therefore, hypothesising is relevant in this research project, but why is it a fundamental element in constructive design research? Based on a motivational context, we, as designers, through abductive reasoning leap to a hypothesis, which is challenged and tested through experiments to further develop the research question, evaluation and knowledge.

Bang et al. (2012) described the role of a hypothesis as that which articulates in which perspective abstract prototypes should be tested and debated according to their relevance to practice, academia and the practicability of the experiment. The perspective on the function of a hypothesis is grounded in the lab context in

Koskinen et al.'s (2011) constructive design research and is therefore a product of natural science: 'A hypothesis is an explanation based on theory: it is researchers' best guess about how the function works before they do a study. The hypothesis is not true before empirical proof […]' (p. 55). In this description, the hypothesis becomes a question of falsifying or validating through research. Koskinen et al. further described, based on Stappers (2014, p. 60), how prototypes embody theory and can be seen and understood as physical hypotheses. This ties into Bang et al.'s (2012) interpretation of the role of hypotheses in the drive wheel model of constructive design research (Figure 3 & 4), which they built based on Koskinen et al. (2011). Thus, the hypothesis manifests itself on or into the experiment and becomes a physical embodiment of a hypothesis that is to be researched through construction in some form or another. Consequently, hypotheses in constructive design research manifest the abductive nature of design research into the process of knowledge creation, through possible explanations to be tested.

2.2.2. DATA GATHERING THROUGH EXPERIMENTATION

Experiments take centre stage in the drive wheel of constructive design research and represent the constructive process. It is also at this level of design research that data are gathered, framed by the hypothesis and research questions, to be evaluated and added to knowledge creation. Therefore, this section will reflect upon how data were gathered through experimentation in this research project based on constructive design research in a research through design perspective. Bang et al. (2012) described experiments as the actual concrete research activity in constructive design research, based on Koskinen et al.'s (2011) notion of experimental work not being limited to prototype construction but also evaluating the exposure of a prototype to the context in which it was meant to operate. However, the experiment is not set in a linear process, one in which the research question leads to an experiment that can be evaluated, but rather as the drive wheel of constructive design research, which continuously facilitates and reframes the hypothesis. Bang et al. (2012) therefore argued that 'the constructive design experimentation can be fruitfully brought to play at any point of the research process and used as a dialogue partner to explore options' (p. 6). This places experimental activities at the core of constructive design research, similar to how observational or participatory studies are at the core of social science.

It was valuable to this research to approach different research activities as experimentations, not limited to the construction and evaluations of prototypes, but also to the framing of experiments as explorations of theory, design insights and communication approaches as design experiments that inform the design of prototypes and help reframe the research questions and hypotheses. Thereby, experimentation is just as much about constructing a scaffold for both prototypes and the design process, to explore and research the hypotheses and research questions. This also refers back to design research being more than just the final design and the

prototypes that got the design to its final stage. The design process of getting to the prototypes and to the final design is just as important, if not more so. Thus, experiments in this research project took the shape of prototypes to be tested, theoretical perspectives to be explored, users to be observed and interviewed, and collaborative design processes to be constructed.

Depending on the type of experiments conducted, different methods were applied, mainly qualitative methods, to continuously collect data through documentation in the experimental work. The methods for each experiment are described in section 2.4: *Research Methods: Design Experiments*. Documenting is key when using design experiments as research activities or in general when doing design research. Kolko (2009) described that the process of synthesising in design and design research can feel like magic to an observer. Therefore, choosing methods for data gathering and documentation is central to removing the magic and generating material from which evaluation can happen.

Two main aspects of data gathering through experiments are relevant to emphasise for this research project: the field and the lab, i.e., the contexts in which the experiments were conducted. These contexts framed which methods and tools were used for data collection and documentation. Koskinen et al. (2011) broke down the contexts of doing design experiments into three methodological contexts: *lab, field* and *showroom*. Each of these contexts is shaped by different research cultures adapted from other fields of research and defines the setting in which the construction of design or experiments will be performed for design research. Koskinen et al. described the three contexts as follows:

Lab is a setting focused on studying designs in a laboratory, where the design element is taken out of its natural environment and can be experimented with, one element at the time, which is also the crux of any lab study. With the lab method, it is impossible to study a design in its entirety, since design has many faces and only some are appropriate for a lab study. In short, if we conduct design experiments in the lab, we de-contextualise a phenomenon to focus on isolated variables with less 'noise'.

Field, as a context, is contrary to the lab's de-contextualisation, a context-dependent method, one which seeks to research and understand what happens with a design in a specific context, as well as who uses it, and how it is used. The field draws on methods and tools from social science, focusing on how a design affects the social context, and how the design in its entity can be researched in its intended context. The field prioritises first-hand experience and insight from a design's interactions in a context over the stricter fact-finding constructed in a lab setting. Koskinen et al. (2011) further argued that the data generated from a field approach often take on a more descriptive account, rather than a more theoretically informed interpretation, as in the lab.

Lastly, the *showroom* context focuses on studying and understanding the aesthetics of art and design – an approach that builds on the tradition of arts and craft rather than science. This context is described as being either more abstract or broader than both the lab and field contexts. The constructed artefacts for the design experiments often have ambiguous agendas, asking more questions than they can answer. In contrast to social science for the field and natural science for the lab, the showroom is often related to the domain of 'critical design', exploring how 'design can be used as a critical medium for reflecting on the cultural, social, and ethical impact of technology' (Koskinen et al., 2011, p. 116).

In this research project, I will not be applying the showroom context to the experimentations, because the research question does not seek to isolate, reflect on and understand the aesthetics of art and design. Nevertheless, since the research question *does* seek to evaluate the users' learning experience of an exploratory exhibition, it could be argued that the showroom context approach could be relevant. But this perspective will be covered as part of the experiments in the field context by researching how the exhibition as an entity affects the social context and experience in its intended context.

Each of these design research contexts influences the experiment, just as the design experiments affect the context in which they are conducted. This research project conducted design experiments in the field and in the lab, as stated earlier, in regard to the serial and expansive experiments in section 2.1. Here we discussed how the interactive process between serial and expansive experiments in this research project was connected to the interaction between the lab and the field from Koskinen et al.'s (2011) constructive design research. Expansive experiments mostly happened in the lab, where theoretical potentials and criteria were explored to test in the field; whereas the serial experiments were mostly conducted in the field, at the Limfjord Museum and in collaboration with the museum practitioners there.

The experiments conducted in a field context in this research project were mainly shaped by the case study, set at the Limfjord Museum, and this case therefore served as the context of design experimentation. Creswell (2009) described case studies as being a strategy of inquiry whereby a researcher explores a case or cases in depth. A case is a programme, event, activity, process or one or more individuals. The case study can be seen as a perspective in field studies which is bound by time and activity, thus providing the field study with a contextual basis for hypothesis testing (Flyvbjerg, 2015). Similar to the description of the field approach, data are collected in a case study through a variety of methods over the given timeframe of the research project (Creswell, 2009). By using a specific case, the Limfjord Museum, as the field context for the design experiments, I am not aspiring to make a generalised conclusion, but rather to use the case study to generate transferrable knowledge to be tested and applied in other museums or settings. Although Flyvbjerg did argue that generalisation can be achieved through case studies, in this project I only had one

smaller Danish museum, not multiple museums. Thus, the goal was to generate transferrable knowledge, not to generalise.

There is no doubt that the physical construction of multiple smaller prototypes would have allowed for another, more material-focused research and user study. Because the motivational context was focused not only on the construction of an exhibition that would encourage exploration but also on a collaborative design process that would apply experience design to the construction of said exhibition, the experiments were divided into different stages or parts of the design process. This means that the experiments were not solely focused on testing and understanding prototypes of design elements for an exhibition design, but were also concentrated on a combination of exhibition construction, both physically and theoretically, and the construction of a collaborative design process that incorporated experience design: a process entailing both the collaborative design process and how to create an exhibition that encourages exploration.

Experiments in this project were not just prototypes or design elements but methods and activities performed to inform the design process and the final design prototype and user studies. Furthermore, these experiments are clusters of 'micro' experiments to research and understand hypotheses and generate knowledge to answer the research question. Therefore, constructive design research in this instance becomes a question of both constructing and facilitating the process of designing an exhibition with experience design as well as the construction of a final exhibition. This also aligns with Bowers and Gaver (2012) and Krogh et al. (2015) as being one of the primary motivators for constructive design research. But how do we then gather data through experimentation?

2.2.3. EVALUATING OUTCOMES OF CONSTRUCTIVE DESIGN RESEARCH

How a scientific proposition is evaluated as reasonable is one of the core discussions in different research programmes and schools of thought (Gaver, 2012; Koskinen et al., 2011). Creswell (2003) described how research design is a paradigmatic discussion between ontology and epistemology existing in an interplay to describe the underlying conditions for a research design through the epistemological question of how we know what we know and the ontological question of what is real. In this interplay is where it is relevant to reveal which contributions are being made. Consequently, in the specific design research perspective of this research project's research design, founded in constructive design research, Bang et al. (2012) would place evaluation in their drive wheel as the binding link between knowledge and research question and experiment. Thus, the research question would be positioned as the framing instance for the criteria of evaluation and knowledge dissemination (Bang et al., 2012). Simultaneously, Bang and colleagues explained that, in many cases, the experimental outcome can lead directly to knowledge disseminated in a community (2012).

This notion of evaluation in constructive design research was further explored by Markussen, Krogh and Bang (2015) following their contributions to hypothesis-making (Bang et al., 2012), described in section 2.2, and methods of experimentation (Krogh et al., 2015), described in section 2.1. Markussen et al. (2015) identified five particular logics and characteristics of evaluation in research through design: (1) *repercussive evaluation* is evaluation of experimental results and design work according to one criterion – removing disturbing factors and contextual relationships; (2) *relational evaluation* is related to comparative evaluation – a core criterion serves as the ground for external and intrinsic comparison; (3) *eclectic evaluation* is about fusing and sampling ideas, theories and philosophies without restraining the results to fit into conceptual systems. Lastly, we find the two evaluation models applied in this research project:

(4) Serial evaluation: Design experiments are evaluated in a certain order to cast light on the overall research interest. This connects to the serial experiment approach of this research project, following the collaborative design process. In serial evaluation, it is the local relationship between experiments in a series of experiments that matters, connecting the findings back to the previous experiment. What makes this type of evaluation relevant for serial experimentation in a collaborative design process is the continued reflection-in and -on practice that furthers the exhibition design, which is set as the final goal of the collaborative design process But serial evaluation does not stand alone; it can fuse with the (5) *expansive evaluation* approach, which focuses on how experiments can reveal and identify qualities of new emerging perspectives—a voyage of discovery. Thus, even though the experiments of this research project were considered as serial and expansive, which could indicate a serial and eclectic evaluation model, it is instead an expansive evaluation model fused with a serial evaluation model.

Both serial and expansive evaluation are not always a structured and visual process when happening in practice or as a retrospective reflection on practice in line with the work by Schön (1983). Reflection-in-practice happens in-situ of design, such as when an unforeseen consequence occurs in a design process, causing the designer to reframe the situation. Reflection-on-practice mostly occurs post design, as the designer reflects on what and why something was decided the way it was. Reflection-in-practice is mainly in play in field experiments (Koskinen et al., 2011), which in this project entailed a collaborative design process, one that required dynamic design development leading to reflections in practice and decision making. These reflections were not always easy to capture because of this dynamic process, where not every design discussion was handled in a controlled setting or workshop, where I was prepared to document reflections in-situ. Nevertheless, to capture reflections, decisions and discussions, all planned activities regarding the design development were documented through sound, video and/or writing on post-it notes. Furthermore, reflection-on-practice was also a valuable practice for documenting approaches and evaluating progression and issues in methods and

tools. Reflection-on-practice was done as both field notes and reflective discussions between me and the design participants at the Limfjord Museum. This type of documentation may provide less reliability, but it still supports the recoverability of results; most importantly, the reflection-on-practice leads to reflection-*for*-practice, which strengthens reflection-in-practice. By reflection-for-practice, I mean that it is through the reflection on practice that potentials or gaps appear, which in turn lead to expansive experiments that strengthen knowledge and understanding of the research interest further and therefore strengthen the researcher's ability to reflect and act in practice.

This discussion thus brings us back to where this section started. The purpose of doing constructive design research is to explore implications of and opportunities for applying principles and criteria of IT-based experience design in the design process of exhibition development and in encouraging user exploration in the final exhibition. Therefore, the purpose of doing research experiments through design is to extract principles for design. The research project as a whole thus becomes research through design, for design. The above model visualises how the research through design experiments accumulate principles as research for design frameworks or best practice examples, which can then be further explored through design. Therefore, the purpose of evaluating is to generate knowledge which can be made transferrable and become knowledge for design.

2.3. A WORLDVIEW: A PRACTICE BASED DESIGN RESEARCH PARADIGM

This section will address how the ontological question of *what is true?* was considered in this dissertation. This is a paradigmatic discussion of the philosophical worldview in which the selected strategy of inquiry, constructive design research, was grounded. In recent times, we can see a number of contributions, such as Dalsgaard (2007), Goldkuhl (2012), Kolko (2009), Rylander (2012) and Stolterman (2008), which point to design research as being grounded in the philosophical worldview of pragmatism. Pragmatism is a philosophical worldview originating from philosophers like Peirce (1994) and Dewey (1938) in the late nineteenth century. This philosophical worldview holds a proposition, such as a theory, where, if the proposition is true, it works as intended. Thus, meaning is found in the practical consequences (Rylander, 2012).

Truth in more traditional science is more focused on cause-and-effect concerning what-is in the world (Goldkuhl, 2012), whereas a pragmatic worldview accounts for truth through what *might be*. This perspective strives to create knowledge through intervening with the purpose of constructing a 'better world', not to be mistaken with forecasting a prognosis about a coming future:

> Essential in pragmatism and in design research is that the search for a possible and desirable world is not only a question of conjectures. A pragmatist and design researcher is not only guessing or proposing what might be, but he/she also tries to install it through action. It is a process of "knowing through making". (Goldkuhl, 2012, p. 88)

This account is highly intertwined with the concept of *utility*, which in pragmatism is connected to whether or not that something is effective. Utility can, according to Goldkuhl (2012) and Dalsgaard (2007), be transferred to a designed artefact as a specific instantiation of a theory, connecting the current state of the world with a proposed might-be state. Thus, viewing design research through the lens of pragmatism provides the foundation for approaching a problematic situation through design intervention, which could be turned into a satisfactory situation, linking back to the research through design approach to research proposed by Frayling (1993). Nevertheless, the pragmatic worldview is not unified and has to some extent incongruent assumptions between its contributors. Therefore, in the following, I will account for some of the key pragmatic concepts on which the paradigmatic worldview in this research project was based.

2.3.1: CONSTRUCTIVE DESIGN RESEARCH IN PRAGMATISM

Although I have argued for viewing design research through a pragmatic lens, I acknowledge that other philosophies, like phenomenology, neo-positivism and constructivism (e.g., Buchanan, 1992; Cross, 1999; Fallman, 2003), could also serve as the philosophical worldview for design research. However, I also agree with the arguments made by those who see pragmatism as the basic paradigm for design research – especially for design research, which emphasises the constructive aspects of design practice. This is also grounded in the chosen strategy of inquiry, about which Koskinen et al. (2011), Bang et al. (2012), Krogh et al. (2015) and Kolko (2009) all argued for constructive design research's foundation in pragmatism, with references to both Peirce (1958) and Dewey (1938/2005):

> The whole process of going from problems to design and use can be conceived in terms of pragmatic inquiry [33]. The existing as-is is considered as a problematic situation that needs to be settled through an inquiry comprising observation, evaluation, reasoning and intervention. (Goldkuhl, 2012, p. 88)

The pragmatic inquiry for this research project takes shape through sections 2.1 and 2.2 by describing how constructive design research has shaped the research inquiry of questioning the as-is situation. Since constructive design research as the strategy for inquiry blurs the line between research and design, and can thus be argued to be right at home in the pragmatic logic of abductive reasoning for researching the truth through what might be, which we discussed in section *2.2.1. Hypothesis for Abductive Reasoning*. The notion of design research, in one way or another, is rooted in pragmatism, as Goldkuhl (2012), Rylander (2012) and Dalsgaard (2007) all pointed out, with reference to Schön's reflective practice (1983) and Rittel and Weber's wicked problems (1973), which links to Dewey's theory of inquiry.

2.4. RESEARCH METHODS: DESIGN EXPERIMENTS

The third element of Creswell's (2003) framework for a research design is *research methods*. This level involves the data collection, analysis and interpretation techniques that a researcher proposes for his or her study. This section is divided into six subsections, each representing one design experiment of the research project. Since this research project's main empirical data originated from the collaborative design process, which used criteria of experience design to develop an exhibition to encourage exploration, each of the experiments incorporated multiple iterations or expansions. Each experiment and its iterations will be unpacked in this section as the research methods of the research project. Figure 5 visualises the progression and drifting (Krogh et al., 2015) which occurred for each of the six experiments. The figure also shows how each experiment was not a closed entity but rather a continued iterative process throughout the research project.

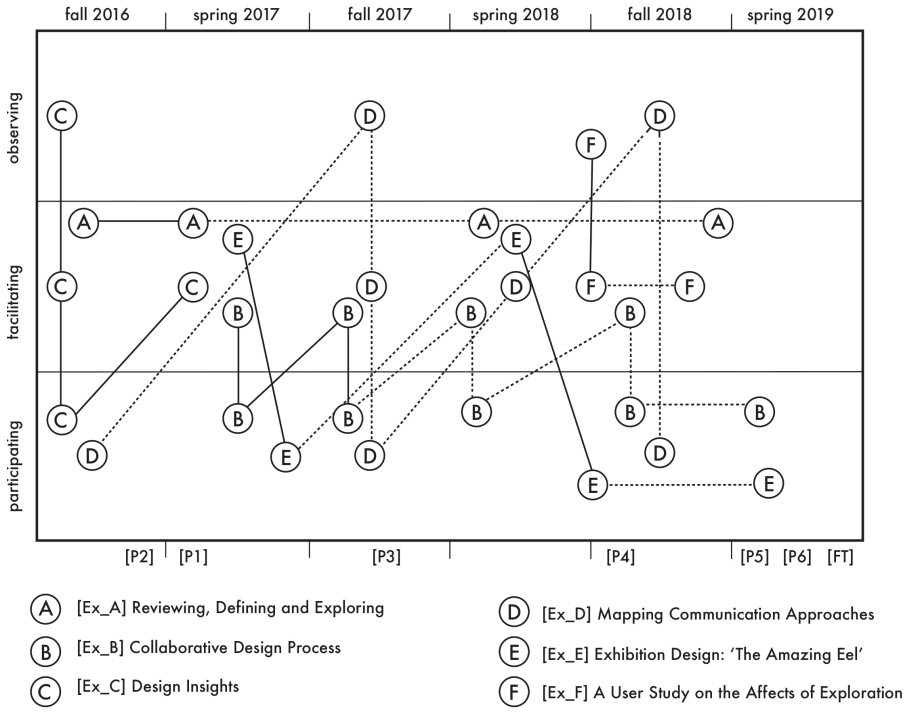


Figure 5: Overview of the research process, between planned progression (solid lines) and the drifting (dashed lines) between activities. The model was inspired by Vistisen's (2016) presentation of his research process overview. [Ex_A] to [Ex_F] are the abbreviations of 'Experiments A to F', and [P1] to [P6] are abbreviations of 'Paper 1' etc.

One example from Figure 5 is the collaborative design process, [Ex_B]. As the B line in Figure 5 shows, the collaborative design process fluctuated between *facilitating* and *participating* from spring 2017 to spring 2019, indicating that I both facilitated the

design process and collaborated with the museum participating in the designing. Furthermore, throughout 2017, the lines between *facilitating* and *participating* are solid, indicating the planned activities of the collaborative design process. Meanwhile, the dashed lines from 2018-2019 indicate drifting and not pre-planned activities. Nevertheless, what the figure does *not* show is the interaction between experiments and how they informed each other along the way. With serial experimentation as the research strategy, I needed to take some planned and structured design steps, since I was involved in a collaborative design process [Ex_B]. That experiment was meant to culminate with an exhibition [Ex_E], which afterwards would need to be researched to understand whether it had the intended effect on user interaction [Ex_F]. This serial experimentation was informed by and initiated expansive experiments to explore design ideas. Furthermore, since the overall selected strategy for inquiry was grounded in constructive design research, my role as a design researcher varied between participating, facilitating and observing, depending on the character and progression of the individual experiments.

In the figure, there are solid lines which visualise the planned progression of the research project; the dashed lines, on the other hand, visualise drifts, or non-planned research endeavours that evolved throughout the research process (Krogh et al., 2015). These drifts opened up new perspectives in the research project and became essential for the findings and final contributions.

On the next page, Table 2 gives an overview of the six experiments, my role as a design researcher, the context of experimentation, to what papers the experiment has contributed, and lastly a short description of the content and purpose of each experiment. Following Table 2, I will unfold and describe each of the experiments and the applied methods to give an overview of and insight into how the constructive design research took shape throughout the research project. Some of the experiment descriptions are not as elaborated as others, since these were more extensively elaborated in one of the papers. But the overall purpose and methods will be described in this section to give a thorough understanding of the research design for this research project. As the following table shows, most of the experiments were set in the field; thus, the research methods in this research project were mainly of an ethnographic character. This follows the guidelines of the constructive design research methodology by Koskinen et al. (2011), which refer to ethnographic methods as being highly relevant when doing research in the field context.

EXPERIMENT	MY ROLE	CONTEXT	CONTRIBUTES TO	DESCRIPTION
Ex_A: Reviewing, defining and clarifying problem area	Reviewing theory	Lab	[P2], [P3], [P4], [P5] & [Framing Text]	Expands on research done within the problem area of this thesis. Methods applied in this study included structured literature reviews, literature reviews and analysis through categorisation, and meaning condensing.
Ex_B: Collaborative design process	Researcher / Designer/ Facilitator	Field	[P2] & [P5] [Framing Text]	Expands on how to apply experience design to a collaborative design process with a museum and how it potentially affects their practices of exhibition planning in the future. Methods used for this study consisted of workshops, conversations and prototyping.
Ex_C: Design insights	Researcher / Designer/ Facilitator	Field	[Framing Text] & [P5]	Empirical insights from the field and case study. Observations of user patterns, museum practices, and workshop data to inform both design and collaboration.
Ex_D: Mapping communication approaches	Researcher	Field	[Framing Text] & [Ex_B]	Empirical experiment seeking to identify uses of communication approaches in state-of-the-art museum exhibitions to inform the exhibition design at hand.
Ex_E: Exhibition design: 'The Amazing Eel'	Designer/ Researcher	Field	[P4] & [P5]	Expands on the design of an exhibition at the collaborative museum. Design decisions, motivation and implementation. Methods applied included prototypes, moodboards, visualisations, observation, and segmentation.
Ex_F: A user study of the affects of exploration	Researcher	Field/Lab	[P6]	Expands on the effects of designing for exploration on the users' learning experience. This was conducted as a case study, with two museum exhibitions. Methods applied for the study included observations and interviews. The latter were transcribed, and thematically analysed afterwards.

Table 2: Overview of the design experiments conducted in the research project.

2.4.1. [EX_A] REVIEWING, DEFINING AND EXPLORING

This first experiment was central for expanding the body of knowledge about the area of interest. The experiment underwent multiple iterations for expanding knowledge and mapping the current state. The reviewing, defining and exploring in this experiment were conducted to clarify the phenomenon and identify potential gaps in knowledge. In terms of identifying the current state of museum experience design, principles of experience design and criteria for exploration, reviewing and defining served as ongoing experiments to inform the design process (section 2.4.2) and contribute to the expansion of the area of interest. Three different literature review strategies, as presented by Grant and Booth (2009) and Pickering and Byrne (2014), were used: literature review, overview review and systematic quantitative literature review (SQLR). In the introductory chapter, a literature review (Grant & Booth, 2009) was used to identify the current state of literature within the area of concern. Through a narrative synthesis and thematic analysis, gaps were identified in the field in which the research question emerged. An overview review (Grant & Booth, 2009) was used when writing [P2], [P4] and [P5], where the goal was to identify conceptual characteristics for experience design and emergent narratives which could be transferred to the design process. Lastly, since I wanted to explore how gamification has been used in museum exhibitions for [P3], I approached the topic through SQLR (Pickering & Byrne, 2014). The purpose was to identify themes and potential gaps. The SQLR for [P3] can be found in appendix [A2_Ex_A]. The main purpose of this experiment was to explore theoretical areas which could inform the design process and eventually expand on how exhibitions are designed in museums. In Table 3, a condensed overview of the primary literature review topics is provided, as are examples of the works identified for each.

TOPIC	METHOD	EXAMPLES OF IDENTIFIED LITERATURE
Museum Experience Design * [Framing Text]	Literature Review (Grant & Booth, 2009)	Vermeeren et al. (2018), MacLeod et al. (2015), Samis (2018), Ciolfi et al. (2018), Dal Falco and Vasso (2017), Vermeeren and Calvi (2015)
Experience Design * [P2]	Overview Review (Grant & Booth, 2009) and Qualitative Analysis	Alben (1996), Boswijk et al. (2012), Buxton (2007), Forlizzi and Ford (2004), Hassenzahl (2010), Jensen (2013), McCarthy and Writght (2004), Norman (2004)
Gamification * [P3]	Structured Review (Pickering & Byrne, 2014)	Deterding (2014), Hamari et al. (2014), Hertzman et al. (2008), Johnson et al. (2015), Martens and Müller (2017), Nicholson (2012), Ryan and Deci (2012)
Emergent Narratives * [P4] & [P5]	Overview Review (Grant & Booth, 2009) and Qualitative Analysis	Aylett (1999, 2000), Swartjes (2010), Walsh (2011), Goldstein (1999), Hall (1980)
Learning & Exploration * [P6]	Overview Review (Grant & Booth, 2009)	Falk and Dierking (2013/2016), Csikszentmihalyi and Hermanson (1994/2004), Kolb (2015), Caulton (2006), King and Dillon (2012)

*Table 3: Overview of review topics, methods and examples of work. *Indicates in which publications the reviews are found.*

2.4.2. [EX_B] COLLABORATIVE DESIGN PROCESS

This second experiment represented the backbone and foundation of the research project. The collaborative design process is what was informed by experiments [Ex_A], [Ex_C] and [Ex_D] and evolved into [Ex_E] and [Ex_F]. This is where theory meets praxis, where design researcher and museum practitioner meet to co-design, where ideas come to life, and where ideas are transformed into prototypes and tests. This is the experiment that served as the core of both the field context (Koskinen et al., 2011) and the case study (Flyvbjerg, 2015). This experiment stretched over a 3-year-long collaboration with the Limfjord Museum, in which I explored how experience design can be applied as a design approach in a museum practice, as the facilitation method for co-creation between design researcher and museum practitioners and for the application of the criteria for exploration. The methods in this experiment focused on driving a collaborative process towards creating an exploratory exhibition design.

The reason why this experiment served as the backbone of the research project is that it constitutes the 3-year-long collaboration through a five-phase iterative design process. This collaborative design process was informed by the other experiments and research activities, and it culminated in a designed exhibition and evaluation. Thus, together with [Ex_E] and [Ex_F], this experiment constituted the serial experimentation. Nevertheless, it was a rather extensive experiment with many iterations and phases. Even though the experiment was serial in structure and connection to [Ex_E] and [Ex_F], it was also an expansive experiment (Krogh et al., 2015) because it sought to generate knowledge on how to use experience design in a collaborative design process. With museum practitioners and I as a design researcher working together in a design development process for creating a new exhibition, it was necessary to break down the process of design, to give room for the creative and iterative nature of collaborative design process to shift between content and form. In the process of designing for explorative behaviour throughout this case, the design process was divided into five phases: *research, ideation, design, production* and *evaluation.*

Figure 6 is a sketch visualising the five phases of the design process and its methods and tools, which were used throughout the process to facilitate and inform the collaborative design process. The phases and guidelines for each are thoroughly explained and elaborated in [P2], which is why I will not elaborate on them in this section. Furthermore, the methods and tools used for facilitating the collaborative design process have been outlined and exemplified in [P5]. In this section, I will elaborate further on which methods and tools have been applied in the design process to facilitate collaboration, data collection and evaluation.

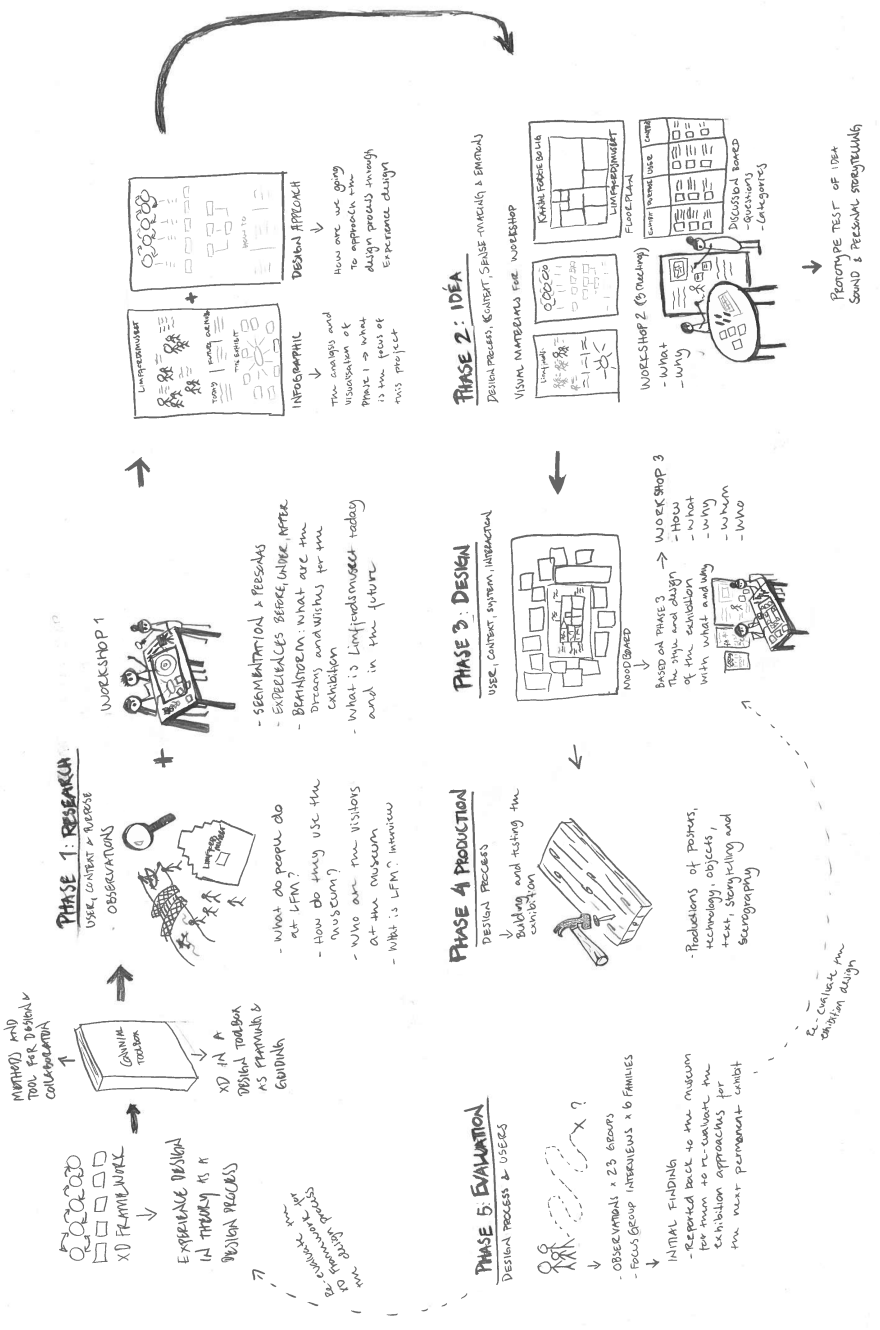


Figure 6: The methods of the five-phase design process. A the figure is available in appendix folder A3_Ex_B (3.4_DesignProcess).

The main method for facilitating collaboration was workshops with different tools depending on the goal of the workshop. Throughout the design process, there were three main workshops, which are described in Table 4 below.

WORKSHOP	OBJECTIVE	TOOLS	DATA
Workshop #1 Appendix [A3]: Ex_B_1	*Problem setting in the research phase:* Defining user segments, the museum experience before, under and after, the focus for the museum experience today, what users may wish for in the future for their museum experience, and lastly brainstorming to identify the goal of the collaboration.	Boards for segmentation and brainstorming, and tools such as post-it notes, characters, and figures as visual aids.	- Video & audio - Discussion points written on post-it notes - Documenting decisions in an infographic
Workshop #2 Appendix [A3]: Ex_B_2	*Problem solving in the ideation phase:* The second focused on ideation on what can and should be communicated in the exhibition and how an exhibition could encourage exploration and content. This was a prolonged process extending over four sessions.	Floor plan of the museum, infographic with results from the previous workshop and a poster with a visualisation of the process and questions	- Video & audio - Discussion points written on post-it notes - Documenting decisions as drawings of exhibitions
Workshop #3 Appendix [A3]: Ex_B_3	*Problem solving in the design phase:* The last workshop was focused on defining the final design and storyline,and on deciding on the flow of the exhibition, installations, narratives and artefacts.	Floor plan of the museum, drawings from previous workshop	- Video & audio - Discussion points written on post-it notes - Documenting decisions on a moodboard

Table 4: Overview of design workshops, their objectives, tools and data.

Each workshop initiated a new phase in the design process and framed its direction. The design process was continuous, not only taking place around a table in a workshop setting, but also between workshops, thus making the workshops essential for framing the goal and shared design language for the discussion between workshops. Each workshop was informed by other experiments, setting the questions and criteria to ask and achieve with the workshop and the design. These questions and criteria are described in papers [P2], [P4] and [P5]. The questions and criteria could not facilitate the workshops; rather, the process required facilitating methods and tools that could create a shared language for the collaborating stakeholders to communicate and discuss ideas, requirements, potentials, limitations and dreams. Sanders and Stappers (2014) described generative design methods and research as a way of providing this shared language: '*Generative design research gives people a language with which they can imagine and express their ideas and dreams for future experiences. These ideas and dreams can, in turn, inform and inspire other stakeholders in the design and development process'* (p. 14). Generative tools are tools for '*[...] the creation of a shared design language that designers/researchers and other stakeholders use to communicate visually and directly with each other. The design language is generative in the*

sense that with it, people can express an infinite number of ideas through a limited set of stimulus items' (Sanders & Stappers, 2014, p. 20). By approaching the collaborative design process through workshops with generative tools, we can support stakeholders in developing a common interdisciplinary design language, one which can make people's different ways of seeing, thinking and doing come together in agreement. Thus, the criteria for exploration were applied in the workshop as constraints or opportunities of design – as how can we, through the narrative, objects and installations, alter the user's mindset? Even though Sanders (2006, p. 6) argued that generative tools are an approach to '*fill the fuzzy front end with the ideas, dreams and insights of the people who are to be served through design*', the goal of using generative tools in a collaborative process between different stakeholders is the same: to generate a shared language, one which allows us to move beyond the fuzzy front-end into concept and design development.

The generative tools therefore became the shared language toolbox, which was used in every workshop, adding new props, questions, sketches or insights to each. After each workshop, I went through the visual materials, post-its and drawings to evaluate the outcome of the workshop through synthesising (Kolko, 2009). The outcome from each workshop was visualised in one way or another and used in the following workshop. Based on the first workshop, the bottom two posters in Figure 7 were created. After the workshop, several drawings and themes were categorised and redrawn on a floor plan and used in workshop three as a reference. Workshop three provided insights and design decisions that led to the moodboard shown in Figure 8. These types of representations of findings and outcomes from the workshops created a visualisation to elaborate on and discuss. This iterative process of experimenting through workshops for design development, of evaluating outcomes to frame the next experiment, also supports this project's strategy of inquiry based on Bang et al. (2012) and their drive wheel of constructive design research. Additionally, it also supports the serial experiment method (Krogh et al., 2015) and serial evaluation (Markussen et al., 2015).

The goal of the collaborative design process was not to use the Limfjord Museum as a terrarium to be observed and interfered with, but rather to make the museum a collaborator with expert knowledge about not only the museum but the museum sector as a whole. Therefore, by engaging in practice with the museum practitioners and collaborating on creating their new exhibition, the hope was to create an intertwined process from which the museum would learn new approaches to exhibition planning and design, and through which I would learn more about the museum context and communicating history. Furthermore, when initiating the research project, the aim was to involve as many of the museum practitioners from the Limfjord Museum as possible, in order to create ownership of the project and exhibition, as well as to provide more valuable insights, but it was decided from the museum side that the collaboration would mainly represent a process between myself and the curator. Consequently, the museum's 'take away' from this research

project, aside from this dissertation, was mainly inherited by the curator, who will, instead of multiple people possessing broader knowledge, primarily hold such knowledge. For the design process, this meant that we had to create a tight collaboration and quickly make decisions, apply new insights and make prototypes without long processes.

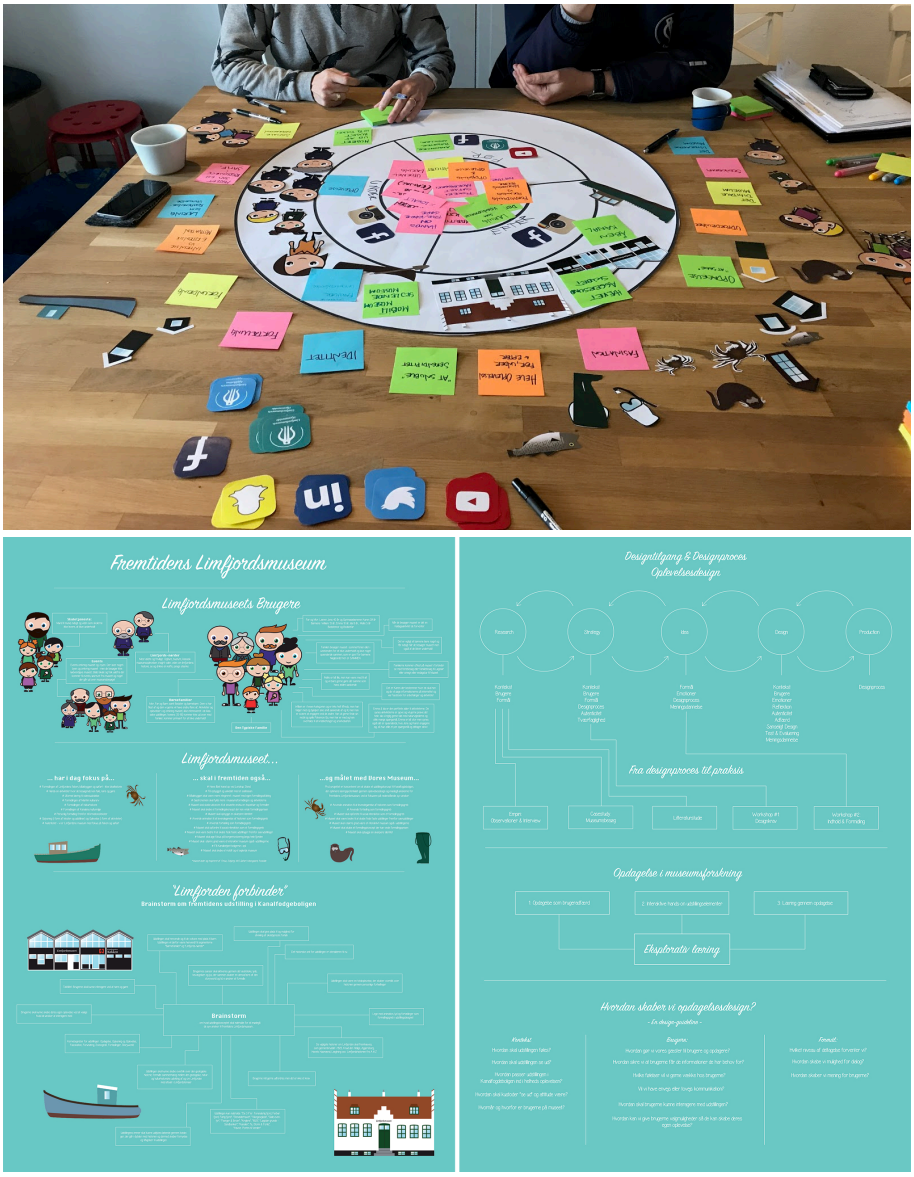


Figure 7: Images of workshop settings, visualisations of insights and generative tools. To see a readable version of the bottom two posters, go to appendix folder A4_Ex_C (4.2_Infographic & 4.3_Poster).

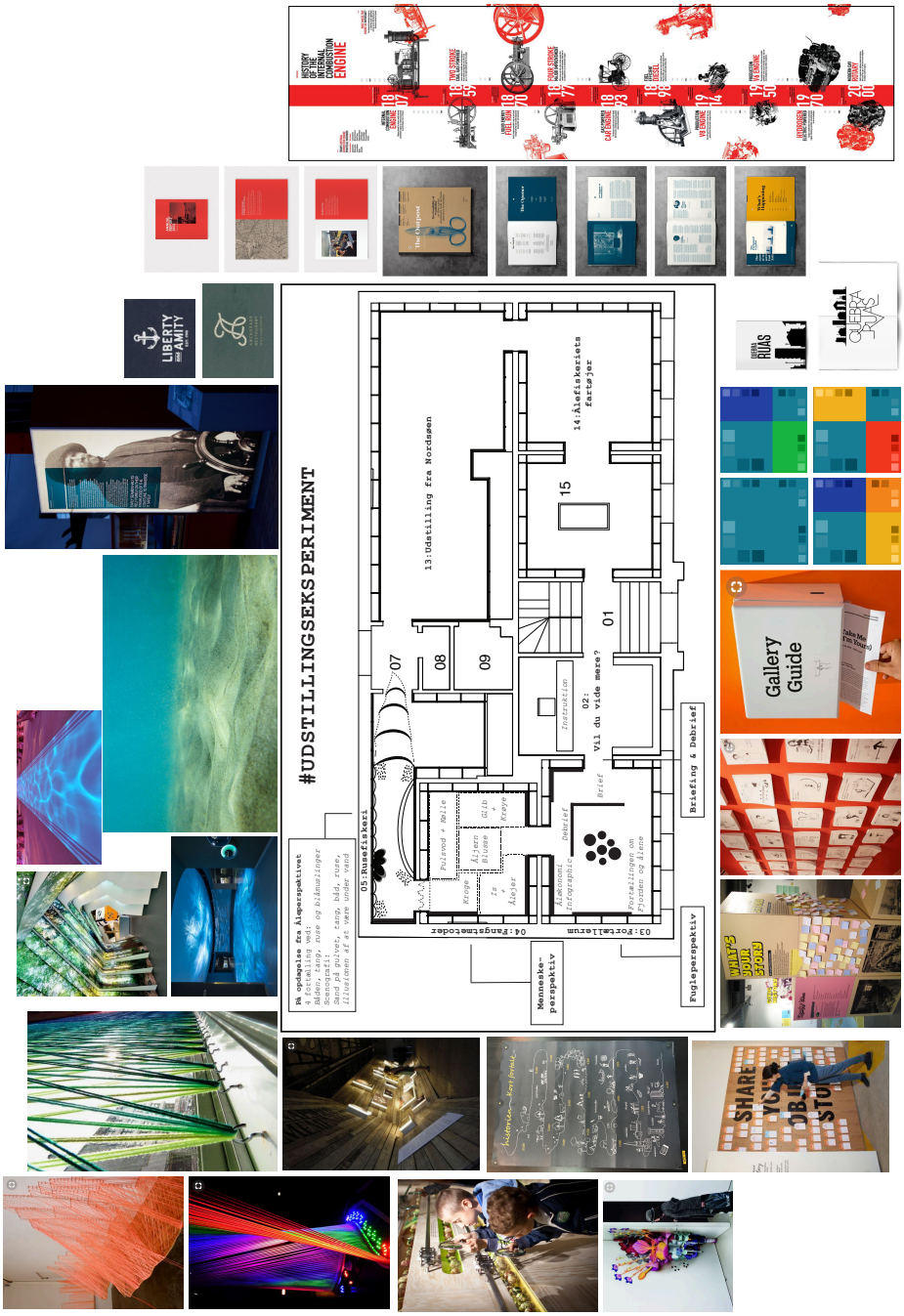


Figure 8: Moodboard for the exhibition, 'The Amazing Eel'. To see a readable version of the mood board, go to appendix folder A6_Ex_F (6.1 _Moodboard_Floorplan).

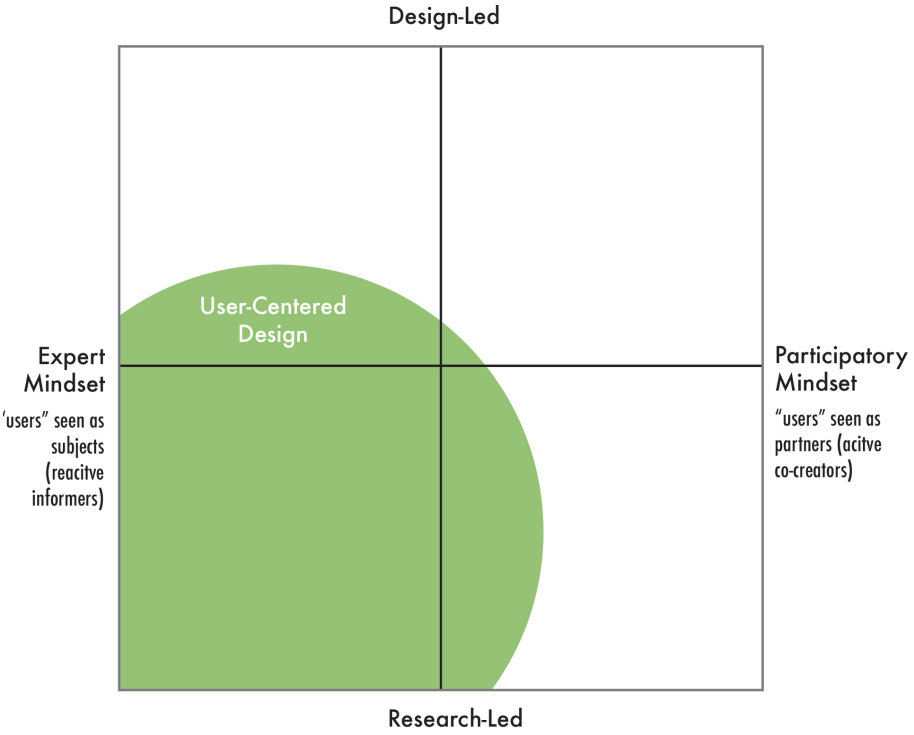


Figure 9: Design Research Map redrawn and simplified based on Sanders (2008).

Another consequence of the collaborative design process is that it became a process based on *expert mindset* (Sanders, 2008), which, for the museum, was a design-led endeavour, but for me, as a design researcher, was a research-led design endeavour (Figure 9), placing the research project somewhere close to the middle of the vertical axis and left towards expert mindset. This places the project solidly in the user-centred design research tradition, highlighted as a green bubble in Figure 9. It would have been interesting to see how the final exhibition would have taken shape had the design process been participatory and involved museum users in the three workshop sessions. Nevertheless, the research project set out, amongst other aims, to explore experience design as a guide for a collaborative design process, one which pulls the project into an expert mindset.

This experiment and process have been essential for the research project's development and knowledge generation, but also for one of the experiments, which I have not yet been able to evaluate as a whole and disseminate in a paper because of the timeframe of the research project. Some parts of the process have been evaluated in papers such as [P5] and in the collective contributions of the research project (Chapter 4). It will be interesting to delve into the effect of the collaborative process on the museum. To be able to analyse this effect, I conducted an interview with the

museum curator, who is mainly involved in the design process. In time, these data will hopefully shed light on the effects of the different methods and tools used throughout the design process, for comparison to how design processes unfold in other museums. Furthermore, as a result of applying different methods and tools to a collaborative workshop setting, I, together with one of the other PhD students from *Our Museum*, Rameshnath Krishnasamy, created the *Our Museum Game* (appendix folder [A8]). The game was intended as an exhibition design game in which the players, across professions, should each represent a user persona, which they create themselves, and go through three stages of user-centred designing. The *Our Museum Game* is a result of knowledge generated through [Ex_B] and through physical contributions to the *Our Museum* programme and museum exhibition design workshops, which I will return to in *Chapter 4. Contributions.*

2.4.3. [EX_C] DESIGN INSIGHTS

This experiment and the following, [Ex_D], had as their main agenda the informing of the design process through empirical data collection and synthesising, using Kolko's (2009) *Abductive Thinking and Sensemaking: The Drivers of Design Synthesis* to frame these two experiments as *Design Insights* and *Design Patterns*. In this experiment, we focused on design insights: how they have been generated and evaluated to inform the design process. Kolko (2009) described *design insight* as being the additive of the problem-specific observation, *I saw this*, and the professional experience, *I know this*, which together become a process of gaining insights from the context of the case study and combining these with theoretical knowledge to explain the observed. Thus, this design insight experiment was essential in the initial phase, where I as the design researcher sought to understand the context, the Limfjord Museum, and the problems thereof: what are they designing for and why? Buxton (2007) described this phase of a design process as *problem setting*, referring to the initial phase of the design process, which addresses the question, 'What is the right thing to build?' (p. 78).

Buxton linked this back to Schön (1983), who was the first to point out that design (product development) demands attention to both *problem setting* and *solving* throughout the design process. Within design thinking, this phase is called *(re-)define the problem* and *need finding & synthesis* by Brenner, Uebernickel and Abrell (2016), which they described as the phases aimed at revealing both the problem and the end-customers' needs. Thus, these are the initial steps in a design process to answer the question of 'What is the right thing to build?'. Thereby, this experiment focused on *problem setting* through the identification of design insights both in the museum context and for the end-users. Based on Koskinen et al.'s (2011) context definitions, this comprised a field experiment in which an ethnographic research phase was performed, as Sanders and Stappers (2014) described initial research endeavours aimed at understanding and identifying the potentials and challenges of the context.

The activities undertaken in this experiment and the connected methods are presented in Table 5 below.

AREA OF INTEREST	METHOD	DESCRIPTION
Problems & potentials for end-users	Observation, Field Notes, Interviews (Crabtree et al., 2012) and Autoethnography (Ellis, Adams, & Bochner, 2011)	Identifying problems, user behaviour and working procedures at the Limfjord Museum. This iteration of the experiment focused on the current state at the Limfjord Museum to understand how they worked with communication, how users used the museum and what issues and potentials could be identified. Observations and reflections thereof was documented through field notes.
Conversations with museum practitioners	Casual Conversations and Field Notes (Crabtree et al., 2012)	While doing the initial observations at the museum, I made a point of talking to the nature guides, boat builders, administrative personal, custodians, etc. to get insights into the museum and users' practices from those who are immersed in these practices. These were casual conversations documented in field notes.
Problem setting with the museum curators	Workshop, Generative Tools, Documenting by Post-its and Drawing + audio recording (Sanders & Stappers, 2014)	The workshop was conducted to define user segments, museum experience before, under and after, the focus for the museum experience today, what users may wish for in the future of their museum experience, and lastly brainstorming to identify the goal of the collaboration. Through the above iterations of the experiments, I generated insights on each of the subjects discussed in the workshop; and through these iterations, I identified the problem and potentials for the collaboration collectively with the museum.

Table 5: Overview of the three iterations of the [Ex_C] Design Insights experiment.

As shown in Table 5, the design insight experiment was focused on the initial problem setting and understanding of the context. The first two iterations were conducted throughout summer 2016, when I started the research project, and helped identify the problem area for the research project as described in section 1.3. *The Limfjord Museum*. Thus, insights were identified that framed the design process and desires for the final exhibition, and which initiated the theoretical exploration of [Ex_A]. Thus, [Ex_C] was a highly design-led experiment. Data from this experiment's iterations can be found in the appendix folder [A4_Ex_C]. Based on the above, I throughout the first two years regularly wrote down thoughts, observations, decisions and conversations in two different documents, to keep documenting reflections happening in the design process. These documents as a whole also contains the field notes, observations and autoethnography The documents can be seen in appendix folder A4_Ex_C(A4_4 & A4_5). I will return to this experiment's synthesis and connection to the other experiments in the following section.

2.4.4. [EX_D] MAPPING COMMUNICATION APPROACHES

In this section, *[Ex_D] Mapping Communication Approaches*, will be unfolded. According to Kolko (2009), *design insights* and *design patterns* are both part of the *insight combination* method, which, through the pairing of design insights with design patterns, creates a synthesis. We discussed the design insight approach and design iterations in the previous section; we will now outline how design patterns in this research project took shape as the mapping of communication approaches in museum exhibitions, rather than as design patterns, as described by Kolko (2009), Tidwell (2005/2010) and Alexander (1977), before moving on to the insight combination. Design patterns are, according to Kolko (2009), structural and behavioural features that improve the 'habitability' of something, e.g., in this research project, museum experiences. This is with reference to Tidwell (2005/2010), who wrote *Designing Interfaces: Patterns for Effective Interaction Design*. As the title suggests, this work focused on design patterns for interaction design. Tidwell described design patterns as the best practices of a given domain, as common solutions to design tensions. Tidwell's approach to identifying design patterns within interaction design was inspired by the works of Alexander (1977) and his representation of pattern language. Alexander defined pattern language within architecture and building construction as '[…] a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use the solution a million times over, without ever doing it the same way twice' (Alexander, 1977, p. x). Thus, this approach can identify patterns in problems as well as their solutions. The pattern language that Alexander (1977) described is but one possible pattern language. Thus, what Tidwell (2005/2010) was building on when defining design patterns for interaction design were common solutions and design patterns, which are not off-the-shelf solutions, rules or heuristics, but are rather differentiated depending on their implementation, which is also what Alexanders argued.

Even though Tidwell (2010) went on to describe 11 areas of design patterns in interaction design, some of which could be relevant in a museum context, e.g., design patterns for 'What Users Do' (Tidwell, 2010, pp. 1–24), the purpose of this experiment was to map communication approaches to identify different types of compositions in exhibitions. This might associate design patterns with the grand problem of disseminating knowledge through exhibition, but it is not the design patterns themselves, as Alexander (1977) described them, that I am interested in here, but rather the idea of design trends, as Kolko (2009) presented. Thus, the experiment sought to identify the components of exhibitions in regard to communication approaches and compositions, to get an overview of how different museums compose exhibitions. Consequently, the study sought to identify the overall composition of different communication approaches in an exhibition rather than a specific pattern. Thus, I cannot argue that the mapping of communication approaches in this study comprised design patterns, but rather constituted a first step in trying to

identify patterns. Nevertheless, the mapping provided a valuable understanding of the more general use and occurrence of different communication approaches and thus more general patterns of exhibition composition. This experiment unfolded as a field study focused on identifying communication approaches in state-of-the-art museums to inform the ideation and design of the exhibition.

Throughout the three-year research project, I visited 34 museums across Denmark, Australia, New Zealand and Scotland. The term *museum* in this research project refers to a wide range of free-choice/informal educational institutions, inspired by the understanding put forth by Falk and Dierking (2013/2016, p. 25). The geographical distribution was determined by my research activities. Whenever I visited a country during the research period, I also visited as many museums as I could, in order to keep developing the list. Therefore, I cannot argue that this is a complete picture, worldwide, or a large enough sample to generalise, but I can identify a composition of communication approaches and reflect on the patterns that arose from these compositions. In Table 6, there is a list of museums in the left-hand column. In the top row, I have listed the different communication approaches, option of choice in the exhibition spaces, social potentials and learning potentials through interaction with people that have been used across the museums. The categories were mainly shaped by the research question and hypotheses of the research project.

The communication approaches list was open and evolved with each visit to a museum, adding new communication approaches. The option of choice and social and learning potentials are connected to exploration and the users' potential to learn through exploration, thus identifying whether the options provided in the exhibitions only used binary choices (press the bottom or not, walk left or walk right) or a more free choice pattern, one which allowed for emergent narratives to occur (multiple choices and layers of narratives to explore and assimilate depending on a user's experience pattern). Further, important questions could be asked here: Does the communication approach encourage social engagement? Does the exhibition provide further learning potentials beyond the exhibition itself? The list of communication approaches evolved along the way and was not set from the beginning. Every time a new approach appeared, it was added to the table and assessed in terms of whether it was present or overlooked in the previously visited museums. By visiting these museums, an understanding of how museums communicate their history and artefacts, how differently and similarly they compose exhibitions, kept broadening. Whenever something stood out, it was documented with pictures. For the first of many museum visits, the experiences were also documented with autoethnographies (Ellis et al., 2011; appendix folder A5_Ex_D). The more the table evolved and the further into the design process we went, the less relevant it was to keep documenting through autoethnographies. This table has not been published in any of the dissertation papers but nonetheless constituted a fundamental experiment in the design process to shed light on design trends and compositions in exhibitions, through visits and mapping. Thus, the experiment

provided an understanding of how communication approaches solve the problem of dissemination and how to potentially create new solutions, which is outlined in [P4] and [P6].

	COMMUNICATION APPROACH	Video	Animations	Sound	AR // VR	Screens	3D // Hologram	Projection	Integrated technology	Sensors	Interaction	Participation	Info texts	Illustrations	Displays	Touch // Try	Narratives	Choice in Narratives	Storytelling	OPTION OF CHOICE	Binary	Emergent	SOCIAL POTENTIALS	With others	With own	LEARNING POTENTIAL	School Programs	Guided tours	Guides
DENMARK																													
Moesgaard		x	x	x	x	x	x	x	x		x		x	x	x		x		x		x			x	x		x	x	
Faaborg Arrest		x		x		x		x	x	x	x	x	x			x			x						x		x		x
Limfjordsmuseet		x	x	x		x		x			x	x	x	x	x	x					x			x	x		x	x	x
Vikingeskibsmuseet		x		x				x			x	x	x		x	x					x			x	x		x	x	x
Zoologisk museum		x		x							x		x		x		x		x		x				x		x		
Søfartsmuseet		x		x		x		x	x		x		x		x		x		x		x			x	x		x	x	
Ragnarok		x		x		x		x	x	x	x		x		x				x		x			x	x		x	x	
Tirpitz		x	x	x		x		x		x	x			x	x		x		x		x				x		x	x	
Vadehavscenteret		x	x	x	x	x		x	x		x		x	x	x		x		x		x				x		x	x	x
Danmarks Borgcenter		x		x				x	x		x		x	x	x		x				x				x		x	x	
Planetariet		x	x	x	x	x		x	x	x	x	x	x	x	x	x			x		x			x	x		x	x	x
Universitarium		x		x	x	x			x		x	x	x			x					x			x	x		x		x
Eksperimentarium		x	x	x		x		x	x	x	x	x	x	x		x					x			x	x		x		
The North Sea Oceanarium		x	x	x		x		x			x	x	x		x	x			x		x	x		x	x		x	x	x
Skovgaard Museet		x						x					x				x				x				x		x	x	
LEGO House		x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x		x	x		x	x		x	x	x
AUSTRALIA																													
Melbourne Museum		x		x		x		x	x		x		x		x		x				x				x		x		x
ACMI		x	x	x	x	x		x	x	x	x		x		x	x	x	x			x			x	x		x		x
Immigration Museum		x		x		x		x			x		x		x		x	x	x		x			x	x		x		
Old Jail Museum		x		x		x		x				x	x		x	x			x		x			x	x		x	x	x
Jewish Holocaust Museum		x		x		x							x		x		x				x				x		x	x	x
ArtVo Museum						x					x	x		x		x					x			x	x				
Australian Museum		x	x	x		x		x	x		x		x	x	x	x					x				x		x		
Hyde Park Barracks		x		x		x		x	x	x	x		x	x	x	x	x	x	x		x			x	x		x		
National Maritime Museum		x		x		x		x			x		x		x	x	x				x			x	x		x	x	x
Powerhouse Museum		x		x		x		x	x		x	x	x		x	x	x				x			x	x		x		x
Susannahs Place Museum		x		x								x	x				x		x					x	x		x		x
Police & Justice Museum		x		x		x					x	x	x		x		x	x	x		x			x	x		x		x
Sydney Museum		x		x		x					x		x		x		x				x				x		x		
NEW ZEALAND																													
Te Papa		x	x	x		x	x	x	x		x		x	x	x	x	x	x	x		x				x		x	x	
Auckland War Museum		x		x		x			x		x		x	x	x	x	x	x	x		x				x		x	x	
SCOTLAND																													
The McManus						x							x	x	x						x				x		x	x	
V&A Dundee		x		x		x			x		x	x	x	x	x	x					x	x		x	x		x	x	x
National Museum of Scotland		x	x	x		x		x	x	x	x	x	x	x	x	x	x				x			x	x		x	x	x

Table 6: Communication approaches in museums across Denmark, Australia, New Zealand and Scotland. If the table is hard to read in print, it can be found in the appendix folder A5_Ex_D (5_3_Mapping).

2.4.5. [EX_E] EXHIBITION DESIGN: 'THE AMAZING EEL'

The fifth experiment was the culmination of the previous four experiments. This experiment featured the final design and production of the exhibition, *The Amazing Eel* (Figure 10). This is where design insights, [Ex_C], was combined with communication approaches, [Ex_D], through the collaborative design process, [Ex_B], following principles of experience design and criteria for exploration, [Ex_A]. Thus, the question of how do we build the right design was addresses. The exhibition design is the final part of the design processes *problem solving* in the pursuit of *getting the design right*, (Buxton 2007) following the steps in *problem setting* and *problem solving* through the previous four experiments. This leads us back to insight combinations (Kolko, 2009), because the right design is shaped through the iterative process of continuously combining design insights and communication approaches with criteria for exploration and principles for experience design to create design ideas that eventually culminate in processes like this experiment – an exhibition design for *The Amazing Eel*.

Even though I fundamentally followed insight combination for this experiment, the writing of design insights and patterns on post-its and the combination thereof (Kolko, 2009) were replaced with workshops as a setting in which to facilitate a collaborative design process whereby the combination of design insights and patterns could evolve organically along with definitions of the content (section 2.4.2). It might have been fruitful to go through a strict insight combination process together with the museum, but because the design process was not only about a design but also about content, it would have been too restricting to just focus on insights and patterns when given shape to the exhibition.

In the process of getting the full exhibition design right, one of the iterations in this experiment involved testing some of the communication approaches which were thought to potentially be a good combination with some of the design insights. This iteration took shape as a small prototype installation (appendix folder A6_Ex_E & 6.2_ Exhibition_Prototype). The purpose was to see how users responded to a certain design pattern composed of *storytelling*, *sound* (audio storytelling) and *integrated technology* (movement-activated sensors). Thus, more insights were provided to further develop the design. Apart from this smaller prototype, we mainly prototyped through sketching and staying in line with the expert mindset (Sanders, 2008; Figure 9) design approach. Opposite, participatory-minded users were not involved until the final exhibition was opened and experiment [Ex_F] was conducted. Involving users in the development process would have been interesting, but one of the reasons for staying firm in the expert mindset throughout the design process was not to please the users' 'wants' but to expand on the experience potentials we can create in exhibitions by designing for exploration. The design decisions for *The Amazing Eel* are elaborated in [P5], describing which design decisions were made and how they were implemented, mainly focusing on designing for exploration and the criteria thereof.

Figure 10: Pictures of the exhibition, 'The Amazing Eel'.

2.4.6. [EX_F] A USER STUDY OF THE AFFECTS OF EXPLORATION

The last experiment was set up as a user study centred around identifying affect and user perception of an exhibition that encourages exploration. Affect was in this research project mainly connected to learning potential in an informal learning setting. Thus, how does the exhibition support informal learning through exploration? This experiment, its methods and results are extensively elaborated in [P6], and therefore its description will be brief in this section. Below, in Table 7, an overview of the research methods applied for this experiment is presented. As [Ex_E], this experiment was the culmination of the five previous experiments and evaluated the end-users perception of the exhibition. Therefore, the criteria for evaluation, which framed the interviews, observations and coding, were based on the chosen design criteria, insights and patterns in order to summarise how this type of exhibition affects users and whether it does so in the intended way.

METHOD	DESCRIPTION
User study in *The Amazing Eel* exhibit	Narrative interviews with families (five families with a total of 18 people). The interviews were conducted with the main user segment at the museum, families, which was identified through the design insight experiment. The interviews were planned as narrative and semi-structured interviews to question their learning experiences.
Observation	23 observations of groups visiting *The Amazing Eel* exhibition were conducted (a total of 68 people). To streamline the observations, a schedule with points of interest was defined for the observations, and further observations were written down as field notes. The observations were done by being in the exhibition and taking notes on users.
User study in the *Anguish & Fire* exhibit	Narrative interviews with families (four families with a total of nine people). The interviews were conducted with the main user segment at the museum, families, and as narrative and semi-structured interviews to understand their learning experiences.
Transcription and thematic analysis	A total of 4 + 2 hours of interview material were transcribed. Based on the transcribed data from the interviews, a thematic analysis was conducted to identify how exploration affected the users' learning experiences.

Table 7: Methods used in the user study. All data are available in the appendix folder A7_Ex_F.

This experiment picks up where I started at the Limfjord Museum, talking to users and observing their interactions in the exhibition. For this experiment, the group interviews were essential, to be able to unfold what the users got out of visiting the exhibition. The interviews were conducted as narrative interviews (Jovchelovitch & Bauer, 2000) to invite families to describe their experiences. The families were in [Ex_C] identified as the primary segment and were therefore to whom the exhibition was intended. The interviews were transcribed and thematically analysed. Observations (Lofland, 1976) were made of whomever entered the exhibition to get an understanding of users' natural behaviour with respect to the new exhibition. Furthermore, to not let this one exhibition and user study stand alone, the research

design for this exhibition was applied to another exhibition in Faaborg, *Anguish & Fire.* The purpose of *Anguish & Fire* as well as *The Amazing Eel* was to create an exhibition whereby users could learn and experience through exploration. Even though *Anguish & Fire* was not designed following the same design criteria or process as *The Amazing Eel*, the designers had worked with many of the same communication approaches we used in the exhibition and with the same intention of creating space for exploration. The study conducted at *Anguish & Fire* was not as extensive as the one conducted at *The Amazing Eel,* since it was not possible to conduct observations in the former exhibition, and the recruitment of participants was harder. This exhibitions are described in [P6] and are thus not discussed any further here. Nevertheless, the observations from *The Amazing Eel* exhibit are not part of [P6] but are an essential part of [Ex_F]. The interviews were thematically analysed to identify what and how exploration affected the users' experiences. The themes were related to the four criteria for exploration, as identified in both [P4] and [P5]. The same criteria were used to analyse and describe the explorative potential of each of the exhibitions.

2.5. SUMMARISING THE RESEARCH DESIGN

In this chapter, I introduced and discussed my research design, organised around Creswell's (2003) framing of interactions between different levels in a research design. I introduced my research, which used a constructive design research strategy of inquiry as a methodological approach in design research. More specifically, this methodology was used as research through design to produce contributions with the character of research *for* design. The research design had a serial and expansive logic (Krogh et al., 2015) towards broadening the body of knowledge through experimentation on the use of experience design in museum exhibitions and collaborative design processes. I further discussed how the drive wheel of constructive design research (Bang et al., 2012) was applied to the research project to structure and visualise the process of knowledge generation in research through constructive design. Furthermore, I reflected on how I view my research through a pragmatic paradigm, as an inquiry into the effects in practice of using experience design to support a design process for exhibition design that encourages explorative behaviour. The individual experiments were thus organised as a pragmatic inquiry primarily situated in either the lab or field context (Koskinen et al., 2011). The primary data output from these inquiries was collected through different ethnographic methods.

This research project was shaped by an explorative research design, one which sought to generate knowledge through hypotheses and experimentation. Thus, this project employed a somewhat structured collaborative design process in the field, one which inspired expansion through insights. The discoveries made through expansion further informed the serial experiments in the design process, working

towards creating an exhibition design. Also, in the pursuit of expanding knowledge on applying methodologies and methods from HCI in exhibition design, the expansive experiments (Krogh et al., 2015) in many ways represent the drifts that the research project has taken based on its openness to exploring insights and ideas emerging out of the serial experiments. The openness, drifts, collaborations and experimentation were not necessarily always easy tasks to document and structurally evaluate. An issue also brought forward by Dahler-Larsen (2008) were problems with qualitative data, such as the immensity of qualitative research data produced, which can be difficult to structure, and with the analysis, which at times can happen late due to practical limitations rather than analytical goals. This was an issue in this project as well, but writing papers along the way provided the opportunity to take a step back, and re-evaluate the progression and structure of experimentation and analysis. With these final reflections on the research methods of each design experiment, the next chapter presents the six original papers included in the dissertation.

“You can design and create, and build the most wonderful place in the world. But it takes people to make the dream a reality.”

- Walt Disney

3

papers

3. PAPERS

In this chapter, the six papers published or submitted throughout this research project are described. These papers are as follows:

[P1] **Paper 1:** Madsen, K. M. (2017). REDOing the Museum Exhibition Design. In A. L. Bang, M. Mikkelsen, & A. Flinck (Eds.), *Cumulus REDO Conference: Proceedings Design School, Kolding* (pp. 690–695). Kolding: Cumulus. (published)

[P2] **Paper 2:** Madsen, K. M. (2019). *Retningslinjer for Udviklingen af IT-baseret Oplevelsesdesign* [Guideline for Creating IT-based Experience Design]. In J. F. Jensen (Ed.), *NN* (not named yet) (p.). Aalborg: Aalborg University. (in press)

[P3] **Paper 3:** Madsen, K. M. (2019). The Gamified Museum - A critical literature review of gamification in museums. In T. Jensen, C. Rosenstand, & O. Ertløv (Eds.), *GameScope: The potential for gamification in digital and analogue places* (p.). Aalborg: Aalborg University Press. (in press)

[P4] **Paper 4:** Madsen, K. M., & Vistisen, P. (2019). Designing for emergent interactions: Strategies for encouraging emergent user behaviour & serendipitous research findings. *The Design Journal, 22*(1), 1807–1820. Taylor & Francis. (published)

[P5] **Paper 5:** Madsen, K. M., Skov, M., & Vistisen, P. (2019). How to design for exploration through emergent narratives. *The Design Journal*. Taylor & Francis. (under review).

[P6] **Paper 6:** Madsen, K. M., & Jensen, J. F. (2019). Learning through exploration at museum exhibitions. *Visitor Studies*. Taylor & Francis. (under review)

Reprints of the papers have been resized to fit the layout of the dissertation without alterations to the content or original layout. Should there be any trouble reading the resized papers in this dissertation, pdf versions of each can be found in the appendix folder [Papers].

Following this chapter is Chapter *4. Connecting the Dots,* which summarises the contributions of this research project in regard to the sub-questions of the main research question before concluding and providing further perspectives.

3.1. [P1] REDOING THE MUSEUM EXHIBITION DESIGN

Madsen, K. M. (2017). REDOing the Museum Exhibition Design. In A. L. Bang, M. Mikkelsen & A. Flinck (Eds.), *Cumulus REDO Conference: Proceedings Design School, Kolding* (pp. 690–695). Kolding: Cumulus.

The first paper is a position paper which frames the initial problem area and research question for this research project. It sets the stage for my research by outlining the hypotheses grounded in the initial stages of experiments A and B. Even though it was a position paper, it was the stepping stone for discussing the subject with other design researchers and for reaching new understandings and asking new questions about the subject. Following up on the research design, the table below summarises which research question and experiments are connected to this paper. As [P1] is a position paper, it does not contribute new knowledge nor seek to answer any of the research questions of the research project; instead, it frames the research interest and problem area.

[RQ]	How can principles of IT-based experience design guide the design, implementation and evaluation of an explorative museum exhibition?
[Ex_A]	Reviewing, Defining and Clarifying Problem Area
[Ex_B]	Collaborative Design Process
Publication Ranking	Cumulus Conferences: Level 1

Table 8: Overview of the research question and experiments connected to [P1].

REDOing the Museum Exhibition Design

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Abstract: This short paper is a research note on a PhD project about *Design and evaluation of experiences as a means of learning in a museum context*. The purpose of the project is to explore and test how we can REDO the museum exhibition design through experience design. The museum's classic role as an information and knowledge institution is being challenged by the experience economy. The methodological construction of the PhD project is based on research through design, which sets the scene for three main experiments in *the lab, the field and the showroom*.

Keywords: Museum, exhibition design, experience design, learning, research through design (RtD)

1. Outline of Research

Danish museums are being challenged by the experience economy, which puts them in competition with attractions e.g. amusement parks and zoos that use experiences as a strategic tool. Users are looking for experiences that are interactive and engaging in comparison to passive experiences such as looking at objects in exhibition cases. This development strains the museums between their obligations as cultural institution and being an experience attraction (Skot-Hansen, 2008). This means that the museum needs to re-evaluate their classic role as an information and knowledge institution and find ways to enhance their experience potential, but still maintain their authenticity and credibility (Skot-Hansen, 2008).

This change in focus is visible in newer museum exhibitions like at Moesgaard Museum. The exhibitions at Moesgaard Museum is an example of a holistic exhibition design, which integrates both design, architecture, digital technologies and game-elements to enhance the user and learning experience (Madsen & Laursen, 2015). What makes Moesgaard Museum different from other museums in Denmark is that their exhibitions are designed by an in-house exhibition design studio. This design studio is a collaboration between set designers, user experience designers, archaeologist, photographers and game designers (Madsen & Laursen, 2015). But there is still some research on the effect and potential of

Kristina Maria Madsen

these types of exhibitions and the effect of combining the different design skills in developing exhibition design.

The outlook to the user's higher demands for experiences in museums and the still missing research of the effect of newer design based exhibitions, has created the foundation for the national research and development project called *Our Museum* (Vores Museum, 2017; 2014). This project is a collaboration between five universities (AAU, SDU, AU, RUC and KU) and eight museums. The goal of *Our Museum* is to contribute to the theoretical, empirical and practical development of museums' communication and design. This goal is achieved by analysing four different historical areas of Danish museum communication and by designing and evaluating seven communication design projects. This research note represents one of the seven design and evaluation PhD projects and is a collaboration between *Aalborg University* and *Limfjordsmuseum*. The goal of this PhD thesis is to explore and test how we can REDO the museum exhibition design through experience design; to enhance the future museum experience and communication but still maintaining the learning potential.

2. Theoretical Foundation

To explore and test how we can REDO the museum exhibition design through experience design I will work in iterative processes between literature studies, practical design interventions at the museum and evaluation of user experience with a *research through design* approach. The expected outcome of this PhD project's research is a tested theoretical design guideline for redesigning the museum experience and an exhibition design concept for the Limfjordsmuseum. The research in the thesis is focused on the intersection of the theoretical tradition of experience design, the 'participatory museum' and learning from which the theoretical design guideline will be defined.

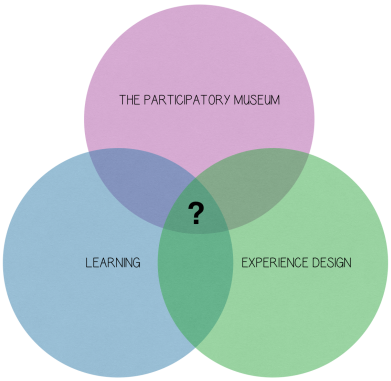

Figure 1. This Veen Diagram (Veen, 1880) illustrates the three main theoretical traditions of the PhD project. The pink bobble represents "The Participatory Museum", the blue bobble represents "Learning" and the green bobble represents "Experience Design". In the middle where all three traditions intersect, there is a question mark, which indicates the area where the academic contribution of this research project will be placed.

The main purpose of the PhD project is to look at how we can REDO the museum exhibition design. There is a lot of different literature about museums and museum experiences (Falk, & Dierking, 2013), but one area that is of particular relevance is the participatory museum. As mentioned in *Outline of the Project* the users are demanding more interactive experiences. The museum literature represented in the design guideline will focus on the participatory museum (Simon, 2010). This literature describes how to increase the user's interaction through participation in the museum and thereby increase the experience. This theoretical tradition is relevant to figure out what works and what does not work in the museum context.

In continuation of the participatory museum, the PhD project seeks to explore how we can REDO the museum experience through *experience design*. Therefore, the second theoretical tradition that I will look into is *experience design*. Experience design as a design tradition is user-centred and seeks to enhance the user experience and optimize the experience potential in a context (Jensen, 2013). Experience design is a multidisciplinary design tradition that combines design elements from different traditions such as aesthetics, flow, user experience etc. Moreover, experience design has a broad application possibility, which makes it relevant for creating the theoretical design guideline for REDOing the museum experience.

Lastly, the PhD project looks at the theoretical tradition around learning to explore how we can maintain or create a learning potential in recreating the museum experience. Because of the broad theoretical tradition within learning (Illeris, 2000), the research will look to theory on informal learning experiences in museums (Hein, 2002), especially focusing on aesthetic learning and the potential of learning through serendipity (Dirksen, 2015) in the exhibition design. So looking back at figure 1, the learning bobble's intersection with experience design and the participatory museums, is where we find the aspects of the museums experience

that is connected to learning; and thereby defines which types of learning that actually occur in the user's interaction with a museum exhibition. By adding learning theory as a central part of recreating the museum experience we can optimize the learning potential in the future museum experience. Thereby we also preserve one of the museum's utmost central objectives, which is to inform the public (Retsinformation, 2016).

As earlier stated the theoretical design guideline will be created based on these three traditions and if we once again take a look at figure 1, the design guideline will be placed within the intersection of all three theoretical traditions where the question mark is placed. This design guideline will create the guideline for developing museum exhibition design that optimises the user experience and learning potential in museums. But since it is at its first iteration, it is purely theoretical. Therefore, I will be testing its functionality and validity through further iterations with different design experiments at the Limfjordsmuseum. To create the optimal research design for this type of research I will, as previously stated, be using *research through design*.

3. Research Design

The PhD project research is based in the field of experience design, where it has been a tradition to work with design research (Collins, Joseph & Bielaczyc, 2004). By applying *research through design* as the foundation for this research design, I meet the methodology traditions of the research field. To frame the research design of the PhD project I use Koskinen, Zimmerman, Binder, Redström and Wensveen's (2011) approach to RtD, because they focus on the creation of understanding and knowledge through the construction of design. Koskinen et al. (2011) argue that we can create knowledge by planning the design process, by producing the theoretical argumentation for the design and through the use of the design.

Koskinen et al.'s (2011) approach to *research through design* creates the optimal conditions for working in an iterative process because it shifts between the theoretical development of the design guideline, creation of prototypes in the "Lab" (Koskinen et al., 2011), practical design interventions as well as experiments at the museum and the evaluation of user experience and the functionality of the design guideline.

4. The Experiment in the Project

On the basis of Koskinen et al.'s (2011) approach to *research through design,* the experiments in the project can be divided into three major experiments: *The Lab, The Field* and *The Showroom*. *The Lab* experiment will revolve around the theoretical creation of the design guideline, thereby the production of the theoretical argumentation for the designs. But also the design and prototype development for *the field* experiment. Furthermore, in an iterative process, *the lab* is a part of the design process that will be re-visited after *the field* and *the showroom* experiments to evaluate the design concepts and data collected by using and testing both the design guideline and the prototypes. The iterative process is applied to improve both the theoretical based design guideline and design concepts to become the best possible within the frame of the research project.

The Field experiment will test the prototypes created on the basis of the design guideline in their appropriate context at the Limfjordsmuseum. The purpose of *the field* experiment is to test how the design concepts created in the lab actually function in their proper setting, how the users interact with them and weather they are fulfilling their purpose as intended. In the field experiment, I will conduct different types of qualitative test with the museums users to evaluate the design concepts. For example, I will use focus groups to test the design concepts before conducting workshops or interviews with the focus groups to hear about their experiences with the designs in the museum context. As mentioned in regards to *the lab,* the outcome of the field experiment will contribute to the re-evaluation of the design guideline and the design concept before the final experiment, *the showroom*.

The Showroom experiment will be conducted as the field experiment. But the difference of the showroom experiment is that instead of testing prototypes I will be testing a new exhibition design at the Limfjordsmuseum, that will be designed on the basis of the design guideline and the tests conducted in *the lab* and *the field* experiments. The purpose of *the showroom* experiment is to test the overall user experience of the exhibition design especially focusing on the aesthetic experience. As with *the field* experiment, I will conduct different types of qualitative test with the museum users, such as focus group workshops and interviews and observations, to evaluate the final design concept. Furthermore, as mentioned in *the lab* and *the field* the outcome of the showroom experiment will contribute to the final re-evaluating of the design guideline and the design concept.

5. Conclusion

This research note has presented the outline of the PhD project that explores how we can REDO the museum experience design to enhance the museum's experience and learning potential. This is achieved by creating a theoretical design guideline based on theory within experience design, participatory museum and learning. The guideline will be tested through design development and intervention experiments at the Limfjordsmuseum. Furthermore, the PhD project contributes to *Our Museum's* vision for improving the public's well-being by redesigning and rethinking the museum experience through experience design.

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3.2. [P2] RETNINGSLINJER FOR UDVIKLINGEN AF IT-BASERET OPLEVELSESDESIGN

Madsen, K. M. (2019). *Retningslinjer for Udviklingen af IT-baseret Oplevelsesdesign* [Guideline for Creating IT-based Experience Design] In J. F. Jensen (Eds.), *NN* (not named yet) (p.). Aalborg: Aalborg University. (in press)

The second paper was central to the research project, both as the motivation for the research endeavour and as the driver for applying experience design in the design process with the museum and in the creation of the exhibition. This paper therefore served as the backbone and design approach for research through design, thus, it also acted as the framework for designing at all levels. Accordingly, I chose experience design as the design approach to apply to challenges in the museum sector, such as balancing enlightenment and experiences. This part of experiment [Ex_A] was preliminary to the PhD project, but the publication on the experiment was developed throughout the PhD. Following up on the research design, the table below summarises which research question and experiments are connected to this paper. [P2] is a chapter for an anthology on experience design, published by Aalborg University Press. The chapter is accepted and reviewed, but is still in press.

[SQ1]	What theoretical principles and criteria can be identified for IT-based experience design and exploration?
[Ex_A]	Reviewing, Defining and Clarifying Problem Area
Publication Ranking	Aalborg University Press: Level 1

Table 9: Overview of the sub-question and experiment connected to [P2].

Retningslinjer for Udviklingen af IT-baseret Oplevelsesdesign

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OPLEVELSESDESIGN SOM PRAKSIS

I dette kapitel vil jeg beskrive et teoretisk funderet Oplevelsesdesign-frameworket, der rammesætter og definerer retningslinjer for udviklingen af kvalitative it-baserede oplevelsesdesign. Dette kapitel er baseret på undersøgelsen og resultatet af "Oplevelsesdesign-framework - ét teoretisk funderet framework til udviklingen af it-baseret oplevelsesdesign" af Madsen og Nybro (2015). Oplevelsesdesign-frameworket har til formål at rammesætte designudviklingen for oplevelsesdesign og dermed være med til at guide en oplevelsesdesigners overvejelser i designprocessen for at sikre udviklingen af kvalitative it-baserede oplevelsesdesign. Motivationen for at udvikle Oplevelsesdesign-frameworket er, at der på nuværende tidspunkt ikke findes en konkret model til udviklingen af oplevelsesdesign eller en samling af retningslinjer for denne type design. Oplevelsesdesign-frameworket er udviklet med afsæt i det mest fremtrædende oplevelsesbaseret teori inden for blandt andet *user experience* (UX), *user interaction* (UI) og *user experience design* (UXD).

I dette kapitel vil jeg præsentere Oplevelsesdesign-frameworket, dets bagvedliggende teori og formål samt dets opbygning. Frameworket danner en rækker retningslinjer, der skal gennemtænkes i udviklingen af oplevelsesdesign igennem designprocessens faser. Formålet med oplevelsesdesign-frameworket er dermed at skabe et udgangspunkt for at sikre kvalitative it-baserede oplevelsesdesign igennem designprocessen både i akademisk- og praksissammenhæng. Frameworket kan ses i to forskellige anvendelsessituationer; som en model og som et værktøj:

- **En model** // Frameworket kan anvendes som en model til at vurdere et eksisterende oplevelsesdesign, for at defineres dets oplevelsesdesignpotentiale og muligheder for forbedringer.
- **Et værktøj** // Frameworket kan anvendes som et værktøj til udviklingen af et oplevelsesdesign, for at sikre dets oplevelsesmæssige potentiale set i forhold til den givne bruger.

Brug Af Frameworket

Forhåbningen er, at modellen og værktøjet vil blive alment udbredt og anvendt af designere, projektledere, konsulenter og studerende for at kunne fordre gennemtænkte og gennemarbejdet oplevelsesdesign. Frameworket er udviklet til at følge en designproces fra den indledende research-fase

til produktionen. Dette er særligt væsentlig, når frameworket anvendes som værktøj til udviklingen af nye oplevelsesdesign. Når frameworket derimod anvendes som model til vurderingen af et eksisterende oplevelsesdesign, vil faserne skabe rammen for hvilken del af oplevelsesdesignet, der skal gennemtænkes. Formålet med dette kapitel er at skabe en formidling af oplevelsesdesign-frameworket på en måde, hvor det vil kunne anvendes til at udvikle og planlægge oplevelsesdesign i en akademisk kontekst og i en praksiskontekst. Jeg vil her starte med at rammesætte et oplevelsesdesign-mindset. Hvad er det, der gør oplevelsesdesign til noget specielt set i forhold til almene designpraksis, og hvordan understøtter oplevelsesdesign-frameworket et oplevelsesdesign-mindset?

ET MINDSET SOM OPLEVELSESDESIGNER

Som tidligere nævnt ligger it-baseret oplevelsesdesign flettet ind i et komplekst og multidisciplinært felt af UX, UXD og XD. Så for at definere hvad oplevelsesdesign præcist er, vil vi som det første se nærmere på definitionerne af dette multidisciplinære felt. *Oplevelsesdesign* (XD) anses som en designpraksis, der sætter fokus på udviklingen af oplevelser. Oplevelsesdesign kan tage form som *produkter, tjenester, begivenheder, processer, omgivelser* etc. (Jensen, 2013). Oplevelsesdesign er design for interaktionen mellem brugeren og produktet i en given kontekst. Som oplevelsesdesigner sætter vi særligt fokus på brugeren og selve kvaliteten af brugerens oplevelse i designprocessen.

Termen *user experience* (UX) bliver ofte brugt som synonym for *usability, user interface, oplevelsesinteraktion, interaktionsdesign, brugeroplevelser* etc. Derudover anvendes UX også som paraplybegreb for disse termer (Roto, Law, Vermeeren, & Hoonhout, 2011). Derfor ses UX som en underkategori til oplevelsesdesign. *User experience design* (UXD) er et komplekst felt, som er svært at adskille fra XD og UX. UXD forstås som planlægningen og konstruktionen af UX (Hobbs, Fenn & Resmini, 2010). UXD udgør en lang række faktorer, der skal tages i betragtning, når UX planlægges. Heriblandt er *informationsarkitektur, interaction design, human computer interaction, user interface design, usability, visual design, information design* og *human factors engineering* (Hobbs et al., 2010). UXD behandler alle aspekter af brugerens interaktion med det givne produkt, hvordan produktet opfattes, hvordan det læres og bliver brugt (Hobbs et al., 2010). UXD ses dermed som et delelement i udviklingen af oplevelsesdesign, som den del der planlægger designet af UX gennem interaktionsmodeller og arkitekturen af et givent oplevelsesprodukt (Hobbs et al., 2010). UXD knytter sig, som UX, til de it-baserede oplevelser, som kræver en vis form for system-, apparat- eller produkt-interface (Jensen, 2013).

Hvordan Og Hvorfor Skiller XD Sig Ud?

Så hvad adskiller et oplevelsesdesign-mindset fra UX, UXD og almen design? Oplevelsesdesign er en designpraksis, med et design-mindset hvor vi sætter brugeren og kvaliteten af selve brugeroplevelsen først igennem hele designprocessen. Vi tager alle elementerne af en oplevelse med i vores overvejelser fra konteksten, hvor oplevelsen skal foregå, til bruger-produkt-interaktionen og produktfunktionalitet. Hvorimod UX designeren fokuserer på bruger-produkt-interaktionen (Jensen, 2013) og den almene designer fokuserer på selve produktets design og produktets funktionalitet (Oppelaar, Hennipmann, & Var der Veer, 2008). Så oplevelsesdesigneren rummer dermed hele forståelsen af bruger-produkt-interaktion i kontekst (Jensen, 2013; Madsen & Nybro, 2015).

Hvad betyder det så, at vi som oplevelsesdesigner har et design-mindset, hvor vi sætter brugeren og kvaliteten af selve brugeroplevelsen først? Jensen (2013) beskriver, at UX og UXD er et vigtigt udspring fra *user-centred design* eller *human-centered design.* Han beskriver, at user-centred design kan defineres som en tilgang, hvor slutbrugerens ønsker, behov, præferencer og begrænsninger har hovedfokus i designprocessen, hvilket vi ligeledes hører hos Buxton (2007). Denne user-centred designtilgang fokuserer således på brugerne og designer til deres adfærd. Denne måde at designe på ses som modpart til designtilgange, som tvinger brugeren til at ændre adfærd for at tilpasse sig produktet eller systemet. User-centred design eller human-centred design stiller spørgsmål til slutbrugerne, deres opgaver og mål, og svarene bruges til at træffe valg i design- og udviklingsprocessen (Jensen, 2013). Det betyder at oplevelsesdesign-frameworket vil sætte fokus på den endelige slutbruger og ikke på en given kunde og deres ønsker. Dog betyder det ikke, at vi som oplevelsesdesignere ikke kan skabe oplevelser, der overrasker eller presser brugerne men derimod, at vi skaber overraskelser eller pres, der er baseret på brugerens behov, præferencer, ønsker og begrænsninger (Buxton, 2007).

Hvad Bidrager Vi Som XD'er Med?

Oplevelsesdesigneren bidrager således med den overordnet forståelse af at skabe rammerne for den gode brugeroplevelse ved at rumme forståelsen af designet for hele bruger-produkt-interaktion i kontekst. Det skal understreges, at vi som oplevelsesdesigner aldrig kan garantere en oplevelse, da dette er individuelt fra menneske til menneske, men vi kan optimere rammerne for oplevelsen, så vi sikrer de bedst mulige chancer for at skabe den ønskede oplevelse for brugeren.

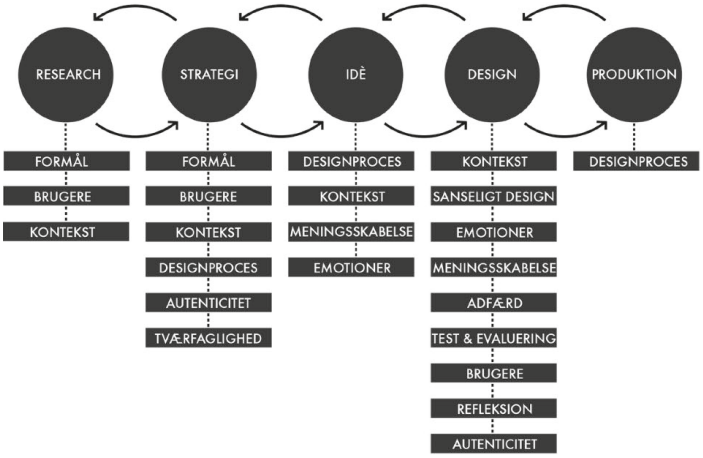
Hvordan Understøtter XD-Frameworket Det?

Oplevelsesdesign-frameworket understøtter oplevelsesdesignerens udviklingsproces ved at forholde sig til hele bruger-produkt-interaktionen i en kontekst igennem hele designprocessen. Frameworket stiller spørgsmål og pointerer designovervejelser for hele oplevelsesdesignet og dets dele igennem de fem faser af designprocessen (se afsnittet *De fem faser*). Ved at anvende frameworket gennem designprocessen vil oplevelsesdesigneren blive konfronteret med designbeslutninger, der kommer hele vejen rundt om det, der karakteriserer et oplevelsesdesign i hele bruger-produkt-interaktionen i en kontekst.

ÉT OPLEVELSESDESIGN-FRAMEWORK

Formålet med oplevelsesdesign-frameworket er at skabe et udgangspunkt for at sikre kvalitative it-baserede oplevelsesdesign igennem designprocessen både i akademisk og praksis sammenhæng. Oplevelsesdesign-frameworket er opdelt efter en designproces med fem generiske faser. De fem faser er baseret på en designproces, der starter med *research* af en idé, koncept eller lignende for at skabe viden og baggrund for at videreudvikle på idéen (se *Research-fasen*). Dernæst kommer *strategi*, som skal bevidstgøre formålet og målet med idéen (se *Strategi-fasen*). Den tredje fase er *idé*, og her kommer hele idéudviklingen på banen (se *Idé-fasen*). I idé-fasen videreudvikler vi på den indledende konceptidé med afsæt i den viden, vi har skabt gennem *research* og rammerne sat i *strategien*. Herefter kommer den fjerde fase *design*. *Design* er den fase, hvor idéen og konceptet formgives, testes, finjusteres og defineres i detaljer (se *Design-fasen*). Den femte og sidste fase er *produktionen* (se *Produktion-fasen*). Her videregives designet til en eller anden form for producent. Derudover ligger under denne fase også salg og marketing, hvor planen for designets videre distribution skal gennemtænkes set i forhold til strategien og formålet med designet (Buxton, 2007).

Under hver af de fem faser ligger en række forskellige kategorier. Til hver kategori er der en række spørgsmål og pointer, som skal gennemtænkes og overvejes af designeren i udviklingen af oplevelsesdesignet for at kunne skabe kvalitative oplevelsesdesign (Madsen & Nybro, 2015). Gennem bevidstliggørelsen af disse kategorier skabes der en aktiv til- og fravælgelse af designelementer og beslutningsprocessen omkring udformningen og indholdet af oplevelsesdesignet med afsæt i det, der karakteriserer oplevelsesdesign.



Figur 1: Oplevelsesdesign-frameworket - med de fem faser og de underliggende kategorier

Beskrivelse Af Oplevelsesdesign-Frameworket

Visualiseringen af frameworket til udviklingen af de it-baserede oplevelsesdesign er, som beskrevet i afsnittet ovenfor, bygget op omkring designprocessens faser, som ses i de øverste fem cirkler i oplevelsesdesign-frameworket. Pilene går frem og tilbage mellem faserne og illustrerer en iterativ proces mellem faserne. En stiplet linje fra hver fase fører ned gennem den pågældende fases kategorier. Kategorierne agerer overskrift for de underliggende spørgsmål og pointer, der beskrives senere i kapitlet. Oplevelsesdesign-frameworket skal fordre designerens bevidsthed om de karakteristiske træk, der findes i udviklingen af it-baseret oplevelsesdesign. Herigennem gøres designerens til- og fravalg bevidste (Madsen & Nybro, 2015).

Designprocessen

En designproces vil variere fra projekt til projekt og fra virksomhed til virksomhed men har det til fælles, at den indikerer processen fra intention til implementering. Dog er det væsentligt at understrege, at det ikke er muligt at skabe én generel og ideel designproces, og at designprocesser ikke forløber som en lige vej fra intention til implementering (Buxton, 2007). Der er mange ubekendte i udviklingen af et design. Hvis en prædefineret lige og direkte designproces anvendes, er der stor risiko for at skabe middelmådige oplevelsesdesign, der indsnævrer oplevelsesdesignet til det visuelle udtryk og usability (Buxton, 2007). Hvis designprocessen ikke planlægges ud fra det givne pro-

jekt, vil designudviklingen blive dyre og mere tidskrævende, da der vil opstå for mange uforudsete elementer. Selvom vi som designere forventer, at vi ved, hvordan designet skal være fra starten af, vil der næsten i alle tilfælde ske ændringer i takt med udviklingsprocessen (Buxton, 2007). Ændringerne kan ske på baggrund af den viden, der udvikles i løbet af udviklingsprocessen eller fordi markedet ændrer sig. Dermed skal designprocessen være designet, så disse problemstillinger bliver identificeret tidligt i processen (Buxton, 2007). De fem generiske faser, *research, strategi, idé, design* og *produktion*, som oplevelsesdesign-frameworket er opdelt i og deres forløb, er illustreret som en generel og lineær designproces, hvor vi kan gå direkte fra intention til implementering uden nogle afvigelser. Dog skal oplevelsesdesign-frameworkets opdeling af designprocessen ikke ses som en endegyldig og lige vej gennem designprocessen men derimod illustrere, hvor i et projekts givne designproces, at oplevelsesdesign-frameworkets faser bør anvendes. Dernæst er en designproces aldrig lineær, men iterativ (Buxton, 2007). Det betyder at den viden der fx skabes gennem idé-fasen kan udløse re-evaluering af strategi-fasen og dermed kommer vi som designere til at bevæge os frem og tilbage mellem faserne adskillige gange, inden det endelige design er skabt. Dermed anser vi oplevelsesdesign-frameworket for værende iterativ, hvilket indikeres med pilene der går mellem faserne i illustrationen af oplevelsesdesign-frameworket.

De Forskellige Aspekter Af Designprocessen

R*esearch, strategi, idé, design* og *produktion* er fremhævet som de mest fremtrædende faser i en designproces, idet alle fem faser indgå i et eller andet omfang i alle designprocesser (Madsen & Nybro, 2015). Det skal igen understreges, at faserne ikke skal ses som opdelte, til trods for modellens illustration af faserne, men derimod som alle værende i spil i mere eller mindre grad under hele designudviklingen. Når vi fx befinder os i idé-fasen kan research-, strategi- og design-faserne ikke tilsidesættes men derimod påvirke idéudviklingen. Det betyder, at når vi er i idéfasen, tilsidesættes de andre faser ikke, men de er ikke det primære fokus. Dernæst skelner vi designprocessens fem faser i to fundamentale dele; *problemafklaring* og *problemløsning* (Buxton, 2007). Her udgør de to første faser, *research* og *strategi*, *problemafklaringen* (Madsen & Nybro, 2015). For at kunne skabe et relevant oplevelsesdesign er det væsentligt at afklare hvad problemstillingen egentlig er og hvad oplevelsesdesignet skal kunne opfylde i forhold til brugeren, konteksten og interaktionen (Buxton, 2007; Madsen & Nybro, 2015). *Problemløsningen* sker gennem *idé, design* og *produktionsfaserne* (Madsen & Nybro, 2015), hvor oplevelsesdesignet tager form, på baggrund af den viden der er sket gennem de to første faser. Det er væsentligt at skelne mellem problemafklaring og problemløsning for at vurdere fasernes formål, og hvordan de underliggende kategorier og pointer anvendes i de-

signprocessen (Madsen & Nybro, 2015). Herudover handler designprocessen ikke kun om designudviklingen men også om planlægning af ingeniørens udviklingsproces, marketingsplaner og finjusteringer af en given forretningsplan eller strategi (Buxton, 2007). Det betyder, at når vi som designere beskriver strategien for udviklingen af oplevelsesdesignet, skal vi også indtænke, gennemtænke og rammesætte de efterfølgende faser (Madsen & Nybro, 2015). Afslutningsvis, i forlængelse af afsnittet *Oplevelsesdesign-Mindset* er det væsentligt at holde sig for øje, at når vi udvikler oplevelsesdesign, med eller uden oplevelsesdesign-frameworket, bør vi have en bruger-centeret designtilgang til designudvikling.

De Fem Faser

Oplevelsesdesign-frameworket har ikke til formål at simplificere eller illustrere alle designprocessens nuancer og kompleksitet men derimod at overskueliggøre, hvilke tanker og spørgsmål en designer skal stille sig selv under designprocessen. Derfor er oplevelsesdesign-frameworket udformet som en yderst simplificeret illustration af en designproces med fokus på de underliggende kategorier med spørgsmål og pointer. Dermed kan frameworket på en overskuelig måde inddrages i et projekts eller virksomheds eksisterende designproces (Madsen & Nybro, 2015). Samtidig er det centrale i modellen de underliggende kategorier med spørgsmål og pointer, som en designer skal forholde sig til i udviklingen af oplevelsesdesign (Madsen & Nybro, 2015).

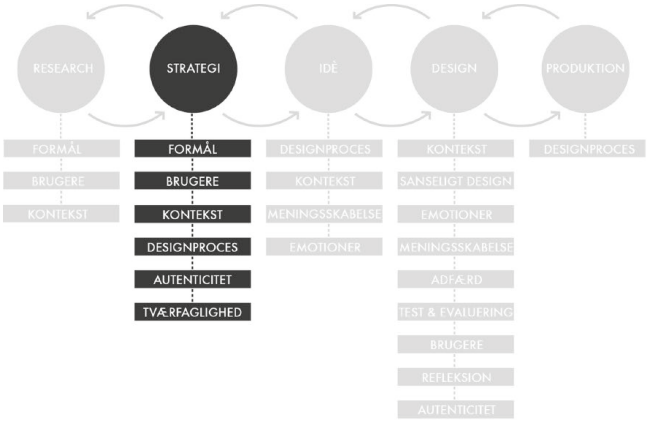
Research-fasen: Den første fase i designprocessen for oplevelsesdesign-frameworket er *Research*. Som tidligere nævnt udgør den indledende fase *Research* problemafklaring i forhold til at skabe en forståelse af baggrunden og formålet med for oplevelsesdesignet. Det er i denne indledende fase, at vi indsamler de indledende informationer om oplevelsesdesignet, som formålet med designet, de indledende tanker og idéer bag samt viden om potentielle brugere og konteksten for oplevelsesdesignet for at skabe en afklaring af problemstillingen. Buxton (2007) forklarer, at måden, hvorpå problemafklaringen oftest foregår, er gennem et designbrief fra kunden. Et designbrief beskriver kundens problemstilling, initierende idéer og tanker for oplevelsesdesignet samt krav hertil. Buxton (2007) understreger dog, at et designbrief sjældent er omfangsrigt nok til at udvikle et kvalitativt design. Derfor er det nødvendigt, at designeren gennemfører yderligere undersøgelser i den indledende fase (Buxton, 2007). Endvidere beskriver Buxton (2007), at problemafklaringen kræver en forståelse af kontekst, potentielle brugere og formål. Denne forståelse har en væsentlig indflydelse på planlægningen af designprocessen. Formålet med research-fasen er hermed at dykke dybere ned i tankerne bag, problemstillingen og formålet med oplevelsesdesignet ved at undersøge brugerne,

afsenderens formål, konteksten for oplevelsesdesignet, eksisterende produkter, data for markedet og eventuelle rettigheder. Research-fasen skaber et solidt udgangspunkt og nogle retningsgivende linjer for beskrivelsen af strategien i den anden fase af designprocessen. Denne strategi danner udgangspunktet for den videre designproces ved at definere nogle retningslinjer for at opnå det rette design til problemstillingen (Buxton, 2007). Det er her igen væsentligt at fremhæve, at vi som oplevelsesdesignere tager en brugercentreret tilgang i indsamling af information. Dermed kommer en given kunde og deres ønsker ikke først, men derimod er det slutbrugeren vi har for øje gennem undersøgelsen (Buxton, 2007). Under research fasen ligger der tre kategorier, som vi skal forholde os til:

Figur 2: Beskrivelsen af de forskellige kategorier og deres underliggende spørgsmål og pointer kan læses i afsnittene: 'Formål', 'Bruger' og *'Kontekst'.*

Strategi-fasen: Den anden fase i designprocessen er *strategi-fasen*. *Strategien* er et kort og specifikt arbejdsdokument, som rammesætter den videre udvikling af oplevelsesdesignet og dermed planen for løsningen af problemstillingen. *Strategien* defineres på baggrund af de informationer der er indsamlet i research-fasen. Det er i denne del af designprocessen, at strategien for designet og designudviklingen fastlægges. *Strategi-fasen* understreger dermed også, at designprocessen ikke kun handler om produktudviklingen, men også om planlægningen af de efterfølgende faser (Buxton, 2007). Det betyder, at når vi som designer beskriver strategien for udviklingen af oplevelsesdesignet, skal vi også gennemtænke og rammesætte de efterfølgende faser såsom ingeniørens udviklingsproces, marketingsplaner og finjusteringer af en given forretningsplan (Buxton, 2007). Formålet med *strategi-fasen* er at få samlet og struktureret informationerne indsamlet i research-

fasen. På baggrund af den viden skal der udformes og beskrives en strategi for den fremadrettet designproces. I denne strategi skal det beskrives hvad det egentlige formål er, hvem brugerne er, i hvilken kontekst oplevelsesdesignet skal indgå (Buxton, 2007; Norman 2004), oplevelsesdesignets autenticitet (Pine & Gilmore, 2007) og muligheden for tværfaglighed (ISO, 2010; Paluch, 2006). Under research fasen ligger der seks kategorier, som vi skal forholde os til:

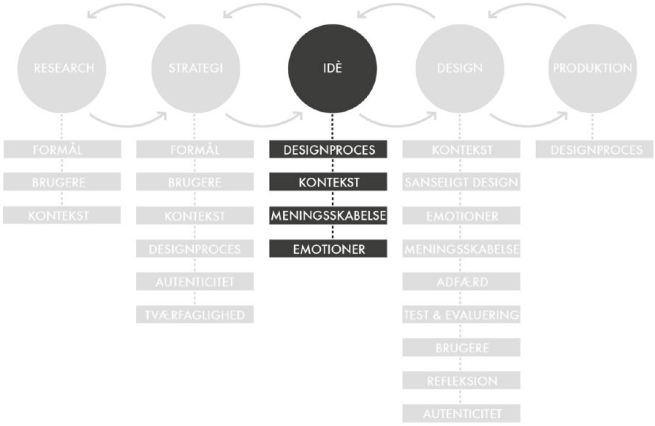


Figur 3: Beskrivelsen af de forskellige kategorier og deres underliggende spørgsmål og pointer kan læses i afsnittene: 'Formål', 'Bruger', 'Kontekst', 'Designproces', 'Autenticitet' og *'Tværfaglighed'.*

Idé-fasen: Den tredje fase i oplevelsesdesign-frameworket er *Idé-fasen.* Idé-fasen består i idégenerering, idéudvikling og idéudvælgelse. Her visualiseres og skitseres alle potentielle idéer på baggrund af den viden, der er genereret igennem research-fasen og i beskrivelsen af strategien for konceptet. Det er også i idé-fasen, at ideerne vurderes og evalueres før hele eller dele af ideerne udvælges til det endelige koncept. Dermed står alle muligheder åbne indledningsvis i idé-fasen, og der findes ingen begrænsninger til løsningen af problemstillingen.

Opbygningen af *idé-fasens* vekslende og iterative idégenerering, idéudvikling og idéudvælgelse er blandt andet baseret på Buxtons (2007) figur '*Flexible Approach to Concept Generation and Selection*', der illustrerer en konstant bevægelse mellem idéudvikling *(concept generation)* og idéudvælgelse *(controlled convergens)*. Det betyder, at vi gennem idé-fasens iterationer mellem idégenerering og idéudvikling skaber mulighed for at udvikle nye idéer på baggrund af analyse og rationali-

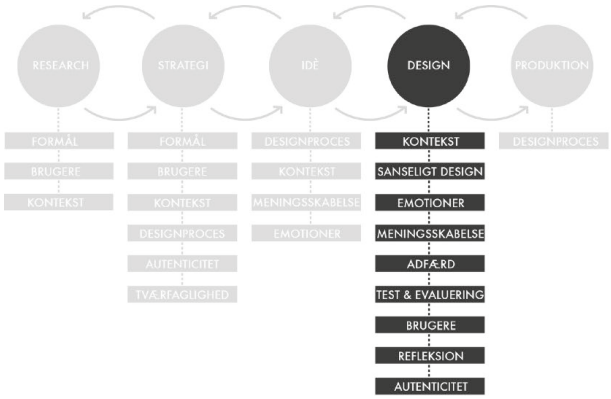
sering. Samtidig, gennem reduktionerne sammenlignes idéer for at udvælge og skabe nye kreative idéer. Buxton (2007) forklarer, at den kontrollerede konvergens i en designproces er udgangspunktet for at kunne italesætte årsagen af til- og fravalg. De forskellige designforslag diskuteres i forhold til hinanden ved at stille spørgsmål til, om designet er at foretrække frem for et andet design. I forlængelse af friheden til at overveje alle muligheder i designudviklingen kommer dermed også bevidstheden, om at der skal tages beslutninger om et design. Designerens beslutninger om hvilke elementer, der skal kasseres, gøres bevidst, og ikke nødvendigvis alle idéer kommer med i det endelige design (Buxton, 2007). Oplevelsesdesign-frameworkets opdeling af idé-fasen og design-fasen er meget firkantet. Denne skarpe opdeling vil sjældent være tilfældet i praksis, hvor disse to faser vil være svære at skelne og konstant være i proces samtidigt. Formålet med den skarpe opdeling af disse to faser er at beskrive, hvad der gør sig gældende og er i fokus i den enkelte fase. Idé-fasen er den fase i designprocessen, hvor alt er muligt og alle idéer skal på bordet uden restriktioner men også, hvor der evalueres inden idéerne eventuelt kommer videre til *design-fasen*. Under idé-fasen ligger der fire kategorier, som vi skal forholde os til:



Figur 4:Beskrivelsen af de forskellige kategorier og deres underliggende spørgsmål og pointer kan læses i afsnittene: 'Designproces', 'Kontekst', 'Meningsskabelse' og *'Emotioner'.*

Design-fasen: Den fjerde fase i oplevelsesdesign-frameworket er *design-fasen.* Design-fasen består i videreudviklingen og specifikationen af konceptidéerne fra *idé-fasen*. Dermed udvikles detaljerne for konceptidéerne i design-fasen, hvor materialer, teknologier, kontekst og sanselighed defineres

for at udvikle prototyper og teste anvendeligheden af konceptidéerne. *Design-fasen* vil i designprocessen foregå sideløbende med *idé-fasen* og dermed være en medvirkende faktor til idéudviklingen og idéudvælgelsen. Formålet med design-fasen er at definere det endelig koncept for løsningen af problemstillingen. Dermed skal resultatet af den iterative udviklingsproces mellem idé- og design-fasen være et helt konkret koncept. Dette koncept skal gennem idé- og design-fasen være gennemarbejdet og testet for at sikre, at det er det rette design for løsningen af problemstillingen (Buxton, 2007). Det er her vigtigt at forstå, at design er et kompromis, som Buxton (2007) beskriver det. Det gør sig særligt gældende ved til- og fravalg af designelementerne, når de forskellige faser af produktudviklingsprocessen mødes. Når en designers design eksempelvis møder ingeniørens realitet. Det er ikke sikkert, at det design, som designeren præsenterer til ingeniøren, er muligt. Dermed må der indgås et kompromis (Buxton, 2007). Som nævnt under idé-fasen, er opdelingen af idé-fasen og design-fasen i oplevelsesdesign-frameworkets meget firkantet. Denne skarpe opdeling vil sjældent være tilfældet i praksis, hvor disse to faser vil være svære at skelne og konstant være i proces samtidig. Men formålet med den skarpe opdeling af disse to faser er at beskrive, hvad der gør sig gældende og er i fokus i den enkelte fase. Idé-fasen er den fase i designprocessen, hvor alt er muligt og alle idéer skal på bordet uden restriktioner men også, hvor der evalueres inden de eventuelt kommer videre til *design-fasen*. Under design-fasen ligger der ni kategorier, som vi skal forholde os til:



Figur 5: Beskrivelsen af de forskellige kategorier og deres underliggende spørgsmål og pointer kan læses i afsnittene: Bruger, 'Kontekst', 'Sanseligt design', 'Emotioner', 'Meningsskabelse', 'Adfærd', 'Test og Evaluering', 'Refleksion' og 'Autenticitet'.

Produktion-fasen: Den femte og sidste fase i Oplevelsesdesign-frameworket er *produktions-fasen*. Denne fase indeholde mange forskellige aspekter og er den fase, hvor det meste arbejde bliver videregivet fra designeren til andre 'afdelinger' eller leverandører. I *produktions-fasen* gives designspecifikationerne fra designfasen videre til producenten, som producerer oplevelsesdesignet, planen for markedsføringen, evt. salg eller afvikling videregives til salgs- og markedsføringsafdeling, bureau eller igangsættes af oplevelsesdesigneren. Produktions-fasen er ikke hovedfokus i oplevelsesdesign-frameworket og har kun en enkelt kategori under sig - *designproces*. Kategorien *designproces* hører under *produktions-fasen,* da det er vigtigt at indtænke og definere hvad der skal foregå i produktions-fasen løbende gennem hele designprocessen (Buxton, 2007). Det kan fx være at inddrage en eventuelt markedsførings- eller salgsafdeling i strategi-fasen eller idé-fasen.

Figur 6: Beskrivelsen af de forskellige kategorier og deres underliggende spørgsmål og pointer kan læses i afsnittene: Designproces.

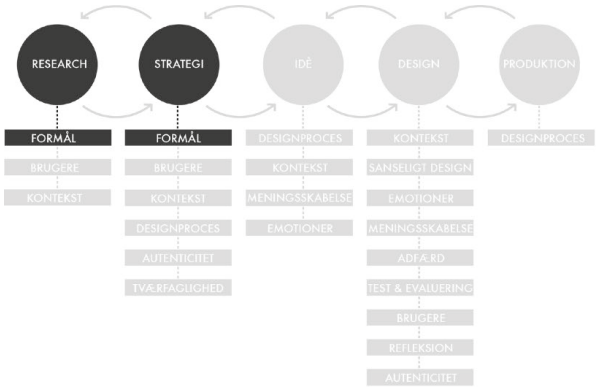
De fem faser i Oplevelsesdesign-fameworkets designproces er nu gennemgået. I det følgende vil vi se nærmere på de underliggende kategorier og pointer fra de forskellige faser af oplevelsesdesign-frameworket.

Kategorierne

For hver kategori er der opstillet en række spørgsmål eller pointer på baggrund af det den teoretiske analyse foretaget i undertegnets "Oplevelsesdesign-framework - ét teoretisk funderet framework til udviklingen af it-baseret oplevelsesdesign" (Madsen & Nybro, 2015). Efter hvert spørgsmål eller pointe er der en reference til den eller de teoretikere der har inspireret det givne spørgsmål. Det skal understreges at de nødvendigvis ikke har opstillet præcis dette spørgsmål eller pointe men at det er analysen af deres teori der har bidraget til udformning af spørgsmålet eller pointen. Derudover skal en designer eller studerende tilpasse og anvende de forskellige spørgsmål og pointer så de passer ind i deres designproces og til hvor de er i den givne designproces.

Formål

Den første kategori, *formål,* indgår i research- og strategi-fasen. Denne del af designprocessen tager sit afsæt i det designbrief, der givet fra en kunde eller den indledende idé (Buxton, 2007) til et oplevelsesdesign. Formålet med kategorien *formål* i *research-fasen* er at kunne skabe en redegørelse af formålet med oplevelsesdesignet. Kategorien *formål* ligger helt grundlæggende op til, at vi skal undersøge, *hvad* der skal opleves af hvem og hvor, for at skabe den indledende forståelse og afklaring af oplevelsesdesignet (Hassenzahl, 2010). En stor del af forståelsen og afklaringen af formålet er dermed også, hvem de potentielle brugere er, og i hvilken kontekst oplevelsesdesignet skal indgå (Buxton, 2007; Norman, 2004). De potentielle brugere og konteksten har hver deres kategori i research-fasen, og dem vil vi derfor se nærmere på, på de næste sider efter formål.



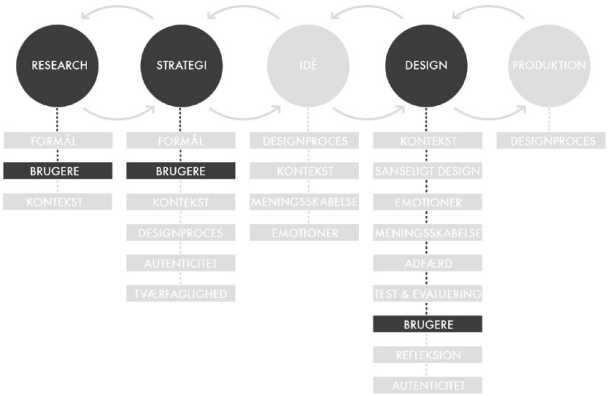
Figur 7: Oplevelsesdesign-framework - kategorien FORMÅL ses fremhævet i research- og strategi-faserne

Kategorien *formål* går igen i både research- og strategi-fasen. Målet med denne kategori i de indledende faser er, at skabe en grundlæggende forståelse og argument for hvad formålet med oplevelsesdesignet er og for at rammesætte den fortsatte designudvikling. I reseach-fasen fokuserer formål på at afklare, hvad det intenderede formål er med oplevelsesdesignet, og hvorfor det er formålet. I strategi-fasen skal kategorien formål formulere det reelle formål, der skal designes for, baseret på den indledende research-fases afklaring af intenderede formål, bruger- og kontekstanalyse. For at kunne afklare formålet med oplevelsesdesignet er der forskellige spørgsmål som designeren bør stille sig selv i research- og strategi-fasen for at kunne planlægge og udføre den resterende designproces.

HOVEDSPØRGSMÅL	**UNDERSPØRGSMÅL**
Hvad er formålet? (Alben, 1996; Norman, 2004; Hassenzahl et al., 2010; Buxton, 2007)	Hvad er tankerne bag oplevelsesdesignet? Forklar hvad den egentlige problemstilling er? Hvorfor er oplevelsesdesign løsningen? Hvad er afsenderens formål med oplevelsesdesignet? Er der en vision eller mission for oplevelsesdesignet?
Hvem designes der til? (Alben, 1996; Buxton, 2007; Jensen, 2013). *Dette punkt uddybes videre i kategorien Brugere	Hvem er potentielle brugere? Hvem er afsenderen for oplevelsesdesignet?
Hvilken kontekst skal designet indgå i? (Buxton, 2007; Jensen, 2013; Wright et al., 2008). *Dette punkt uddybes videre i kategorien Kontekst	Hvordan skal oplevelsen gives? Hvilken kontekst skal oplevelsesdesignet indgå i?
Hvad skal opleves? (Alben, 1996; Pine & Gilmore, 2011; Hassenzahl, 2010)	Hvilken oplevelse ønskes der skabt? Hvilke parametre skal den indeholde? Hvilket niveau af digitalitet er der tale om?
Skal produktet være innovativt eller en forbedring af noget eksisterende? (Norman, 2004)	Er oplevelsesdesignet innovativt dvs. er det noget nyt der ikke set før? Eller er det en forbedring af et allerede eksisterende oplevelsesdesign?
Hvilke relaterede eksisterende produkter findes?	Er der noget data for markedet? Hvem har eventuelt rettighederne?
Hvordan skal oplevelsen gives? (Alben, 1996; Pine & Gilmore, 2011; Hassenzahl, 2010)	
Hvad er brugerens forventning? (Wright, Wallace & McCarthy, 2008; Jantzen et al, 2011; Dewey, 2005; Hassenzahl, 2010)	
Hvilke behov skal oplevelsesdesignets funktionalitet og brugbarhed understøtte? (Hassenzahl, 2010; Norman, 2004)	
Er de rette kompetencer tilgængelige i organisationen til at skabe oplevelsen (infrastruktur, teknologi og platform)? (Boswijk, 2012)	

Bruger

Den anden kategori *bruger* indgår i research-, strategi og design-fasen. Kategorien *bruger* udgør i oplevelsesdesign det menneskelige subjekt, den som oplever. Det er brugeren, der er i interaktionen med et produkt i en kontekst. Brugerne har indvirkning på oplevelsen ved at medbringe følelser, stemning, motivation, kognitive modeller, perceptioner, øjeblikkelige mentale og fysiske ressourcer, evne til at fortolke samt tidligere oplevelser, som giver bestemte forudsætninger. Brugernes oplevelse beskriver, hvad en bruger føler, når brugeren interagerer med et produkt (Forlizzi og Ford, 2000; Jensen, 2013). Selvom vi i oplevelsesdesign har fokus på designet af hele bruger-produkt-interaktionen i en kontekst, ser vi, at oplevelse er iboende mennesker. Derfor bør vi som oplevelsesdesignere have en brugercentreret tilgang til designudviklingen, så brugerens oplevelse bliver essentiel for oplevelsesdesignet. Dermed skal vi under research-fasen undersøge, hvem slutbrugerne er, og hvad deres ønsker, behov, præferencer og begrænsninger er i forhold til udviklingen af det ønsket oplevelsesdesign. Med brugeren i centrum er formålet med kategorien *bruger*, foruden at beskrive hvem de potentielle brugere er, at overveje de menneskelige, bløde kvalitative sider (Jensen, 2013) der kan komme i spil i den givne oplevelse. Hermed menes, at vi som oplevelsesdesignere skal tage en holistisk tilgang til forståelsen af vores bruger ved at tage hele mennesket og dets handling, tanker, følelser og meningsskabelse i betragtning (Wright, Wallace and McCarthy, 2008). Det betyder, at vi i udviklingen af oplevelsesdesign skal have brugeren med i hele udviklingsprocessen. Her under research-fasen skal vi som udgangspunkt forstå, hvem de potentielle bruger er, hvilke behov de har i forhold til oplevelsen, og hvilken oplevelse vi ønsker at give dem.



Figur 8: Oplevelsesdesign-framework - kategorien BRUGERE ses fremhævet i research-, strategi- og design-faserne

Kategorien *bruger* ses som en væsentlig kategori i både research, strategi og designfasen. I Research handler det om at undersøge, hvem de potentielle brugere er, og hvad de har brug for, har af værdier, behov, lyster og mål (McCarthy og Wright, 2004). I strategi samler vi op på den viden for at rammesætte den videre designudvikling med afsæt i den viden, der er skabt under research-fasen. Kategorien *bruger* vil i strategi-fasen definere nogle designkrav og retningslinjer som kan anvendes i idé- og designfasen til at sætte rammerne for løbende brugertest og evaluering. For at kunne beskrive hvem brugerne er, i relation til oplevelsesdesignet, er der forskellige spørgsmål som designeren bør stille sig selv i research-, strategi- og design-fasen, for at kunne planlægge og udføre designproces.

HOVEDSPØRGSMÅL	**UNDERSPØRGSMÅL**
Hvem er de potentielle brugere? (Norman, 2004)	Er der tale om en specifik aldersmæssig, demografisk eller stedsspecifik målgruppe? Hvad ved vi om dem? Hvad kan vi finde ud af om dem?
Hvad er brugerens værdier, behov, lyst og mål? (McCarthy & Wright, 2004)	Hvad ved vi om de potentielle brugeres værdier, behov, lyst og mål? Hvad kan vi finde ud af, om de potentielle brugeres værdier, behov, lyst og mål?
Hvordan er oplevelsen fra brugerens perspektiv? (Jensen, 2013)	Tal med brugerne og find ud af hvad deres oplevelse er.
Hvad er brugerens forventning til oplevelsen? (Boswijk et al., 2012; Dewey, 2005; Jensen, 2013; Jantzen et al., 2012; Oppelaar et al., 2008; Wright et al., 2008)	Har de potentielle brugere nogle forventninger til oplevelsesdesignet?
Hvilke negative sider af brugeren kan komme i spil? (Boswijk et al., 2012; Wright et al., 2008)	Bringer den eksisterende eller lignende oplevelse nogle negative sider af brugeren i spil? Og kan disse forbedres eller undgås?
Hvad sanser og føler brugeren? (Hassenzahl, 2010; Norman, 2004; Wright et al., 2008)	Sæt ord på hvad brugerne sanser og føler i den eksisterende eller lignende oplevelsen for at få en bedre fornemmelse af, hvad oplevelsesdesignet skal indeholde. Heri ligger blandt andet, at brugerens sanselige oplevelse skabes gennem det instinktive niveau, der indeholder det sanselige, visuelle og taktile udtryk af oplevelsesdesignet (Norman, 2004). Derudover ligger heri brugernes refleksive niveau, hvor brugerens bevidsthed, fornemmelse, følelser og erkendelse af den samlede oplevelse både i øjeblikket og i tilbageblikket. Det betyder ifølge Norman (2004), at oplevelsen på den ene side vurderes ud fra, hvad dens budskab, kultur, værdier og personlige minder udtrykker, og på den anden side vurderes oplevelsen ud fra brugerens selvbillede og det budskab, som sendes til andre.

Hvilke dele består oplevelsen af, og hvordan er de som helhed? (Hassenzahl, 2010; McCarthy og Wright, 2004; Norman, 2004;) Der skelnes her mellem be goals, do goals og motor goals (Hassenzahl, 2010). Det er her væsentligt at forstå subjektets relation til objektet for at kunne udvikle objektet. For at kunne designetil brugere er det således essentielt at kende til brugernes behov. Endvidere vil en opdeling af oplevelsen give mulighed for at forstå de forskellige komponenter i oplevelsen, og dermed hvilke dele der skal udvikles. Be goals og do goals er begge goals der foregår i brugeren. Hvor motor goals knytter sig til objektets brugbarhed og funktioner.	Be goals motiverer handling og giver brugeren mening. Her ses aktivitet som en del af subjekt-objekt interaktionen (Hassenzahl, 2010). Be goals knytter sig dermed til brugernes refleksion over oplevelsen og deres eget selvbillede i oplevelsen (Norman, 2004) Do goals er det konkrete udfald, som brugeren ønsker at opnå gennem interaktionen. Do goals beskrives af subjektets motiv eller bevæggrund. Do-goals er således aktiviteter, der består af et system af aktiviteter orienteret mod et motiv, hvor meningen med hver individuel komponent i systemet er bestemt af dets rolle i at opfylde motivet (Hassenzahl, 2010). Do goals knytter sig særligt til objektets evne til at imødekomme brugernes ønsker til interaktionen gennem sin adfærdsmæssige funktionalitet. Motor goals fokuserer på objektets konkrete brugbarhed. Motor goals er af mindre betydning under Bruger kategorien, men det er væsentligt at anerkende den, som en vigtig del af oplevelsen.
Taler oplevelsesdesignet til brugeren? (Hassenzahl, 2010)	
Vi kan ikke garanterer en specifik oplevelse, men vi skal skabe forhold for, at den oplevelse, som vi ønsker brugeren skal få, kan emergere. (Hassenzahl, 2010)	
Holistisk tilgang: Tag hele mennesket og dets handling, tanker, følelser og meningsskabelse i betragtning. (Wright et al., 2008)	
Udvælgelse af en designtilgang som har slutbrugerens ønsker, behov, præferencer og begrænsninger i fokus. (Buxton, 2007)	
Brugerne bør involveres i design- og produktions-fasen (Buxton, 2007). Brugere bør involveres i produktudviklingen i forhold til test og evaluering for at sikre at brugernes "behov" bliver indfriet.	

Kontekst

Den tredje kategori *kontekst* indgår i research-, strategi, idé- og design-fasen. Konteksten er de omgivelser eller den situation, hvori bruger-produkt-interaktionen foregår (Jensen, 2013). Denne kontekst er formet af sociale, kulturelle og organisatoriske adfærdsmønstre (Forlizzi og Ford, 2000). Ved at skabe en forståelse af konteksten som situation og omgivelse, kan vi som designere tage en aktiv rolle i beslutningstagen om komponenter af produktet i interaktionen. Dette giver os mulighed for at designe til konteksten (Jensen, 2013). Dermed undersøger vi i *kontekst*-kategorien, hvordan og hvor vi ønsker at skabe oplevelsesdesignet. Som tidligere nævnt udgøres et oplevelsesdesign af bruger-produkt-interaktionen i en kontekst, dermed vil en oplevelse aldrig være fri af en kontekst, og konteksten vil bidrage til oplevelsen (Wright et al., 2008). Det betyder endvidere, at konteksten skal støtte op omkring oplevelsen og ikke modarbejde den. Det er vigtigt, at oplevelsesdesignet er

tilpasset konteksten eller at konteksten kan ændres eller manipuleres i henhold til oplevelsesdesignet. Når vi taler om konteksten, er der flere forskellige parametre, vi skal forholde os til, såsom i hvilken tid og på hvilket sted oplevelsesdesignet skal befinde sig (Wright et al., 2008). Vi skelner mellem offentlig og privat sted, hvor der er forskel i komfortzoner og forskellige grænser mellem en selv og andre (Wright et al., 2008). Der er også forskel i forskellig tid. Oplevelser er bestemt af tid og sted, og de relaterer sig til bestemte mennesker i en bestemt situation. Dermed vil to oplevelser ikke være ens (Wright et al., 2008).

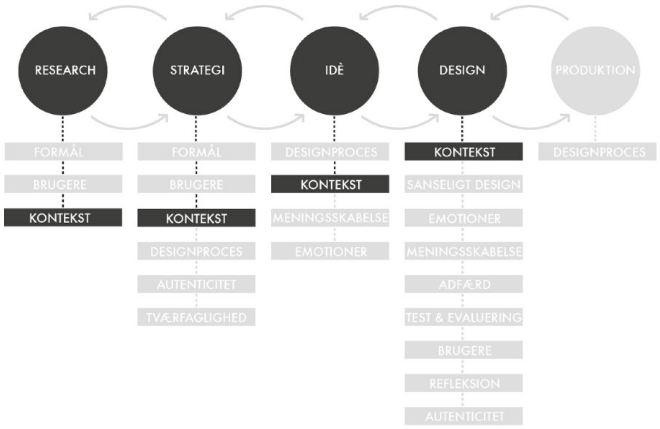


Fig. 9: Oplevelsesdesign-framework - kategorien KONTEKST fremhævet i research-, strategi-, idé- og design-faserne

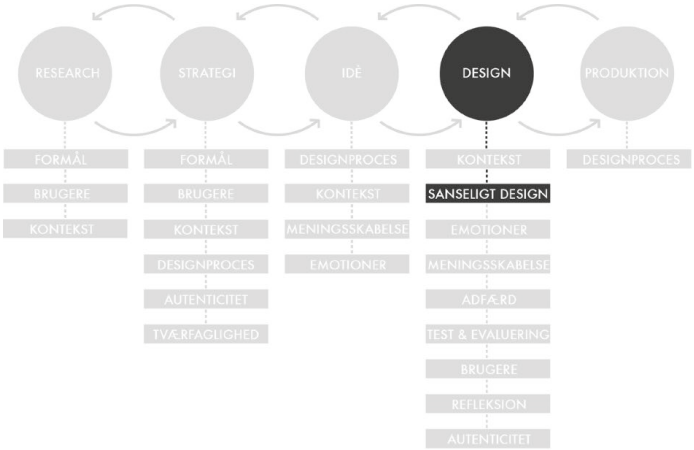
Kategorien *kontekst* er af væsentlig betydning under designprocessen første fire faser og skal dermed medtænkes i dem alle. I *research-fasen* undersøges og forstås den tiltænkte *kontekst* for at kunne designe oplevelsesdesignet dertil. I strategi-fasen defineres tilpasningen af konteksten med eventuelle designkrav. I idé-fasen skal kategorien *kontekst* skabe inspiration til idé-genereringen af det samlede oplevelseskoncept. Dermed vil kategorien *kontekst* i design-fasen blive retningsgivende for designet af konteksten for bruger-produkt-interaktionen. For at kunne beskrive *konteksten* og dens betydning for oplevelsesdesignet, er der forskellige spørgsmål, som designeren bør stille sig selv igennem både research- strategi-, idé- og design-fasen.

HOVEDSPØRGSMÅL	UNDERSPØRGSMÅL
I hvilken kontekst skal oplevelsen indgå? (Buxton, 2007; Jensen, 2013; Wright et al., 2008)	Hvor skal oplevelsesdesignet designes til?
I hvilken tid og hvilket sted skal oplevelsen udspille sig? (Wright et al., 2008)	Hvor og hvornår skal oplevelsen udspille sig? Skal oplevelses udspille sig et fysisk sted og i fysisk tid eller er der et digitalt lag over oplevelsen, der rykker den ud af tid og sted (Brug multivers til at definer)?
Skal oplevelsen udspille sig i et privat eller offentligt rum? (Wright et al., 2008)	Hvad har det af betydning for oplevelsesdesignet, hvis det skal udspille sig i et offentligt vs. et privat rum?
Udfordres brugerens komfortzoner? (Wright et al., 2008)	Vil der i den givne kontekst være risiko for at brugerens komfortzoner bliver overtrådt?
Experience patterns: Hvad er det eksisterende mønster for brugeren i den kontekst, som der designes til? (Hassenzahl, 2010; Sharp et al., 2007)	Undersøg hvilke eksisterende oplevelsesmønstre der hos brugeren. Igen ved at tale med brugerne eller observere deres mønstre etc.
Hvor i Multiverse-modellen kan oplevelsen kortlægges? (Pine & Korn, 2011)	Pine og Korn (2011) har opsat en matrix the multivers. Denne matrix indkapsler således, hvornår oplevelsen finder sted, hvor den finder sted og hvad den beskæftiger sig med. Multiverset illustrerer et udgangspunkt for at vurdere oplevelsers niveau af digitalitet med afsæt i tid, sted og form med sine 8 verdener: Physical virtuality, mirrored virtuality, warped reality, alternate reality, augmented virtuality, virtuality og reality.
Hvad er den sociale, kulturelle og organisatoriske kontekst for oplevelsen? (Forlizzi & Ford, 2000; Roto et al., 2011)	Hvad er den sociale, kulturelle og organisatoriske kontekst for oplevelsen? (Forlizzi & Ford, 2000; Roto et al., 2011) Er der en social, kulturel og organisatorisk kontekst (Forlizzi & Ford, 2000) som vi skal forholde os til der, hvor oplevelsen skal udspille sig og blandt de potentielle brugere? Konteksten kan beskrives på forskellige niveauer. Roto et al. (2010) foreslår seks dimensioner, som kan overvejes i beskrivelsen af konteksten: Fysisk kontekst, social kontekst, kulturel kontekst, tidsmæssig kontekst, teknologisk kontekst og organisatoriske kontekst.

Sanseligt design

Den fjerde kategori *sanseligt design* indgår i design-fasen. Kategorien *sanseligt design* fokuserer på inddragelsen af sanserne i oplevelsesdesignet for at skabe kropsligt engagement og æstetisk nydelse. Det er med denne kategori at designets umiddelbare udtryk samt sanselighed overvejes og designes. Det sanselige design beskriver Norman (2004) også som det instinktive niveau, som beskriver førstehåndsindtrykket, objektets visuelle udtryk, berøringen og fornemmelse. Vi er som mennesker, fra naturens side, styret til at få stærke følelsesmæssige signaler fra omgivelserne gennem fortolkningen på det instinktive niveau. Hvis vi opfatter noget som smukt, tiltrækkes vi af det. Denne

tiltrækning kommer fra det instinktive niveau, og har fokus på de fysiske aspekter af et design som udseende, lyd og fornemmelse (Norman, 2004). Dermed spiller den visuelle renhed og tiltrækning en stor rolle i designet af et oplevelsesdesign. Et effektivt sanseligt design kræver et stærkt visuelt udtryk, da form og den fysiske taktilitet af materialer former den umiddelbare følelsesmæssige påvirkning. Designet skal føles godt og se godt ud, da sensualiteten og det æstetiske udtryk af designet er afgørende for subjektets interesse i objektet eller oplevelsen (Norman, 2004). Udformningen af det visuelle og taktile udtryk i oplevelsesdesignet er afhængig af oplevelsens kontekst og formål. Det betyder, at det sanselige design udformes med afsæt i forståelsen af oplevelsesdesignets kontekst og forståelse af, hvilket formål oplevelsen har. Med et veldesignet sanseligt oplevelsesdesign kan der ved brugeren skabes en følelse af nydelse og stimulering gennem oplevelsens visuelle, taktile og æstetiske udtryk. Endvidere kan dette tiltrække brugerens opmærksomhed og være med til at drage potentielle brugere ind i en interaktion med et objekt (Norman, 2004).



Figur 10: Oplevelsesdesign-framework - kategorien SANSELIGT DESIGN ses fremhævet i design-fasen

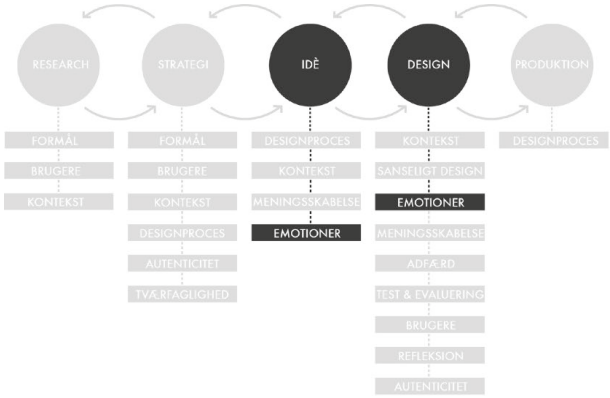
Dermed er der i kategorien *sanseligt design* fokus på det visuelle design af oplevelsesdesignet. Derfor ses *sanseligt design* også kun i *design-fasen,* hvor det endelige design skabes og formgives. For at kunne beskrive *sanseligt design* og dens betydning for oplevelsesdesignet, er der forskellige spørgsmål, som designeren bør stille sig selv i research-fasen.

HOVEDSPØRGSMÅL
Hvordan vil brugerens førstehåndsindtryk være? (Norman, 2004)
Hvordan og hvilke sanser inddrages i oplevelsen? (Norman, 2004)
Visualitet: Hvad kan man se? (Norman, 2004)
Grafisk og fysisk udtryk: Hvad kommunikerer det grafiske og fysiske udtryk? (Norman, 2004)
Taktilitet: Hvad kan man røre? (Norman, 2004)
Hvordan understøtter vi funktionaliteten gennem sanseindtryk? (Norman, 2004)
Hvordan skal det samlede sanseindtryk i oplevelsen være? (Norman, 2004)

Emotioner

Den femte kategori *emotioner* indgår i idé- og design-fasen. *Emotioner* fokuserer på opleverens emotionelle perspektiv. I kategorien emotioner søger vi at skabe en afklaring og forståelse af de behov, som oplevelsen skal opfylde, og hvilke følelser oplevelsen fordrer hos brugeren. Ifølge Boswijk, Peelen & Olthof (2012) husker vi som mennesker de mest emotionelle oplevelser bedst. De emotionelle oplevelser knytter sig til meget personlige oplevelser, som enten involverer andre mennesker, som vi holder af, eller er personlige initiativer. Dermed er disse emotionelle oplevelser med til at motivere os og dominere vores handlinger (Boswijk et al., 2012). Boswijk et al. (2012) beskriver, at de emotionelle oplevelser oftest øger energiniveauet og fokus hos brugerne. Især i livets store skelsættende oplevelser såsom fødsel, bryllup, død og sygdom, intensiveres vores energi og selvbevidsthed for livet. Boswijk et al. (2012) understreger, at de emotionelle oplevelser oftest udspiller sig i en sociokulturel kontekst, der vedrører brugerne.

Følelser reflekterer vores/brugernes unikke opfattelse af oplevelse gennem de emotionelle parametre *værdier, behov, lyst* og *mål* (McCarthy og Wright, 2004). Følelser reflekterer oplevelsen ud fra opleverens totalitet af aktioner, sansning, tanker, følelser og meningsdannelse. Derfor afspejles bedømmelsen af værdien af oplevelsen i den samlede oplevelse. Følelser har stor effekt på vores adfærd. Hvis vi føler os draget af noget og er glade og interesserede, er vi mere villige til at tage chancer og prøve nye ting. Hvis vi derimod er negative, og vi væmmes ved noget, vil vi automatisk undgå disse situationer (Boswijk et al., 2012). Det er derfor vigtigt, at vi i udviklingen af it-baseret oplevelsesdesign medtænker, hvilke følelser vi ønsker, at brugerne oplever, og hvordan dette står i forhold til oplevelsesdesignets formål.



Figur 11: Oplevelsesdesign-framework - kategorien EMOTIONER ses fremhævet idé- og design-faserne

Kategorien *emotioner* ses i idé- og design-fasen, hvor den er med til at sætte den følelsesmæssige stemning i oplevelsesdesignet samtidig med at kategorien er med til at indfri de behov og lyster, som brugerne måtte have i henhold til det givne oplevelsesdesign. For at kunne beskrive kategorien *emotioner* og dens betydning for oplevelsesdesignet, er der forskellige spørgsmål, som designeren bør stille sig selv i idé- og design-fasen.

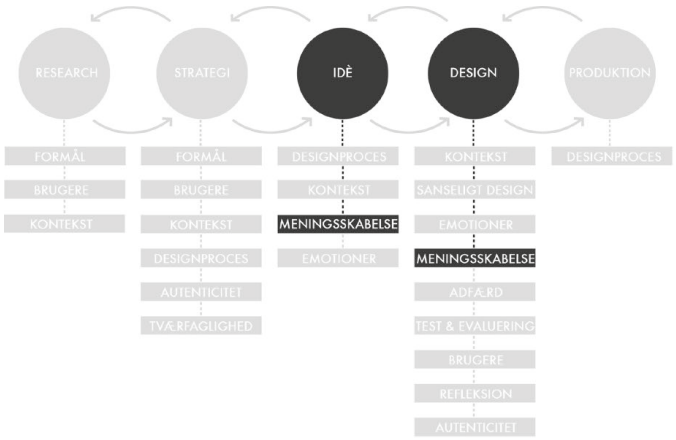
HOVEDSPØRGSMÅL	**UNDERSPØRGSMÅL**
Hvilke af de syv følelsesmæssige behov, competence, relatedness, stimulation, influence, meaning, autonomy og security, skal oplevelsesdesignet beskæftige sig med? (Hassenzahl, 2010; Sheldon et al., 2001)	Autonomy/independence; følelsen af at have kontrol over sine egne handlinger Competence; følelsen af at have kompetencerne til at løse opgaven Relatedness; følelsen af at have kontakt med andre mennesker som er vigtige Influence/popularity; følelsen af at være respekteret, vellidt og blive hørt Pleasure/stimulation; følelsen af velbehag og glæde ved nye oplevelser Meaning; følelsen af at udvikle sit potentiale og gøre livet mere meningsfyldt Security; følelsen af at være sikker og have kontrol over sit liv
Hvad er brugerens værdier, behov, lyst og mål? (McCarthy og Wright, 2004)	Hvad ved vi om de potentielle brugers værdier, behov, lyst og mål? Hvad kan vi finde ud af om de potentielle brugers værdier, behov, lyst og mål?

Hvilke af de syv fundamentale følelser; overraskelse, ængstelse, vrede, vemod, væmmelse, foragt og glæde, skal oplevelsesdesignet understøtte? (Boswijk et al., 2012)	Den følelsesmæssige reaktion på det sanselige indtryk er individuelt. Boswijk et al. (2012) skelner mellem syv fundamentale følelser og understreger, at vi som mennesker sjældent kun oplever én følelse i en oplevelse men derimod en kombination af flere følelser. Følelsen *surprise*, eller overraskelse, er konfrontationen med noget mystisk, positivt eller negativt, som brugeren endnu ikke ved, hvad er. *Anxiety,* eller ængstelse, er en af de vigtigste følelser, der enten fører til undslippelse eller framelding. *Anger*, eller vrede, opstår, hvis forventningerne ikke indfries og er ofte relateret til kamp. *Sadness*, eller vemod, viser sig, hvis en bruger føler sig hjælpeløs og fører til ugidelighed og undvigelse. *Disgust*, eller væmmelse, medfører, at brugeren trækker sig væk fra oplevelsen. *Contempt*, eller foragt, er måden, hvorpå mennesker viser, at nogen eller noget er under deres værdighed. *Joy*, eller glæde, er en klar positiv følelse og er ekstrem værdifuld i relation til vores lykke og mulighed for overlevelse.

Meningsskabelse

Den sjette kategori *meningsskabelse* indgår i idé- og design-fasen. *Meningsskabelse* sætter fokus på at skabe oplevelser, der fordrer meningsskabelse hos brugerne. Meningsdannelse handler om, at brugeren skal kunne se en større mening med oplevelsen og dermed skabe en dybere selvforståelse (Hassenzahl et al., 2010). En brugeres emotioner (se afsnittet *Emotioner*) reflekterer oplevelsen ud fra opleverens totalitet af aktioner, sansning, tanker, følelser og meningsdannelse. McCarthy og Wright (2004) beskriver, at meningsskabelse afspejler bedømmelsen af værdi i brugerens samlede følelsesmæssige oplevelse. Ifølge Norman (2004) er *meningsdannelsen* dermed med til at danne den overordnede oplevelse og følelse og refleksion hos brugeren. Jantzen et al. (2011) ser æstetik som et systematisk middel til at kunne forandre, forundre og forvandle brugeren gennem oplevelsen. Dermed skaber det æstetiske i en oplevelse rum til nye forståelser og anskuelser for brugere. Med æstetik som middel til *meningsdannelse* beskriver Wright, Wallace og McCarthy (2008) fortryllelse som centralt for den æstetiske oplevelse med teknologi. Den fortryllende oplevelse er en oplevelse af at blive forført og henrykt. Den fortryllende oplevelse driver brugeren, hvilket vi kan relatere til i Csikszentmihalyis (2008) flow-begreb. Interaktive produkter, der er designet til fortryllelse, bør have potentiale for det uventede, der giver mulighed for nye opdagelser. Jo større chancer der er for at møde dette uventede, des mere dybde giver oplevelsen, og jo længere vil fortryllelsen vare (Wright et al., 2008). Samtidig beskriver Wright et al. (2008), at oplevelser er skabt af kontinuerligt engagement med verden gennem meningsskabelse på mange niveauer. Hermed menes, at vi aldrig kan være udenfor en oplevelse og det, der er aktivt i oplevelse er følelser samt handling med og gennem materialer og værktøjer. Mening bliver dermed skabt i et dynamisk samspil af det komposi-

tionelle, det sensoriske og det emotionelle i en bestemt tid og sted (Wright et al., 2008). Dermed sker meningsskabelsen gennem brugerens refleksion over oplevelsen som helhed (Normans, 2004).



Figur 12: Oplevelsesdesign-framework - kategorien MENINGSSKABELSE ses fremhævet i idé- og design-faserne

Kategorien *meningsskabelse* ses i idé- og design-fasen, hvor den er med til at sikre formålet med oplevelsesdesignet ved at fokusere på at skabe en form for mening hos brugerne. For at kunne beskrive kategorien *meningsskabelse* og dens betydning for oplevelsesdesignet, er der forskellige spørgsmål, som designeren bør stille sig selv i idé- og design-fasen.

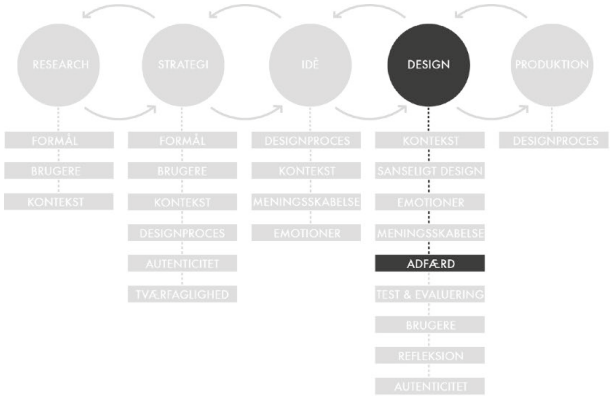
HOVEDSPØRGSMÅL	**UNDERSPØRGSMÅL**
Hvordan skaber vi flow? (Csikszentmihalyi, 2008)	Forholdene for flow kræver læring, at have mål, at give feedback og have kontrol. Disse aktiviteter skal faciliterer koncentration og engagement ved at tage aktiviteten ud af en hverdagskontekst. Csikszentmihalyi (2008) konkluderer, at alle flow-aktiviteter giver en fornemmelse af opdagelse og en følelse af at transportere det oplevende ind i en ny virkelighed. En oplevelse, hvor selvbevidsthed forsvinder og fornemmelse for tid forstyrres, beskrives som en oplevelse så tilfredsstillende, at folk er villige til at udføre aktiviteten for aktivitetens skyld, selv hvis aktiviteten er svær eller farlig (Csikszentmihalyi, 2008). Ifølge Csikszentmihalyi (2008) fordrer disse oplevelser flow, som fordrer dirigering af brugeren i en oplevelse.

Hvilke sensibiliteter understøtter et empatisk design?	En fortryllende eller meningsskabende oplevelse kan ikke opbygges på mekanisk vis ved formularer eller faste principper, da det vil ligge for fjernt fra det egentlige følte liv. I stedet tænker Wright et al. (2008) i sensibilities, som vi oversætter til sensibiliteter, der understøtter en empatisk tilgang til design. I en empatisk tilgang er det essentielt at medtænke et emotionelt aspekt i relationen mellem designer, bruger og objekt. Sensibiliteter er noget der er følt i mennesker, i deres viden, deres måde at se, høre og handle. Wright et al. (2008) har opsat en række punkter som udgør sensibiliteterne: Den sensoriske del af en oplevelse (se afsnittet Sanseligt design), mennesket som helhed, involvering af leg-situationer (se afsnittet Adfærd), involveringen af paradoks, tvetydighed, kompleksitet og lag af fortolkninger samt transformation. Disse sensibiliteter skal efter Wright et al. (2008) vurdering overvejes i et design orienteret mod fortryllelse eller meningsdannelse. Understøtter designet brugerne som helt menneske? (Wright et al., 2008) Vil vi gøre brug af paradokser og tvetydighed? (Wright et al., 2008) Hvilke lag af kompleksitet og fortolkninger udbydes der? (Wright et al., 2008)
Hvad vil vi forandre; vil det skabe forundring og hvordan vil det forvandle brugeren? (Jantzen et al., 2011)	Jantzen, Vetner og Bouchet (2011) beskriver det sanselige som omdrejningspunktet for oplevelser, og ser således æstetik som essentielt at medtænke i oplevelsesdesign. Endvidere beskriver Jantzen et al. (2011), at æstetikken tilbyder noget, som vi ikke regnede med at få. Det er for dem æstetikken, der overrasker, forbløffer og forundrer. Jantzen et al. (2011) beskriver æstetik som sanselig erkendelse, der fungerer som det objektive i en subjektiv oplevelse. Altså handler æstetik i oplevelser om at skabe sanselig erkendelse hos brugeren, som bunder i det kropslige nærvær, som giver mulighed for forandring, forundring og forvandling (Jantzen et al., 2011). Ifølge Jantzen et al. (2011) opstår denne sanselige erkendelse, når der sker et brud i det vante, som dermed ændrer det forventede, hvilket gør oplevelsen nærværende.
Skal flow brydes? (Csikszentmihalyi, 2008; Jantzen et al., 2011; Wright et al., 2008)	Endvidere kan der arbejdes med forundring, forandring og forvandling for at fordre eller bryde flow (Jantzen et al., 2011), da fortryllelse eller meningsdannelse også er et udtryk for et møde med det uventede (Wright et al., 2008).
Kan der findes eksplicitte meninger i oplevelsen? Understøtter de den ønskede oplevelse? (Crumlish, 2009)	
Narrativ struktur: Hvad er oplevelsens narrative struktur? (Wright et al., 2008)	

Adfærd

Den syvende kategori *adfærd* indgår i design-fasen. *Adfærd* beskriver oplevelsesdesignets funktionalitet og brugerens interaktion med oplevelsesdesignet. I denne kategori skal vi som oplevelsesdesignere arbejde med, hvilke funktioner oplevelsesdesignet skal indeholde og hvilken adfærd, det skal fordre hos brugeren. Adfærd er særligt knyttet til Normans (2004) følelsesmæssige *behavioral level*, der knytter sig til oplevelsen af interaktionen med et design. Her har selve designet fire aspekter *function, performance, usability* og *physical feel* (Norman, 2004). Som udgangspunkt er det væsentligt, at designeren stiller sig følgende spørgsmål: Hvad skal objektet gøre? Hvilken funktion skal objektet kunne udføre? Og hvilke behov opfylder objektet? (Norman, 2004). Hvis det ad-

færdsmæssige niveau er forvirrende eller frustrerende for brugeren, vil oplevelsen blive negativ frem for positiv (Norman, 2004). I udviklingen af et it-baseret oplevelsesdesign skal det adfærdsmæssige niveau imødegås med afsæt i kontekst og brugerforståelse. Objektets funktionaliteten designes med det formål at skabe velbehag og effektivitet i interaktionen. Objektets performance sikres gennem usability, det sanselige og brugertest (Norman, 2004).



Figur 13: Oplevelsesdesign-framework - kategorien ADFÆRD ses fremhævet i design-fasen

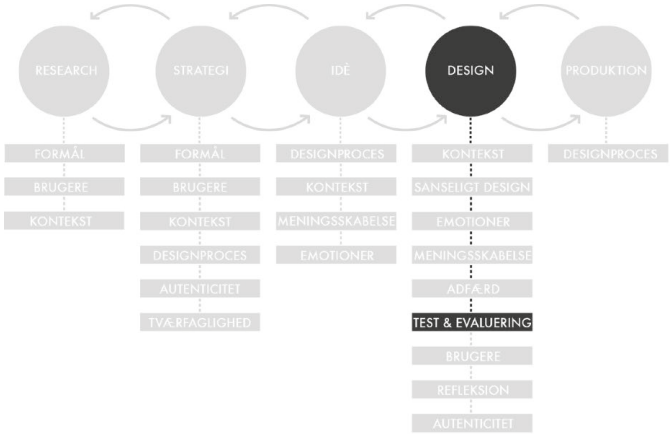
Formålet med at fokusere på oplevelsesdesignets *funktion, usability* og *performance*, er at skabe *intuitiv adfærd* (Paluch, 2006), da det optimerer muligheden for flow (Csikzentmihaly, 2008). For at kunne planlægge oplevelsesdesignets *funktion, usability* og *performance* skal vi forstå brugernes adfærd og dermed hvilke performance, der kræves af oplevelsesdesignet. Dermed er der i kategorien *adfærd* fokus på oplevelsesdesignets *funktion, usability* og *performance*. Derfor ses *adfærd* også kun i *design-fasen,* hvor det endelige design skabes og formgives. For at kunne beskrive *adfærd* og dens betydning for oplevelsesdesignet, er der forskellige spørgsmål, som designeren bør stille sig selv igennem designprocessen.

HOVEDSPØRGSMÅL	**UNDERSPØRGSMÅL**
Hvilken adfærd ønsker vi at fordre? (Crumlish, 2009; Sharp et al., 2007)	Her beskrives hvilken adfærd, vi ønsker at fordre for brugeren med oplevelsesdesignet. Dette kan gøres ved at se på eksisterende adfærdsmønstre og beskrive nye. Eksempelvis præsenterer Crumlish (2009), at man kan beskrive brugerens experience patterns: pave the cowpaths, talk like a person, play well with others, learn from games og respect the ethical dimension (Crumlish, 2009).

Funktion: Hvilken funktion skal objektet kunne udføre? (Norman, 2004)	Det skal afklares, hvilke funktioner oplevelsesdesignet skal udføre, og hvordan disse skal designes i forhold til de behov som oplevelsesdesignet ønsker at imødegå eller stimulere (Norman, 2004). Function knytter sig til, hvilken aktivitet objektet understøtter, og hvad objektet skal kunne gøre i oplevelsen. Her skelnes der mellem to former for udvikling af objekter: forbedring eller innovation (Norman, 2004). Hvis der designes med henblik på en forbedring af et produkt inden for en eksisterende produktkategori, vil udviklingen oftest ske gennem observationen af brugerens interaktion med et eksisterende produkt og forståelse af, hvad deres umiddelbare problemer med produktet er. På baggrund heraf skaber designeren et forbedret design, som imødegår problemerne med et eksisterende produkt. I udviklingen af de innovative produkter er det designeren, der ser en mulighed for at stimulere et behov, som brugeren ikke vidste de havde. I udviklingen af de innovative produkter kan det være svært at inddrage brugerne i designet af funktionalitet, da det ikke er et produkt eller behov, de har erfaring med eller ser som en mangel. Derfor vil udviklingen af de innovative produkter og deres funktionalitet være formet ud fra designernes ekspertise.
Usability: Kan brugeren anvende objektet? (Norman, 2004)	Usability knytter sig til, hvor nemt og hurtigt en bruger formår at kunne få objektet til at performe (Norman, 2004). Usability er en kompleks størrelse. Selvom objektet gør, hvad det skal og er forståelig i sin funktionalitet, er det ikke nødvendigvis ensbetydende med, at det er nemt at bruge (Norman, 2004). Hvis brugeren ikke kan få objektet til at performe, kan dette medføre en negativ oplevelse (Norman, 2004).
Performance: Understøtter designets usability og funktioner brugerens intuitive adfærd? (Norman, 2004; Paluch, 2006)	Når funktionaliteten af oplevelsesdesignet er defineret, skal usability designet udformes. Dette gøres for, at sikre, at designet kan performe intuitivt for brugeren.
Vil elementer af leg fordre den ønskede oplevelse? (Crumlish, 2009; Huizinga, 1980)	Det kræver ikke nødvendigvis, at der udvikles spil men, at der kan implementeres elementer fra spil. Overvej hvordan brugere kan begejstres og opmuntres til at engagerer sig. I spilelementer som kan implementeres ser vi regler, der giver rammerne for et miljø, hvori man kan interagerer med hinanden. Endvidere beskrives, at folk vil skabe deres egne regler(Crumlish, 2009). Dette ser vi også stemme overens med Huizingas (1980) beskrivelse af leg. I tråd med tidligere definitioner af oplevelse ser Huizinga (1980) leg som frivillig aktivitet uden for den almindelige hverdag. Ligeledes ser vi i leg, at brugere emergerer sig totalt og absolut. Her skabes fællesskab og der opstilles regelsæt eller ritualer, som befinder sig uden for hverdagens normale regler. Leg defineres også af tid og sted (Huizinga, 1980).
Hvad skal objektet gøre? (Norman, 2004; Crumlish, 2009; Paluch, 2006)	
Hvilke behov skal objektet opfylde? (Norman, 2004)	
Hvilke dele består interaktionerne af? (Jantzen et al., 2011)	
Hvad begejstrer og engagerer brugeren i oplevelsen? (Crumlish, 2009)	

Test Og Evaluering

Den ottende kategori *test og evaluering* indgår i *design-fasen*. *Test og evaluering* fokuserer på løbende test og evaluering af oplevelsesdesignet gennem design-fasen. De løbende test og evalueringer af designet skal være med til at videreudvikle idéer og designforslag, kassere og fravælge idéer, teste det adfærdsmæssige design samt validere og vurdere, hvorvidt designforslagene lever op de stillede krav fra strategien. *Test og evaluering* er særligt knyttet til det adfærdsmæssige design, som handler om brugbarheden i brugere-produkt-interaktionen. Dermed testes og evalueres oplevelsesdesignets funktioner, usability og dens fysiske sanselighed gennem prototyping, brugertest og -observationer (Norman, 2004).



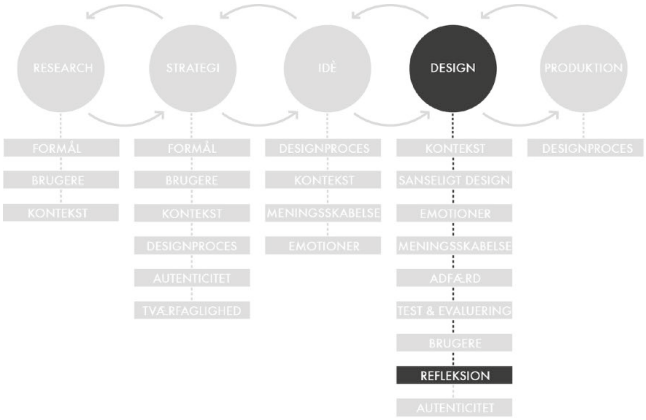
Figur 14: Oplevelsesdesign-framework - kategorien TEST & EVALUERING ses fremhævet i design-fasen

Test og evaluering gennemføres med afsæt i forståelsen af, hvem de potentielle brugere er, hvilken kontekst oplevelsesdesignet indgår i, og hvilke behov og intuitiv adfærd oplevelsesdesignets funktionalitet og brugbarhed ønsker at understøtter (Nielsen, 2012). Dette gøres for at sikre at det adfærdsmæssige mål i oplevelsesdesignet indfries. For at kunne beskrive *test og evaluering* og dens betydning for oplevelsesdesignet, er der forskellige overvejelser designeren bør forholde sig til igennem designprocessen.

HOVEDSPØRGSMÅL	UNDERSPØRGSMÅL
Test på potentielle brugere (Buxton, 2007; Hassenzahl, 2010)	Involvering af brugere i designprocessen er vigtigt. Både for at forstå hvem brugeren er og hvad deres behov er (som beskrevet i afsnittet Bruger), men involvering af brugeren er også væsentlig i designudviklingen for at teste oplevelsesdesignets brugbarhed. Buxton (2007) beskriver sketching og prototyping som metoder til at forstå brugeres interaktion med et system ved at involvere brugerne i den iterativ designproces. Hertil kan involveringen af brugere bestå af deltagelse i test og validering af designet.
Evaluering af de seks usability komponenter (Hassenzahl, 2010; Nielsen, 1993;2012)	Blandt andet præsenterer Hassenzahl (2010) usability test som test af oplevelsesdesignets brugbarhed. Usability test hjælper med at bedømme, om den designede interaktion er kompatibel med brugerens evner. Herudover beskriver Nielsen (1993;2012) seks usability komponenter, som kan anvendes til test og evaluering: *Learnability* handler om, hvor nemt det er for brugeren at udføre simple opgaver første gang, de interagerer med designet. *Efficiency* fokuserer på, når brugeren har lært designet at kende, hvor hurtigt de så kan udføre opgaverne. *Memorability* beskæftiger sig med, om brugeren kan reetablere sine færdigheder i interaktionen, når de vender tilbage til den efter en længere periode . *Errors* forholder sig til, hvor mange fejl brugeren begår, hvor store fejlene er, og hvor hurtigt de kan komme videre. *Satisfaction* fokuserer på, hvor behageligt det er for brugeren at interagere med objektet gennem optimeringen af de ovenstående komponenter. Dermed understøtter satisfaction brugerens intuitive adfærd i oplevelsesdesignet. *Utility*: usability og utility er lige vigtige i et design, da et objekt skal være godt og brugbart. Opfylder designet ikke brugerens behov, har designet ingen værdi. Samtidigt, hvis funktionaliteten er til stede til at opfylde et behov, men brugbarheden i designet ikke er tilstede, virker det heller ikke.
Test af funktionalitet og performance (Norman, 2004)	Udover usability bør oplevelsesdesignets funktion og performance testes for at sikre, at det understøtter brugerens intuitive adfærd. Fx ved at undersøge nedenstående spørgsmål. Hvad skal objektet gøre? Hvilken funktion skal objektet kunne udføre? Hvilke behov opfylder objektet? En måde, hvorpå brugbarhed, funktionalitet og performance af oplevelsesdesignet kan testes for at sikre, at avancen ikke overstiger bruger behovet, er ifølge Norman (2004) gennem udvikling af prototyper, som kan testes af potentielle brugere. Da både brugerens instinktive og adfærdsmæssige handlinger sker gennem underbevidstheden, kan brugeren ikke italesætte disse.
Observation & Evaluering af observation (Norman, 2004)	For at kunne drage nytte af de ovenstående test med potentielle brugere, er observationen af brugere en væsentlig metode. Observationer kan skabe forståelse for brugerne, konteksten, potentielle forbedringer af oplevelsesdesignet og anvendelsesproblematikker. Observationer af brugerne kan bidrage til forståelsen af behov, belysning af ikke sete problemstillinger og anvendelsesmuligheder i designet til det adfærdsmæssige niveau (Norman, 2004). Derfor er observationer ifølge Norman (2004), det bedste værktøj til forståelse af brugbarhed i den konkrete kontekst og behovsafklaring. Evalueringen af observationerne sker på baggrund af data indsamlet med afsæt i foranstående spørgsmål fra test og evaluering. Evalueringer gennemføres af designeren for at generere viden til forbedring af oplevelsesdesignet.

Refleksion

Den niende kategori *refleksion* indgår i design-fasen. *Refleksion* knytter sig til brugerens fortolkning og forståelse af den samlede oplevelse. Dermed søger denne kategori at skabe en forståelse af den refleksion, som opstår i brugeren i forlængelse af en oplevelse. Det er væsentligt at kunne forstå eller reflektere over, hvad oplevelsesdesignets kan repræsentere for en brugens selvbillede, kulturelle baggrund etc. for at kunne tilpasse oplevelsesdesignet herefter og fordre den ønskede oplevelse.



Figur 15: Oplevelsesdesign-framework - kategorien REFLEKSION ses fremhævet i design-fasen

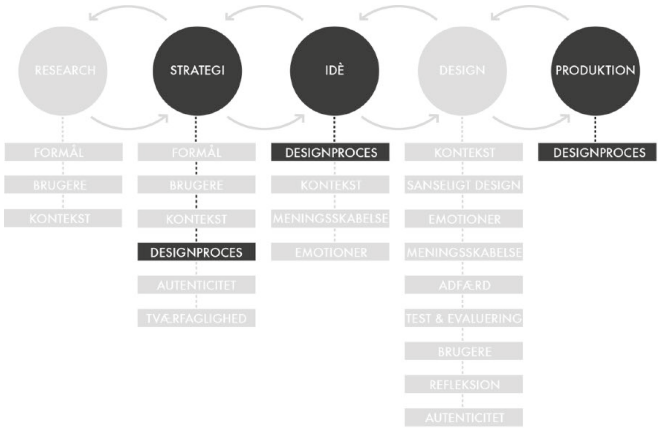
Kategorien *refleksion* har særligt taget form efter Normans (2004) beskrivelse af et af de tre følelsesmæssige niveauer; *reflective level*. Norman (2004) beskriver det refleksive niveau i brugeren, som det niveau, hvor brugerens samlede refleksion af oplevelsen skabes. Det sker både i forhold til, om oplevelsen er interessant for brugeren og oplevelsens påvirkning på minder. Det refleksive niveau er brugernes behov for at kunne identificere deres selvbillede af oplevelsen på baggrund af deres kulturelle baggrund, værdier og mål (Norman, 2004). Det er på det refleksive niveau, at der kan skabes relationer og langsigtede positive minder. Det er derfor vigtigt, at vi i designet til dette niveau kender vores brugere og konteksten, så vi kan søge at skabe noget, der understøtter muligheden for positive og selv-identificerende oplevelser i subjekt-objekt interaktionen. Da dette niveau hovedsageligt foregår i brugernes psyke, er det svært at designe noget specifikt til dette niveau eller definere klare designparametre til det (Norman, 2004). Som kategori kræver det refleksive niveau, at vi som designere er bevidste om hvilke design- eller oplevelsesmæssige aspekter, der understøtter

det selvbillede, som de potentielle brugere gerne identificerer sig med. Det er derfor væsentligt, at det refleksive niveau af oplevelsesdesignet bliver gennemtænkt i forhold til den potentielle bruger, oplevelsesdesignets formål samt dets kontekst (Norman, 2004). For at kunne beskrive *refleksion* og dens betydning for oplevelsesdesignet, er der forskellige spørgsmål, som designeren bør stille sig selv igennem designprocessen.

HOVEDSPØRGSMÅL	**UNDERSPØRGSMÅL**
Hvordan er brugerens selvbillede? (McCarthy og Wright, 2004; Norman, 2004)	Det reflektive niveau kræver, at vi som designere er bevidste om hvilke design- eller oplevelsesmæssige aspekter, der understøtter det selvbillede, som de potentielle brugere gerne identificerer sig med. De nedenstående spørgsmål kan derfor overvejes i forhold til at skabe et mere klart billede af brugerens selvbillede. Hvilke værdier og mål driver brugeren i oplevelsesdesignet? Lyst driver brugerens til- eller fravælgelse af en oplevelse og er styret af kultur, brugerens selvbillede, værdier og mål (McCarthy og Wright, 2004; Norman, 2004). Hvilke kulturelle skikke knytter sig til brugerne? Brugerens selvbillede påvirkes af de kulturelle skikke, der omgiver brugeren. Der er ifølge Norman (2004) intet praktisk eller biologisk i brugerens til- og fravalg. Det er derimod kulturbestemt.
Hvilke aspekter i oplevelsesdesignet understøtter brugerens selvbillede? (Boswijk et al. 2012), (Hassenzahl et al., 2010), (Norman, 2004)	Skaber oplevelsen en større mening og dybere selvforståelse for brugeren? (Boswijk et al., 2012; Hassenzahl et al., 2010) Hvilken viden og læring tilbyder oplevelsesdesignet brugerne? Vurderingen af et objekts skønhed, prestige og eksklusivitet opstår på det refleksive niveau, hvor den bevidste refleksion af oplevelse skabes på baggrund af brugerens viden, læring og kulturelt bestemte skikke (Norman, 2004).
Hvad er brugerens forventninger, og hvordan kan vi justere dem? (Wright et al., 2008)	Når vi går ind i situationer er vores oplevelse altid formet af tidligere erfaringer. Herfra skabes forventninger om oplevelsen. Forventninger kan være bekymrede eller begejstrede. Ligeledes skabes forventninger om muligheder i oplevelsen eller et udfald af oplevelsen. Forventninger ligger ikke kun før en oplevelse. De fortsætter gennem oplevelsen og er revideret efter oplevelsen. En oplevelse kan således være behageligt overraskende eller skuffende afhængigt af forventningerne og den egentlige oplevelse (Wright et al., 2008).
Fordrer oplevelsen transformation af brugeren? (Pine og Gilmore, 2011)	Er oplevelsesdesignet tilpasset til brugerens behov? Transformation opnås, når en oplevelse skræddersyes til modtageren og forvandler modtageren. Den tilpassede oplevelse skaber dermed potentiale for at brugeren transformeres (Pine og Gilmore, 2011).
Hvad fortæller brugeren videre efter oplevelsen og hvordan former det refleksionen over oplevelsen? (Wright et al., 2008)	Det er her, det personlige, sociale og kulturelle mødes. Denne proces kan ske i tale eller på skrift. Når den, der har oplevet noget, skal berette om denne oplevelse, vil denne oplevelse være redigeret af den oplevende og dele vil være fremtonet. Endvidere modtages disse beretninger af andre subjekter, som videre vil redigere og fremtone dele af beretningen. Når en oplevelse kommer i cirkulation behandles den således af subjekter, og der er mulighed for at subjekter lærer noget om hinanden, hvilket er en anden måde at finde mening og muligheder i en oplevelse (Wright et al., 2008).

Designproces

Den tiende kategori, *designproces,* indgår i *strategi-* og *produktions-fasen*. *Designproces* beskriver planlægningen af designprocessen i udviklingen af it-baseret oplevelsesdesign. Formålet og vigtigheden i denne kategori er at udvikle og planlægge den rette designproces til det givne projekt. Denne kategoris underliggende spørgsmål og pointer opstiller dermed retningslinjer for planlægningen af en effektiv designproces. Planlægningen af designprocessen er væsentlig for at udvikle kvalitative it-baserede oplevelsesdesign. Formålet med designprocesser er at skabe balance mellem back-end design, usability og engineering samt front-end design, sketching og idéudvikling (Buxton, 2007). I udviklingen af Oplevelsesdesign-frameworket har vi anvendt Buxton (2007) redegørelse for retningslinjer for en effektiv designproces, da han fokuserer på skabelsen af involverende oplevelsesdesign med teknologi, der understøtter værdifulde brugeroplevelser.



Figur 16: Oplevelsesdesign-framework - kategorien DESIGNPROCES ses fremhævet strategi-, idé- og design-faserne

Buxton (2007) understreger, at det ikke er muligt at skabe én generel og ideel designproces. Designprocesser er ikke en lige vej fra intention til implementering. Der er mange ubekendte i udviklingen af et design. Hvis en prædefineret lige og direkte designproces anvendes, er der stor risiko for at skabe middelmådige oplevelsesdesign, der indsnævrer oplevelsesdesignet til det visuelle udtryk og usability (Buxton, 2007). Dermed er formålet med kategorien *designproces* ikke at skabe én generel og ideel designproces, men tværtimod at definere en designproces tilpasset til det givne projekt. Hvis designprocessen ikke planlægges ud fra det givne projekt, vil designudviklingen blive

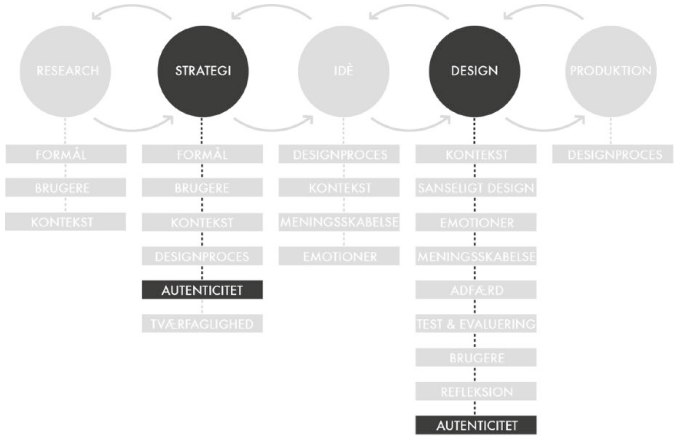
dyrere og mere tidskrævende, da der vil opstå for mange uforudsete elementer. Endvidere vil det endelige design bære præg heraf (Buxton, 2007). Buxton (2007) understreger, at selvom vi som designere forventer, at vi ved, hvordan designet skal være fra starten af, vil der næsten i alle tilfælde ske ændringer i takt med udviklingsprocessen. Ændringerne kan ske på baggrund af den viden, der udvikles i løbet af udviklingsprocessen, eller fordi markedet ændrer sig. Dermed skal designprocessen være designet, så disse problemstillinger bliver identificeret tidligt i processen, hvor det er billigst at ændre designet (Buxton, 2007). For at kunne beskrive kategorien *designproces* og dens betydning for oplevelsesdesignet, er der forskellige spørgsmål som designeren bør stille sig selv i *strategi-* og *produktions-fasen*.

HOVEDSPØRGSMÅL	**UNDERSPØRGSMÅL**
Empatisk og Holistisk (Wright et al., 2008)	Når vi i udviklingen af oplevelsesdesign arbejder indenfor feltet human-centered eller user-centered design, sætter vi brugeren i centrum for designudviklingen (Buxton, 2007; Jensen, 2013). Dermed er det en fordel at tage en empatisk og holistisk tilgang til designprocessen. Med en empatisk tilgang sættes der fokus på et emotionelt aspekt i relationen mellem designer, bruger og objekt (Wright et al., 2008), og med en holistisk tilgang ser vi bruger som et helt menneske, som handler, sanser, tænker, føler og skaber mening i en kontekst (Wright et al. 2008).
Undgå standardisering af designprocessen (Buxton, 2007)	Buxton (2007) understreger, at det ikke er muligt at skabe én generel og ideel designproces. Hvis en prædefineret lige og direkte designproces anvendes, er der stor risiko for at skabe middelmådige oplevelsesdesign, der indsnævrer oplevelsesdesignet til det visuelle udtryk og usability (Buxton, 2007). Dermed er det væsentligt at forme designprocessen på baggrund af det givne projekt og ikke anvende en prædefineret designproces.
Arbejde ud fra en iterativ designproces, der veksler mellem idéudvikling og kontrolleret konvergens (Buxton, 2007)	En iterativ designproces er en designproces, som gennem sine iterationer skaber mulighed for at udvikle nye idéer på baggrund af analyse og rationalisering. Gennem reduktioner sammenlignes idéer for at udvælge og skabe nye kreative idéer (Buxton, 2007).
Hvilken designtilgang arbejder vi ud fra i forhold til de to dimensioner design-research-led og expert-, participatory-mindset? (Sander, 2008)	En del af planlægningen af den iterative designproces sker gennem en stillingtagen til, hvilken designtilgang der tages udgangspunkt i. Dette kan gøres med afsæt i Sanders (2008) designkort med de to dimensioner design-, research-led og expert-, participatory-mindset. Endvidere skal der, på baggrund af den valgte tilgang, udvælges metoder eller værktøjer til selve designudviklingen.
Hvilke metoder og værktøjer skal der anvendes i udviklingen? (Buxton, 2007)	Eksempler herpå kan være; kreativitetsteknikker, observationer, evaluering, interviews, autoetnografier, rapid prototyping, sketching, prototyping etc.

Hvad skal der ske efter designprocessen? (Buxton, 2007)	Dette spørgsmål lægger op til planlægningen af den videre proces efter designudviklingen, som knytter sig særligt til oplevelsesdesign-frameworkets sidste fase, produktion. Når vi er i designfasen, kan produktion og salg ikke tilsidesættes, men de er ikke det primære fokus for denne del af produktudviklingen (Buxton, 2007). Det er her den videre produktion og markedsføring løbende i designprocessen skal planlægges. Dette kan eksempelvis være i løbende samarbejde med produkt- og marketingsmanager, administration, usability-, software-, interface-, interaktionsingeniører etc.

Autenticitet

Den ellevte kategori *autenticitet* indgår i *strategi-* og *design-fasen*. *Autenticitet* fokusere på om designet er, hvad den giver sig ud for at være, og om det er tro mod sig selv og sin afsender (Gilmore og Pine, 2007). Autenticitet i oplevelsesdesign er væsentlig for at skabe kvalitative oplevelser for brugerne. Der er i dag et højt krav til virksomheder om, at de skal være autentiske. Det betyder, at både virksomheden, samt dens produkter og tjenester, skal formes til at underbygge den autentiske oplevelse for kunden (Gilmore og Pine, 2007). Autenticitet beskrives af Crumlish (2009) som menneskelig tone. Med denne tone foretrækker kunder samarbejde frem for en påtvunget oplevelse. En organisation eller afsender skal være aktiv, synliggjort og eventuelt tage en facilitator rolle i oplevelsens forskellige aspekter. For at kunne beskrive kategorien *autenticitet* og dens betydning for oplevelsesdesignet, er der forskellige spørgsmål, som designeren bør stille sig selv i *strategi-* og *design-fasen.*

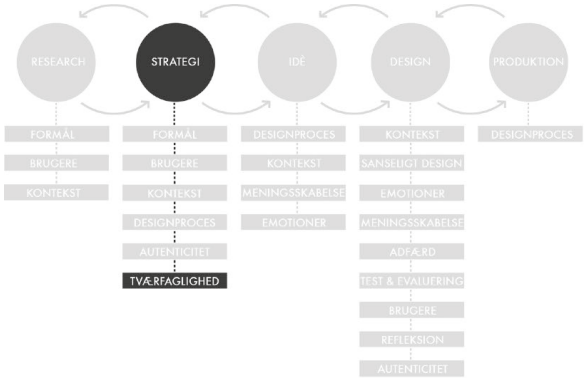


Figur 17: Oplevelsesdesign-framework - kategorien AUTENTICITET ses fremhævet i strategi- og design-faserne

HOVEDSPØRGSMÅL
Er vi, hvad vi giver os ud for at være? (Pine og Gilmore, 2007)
Og er vi tro mod os selv? (Pine og Gilmore, 2007)
Har designet en autentisk og menneskelig tone? (Crumlish, 2009)
Fordrer vi samarbejde frem for at trække noget ned over hovedet på brugeren? (Crumlish, 2009)

Tværfaglighed

Den tolvte kategori *tværfaglighed* indgår i *strategi-fasen*. Denne kategori lægger op til, at oplevelsesdesigneren trækker på afsenderens netværk for at skabe den bedst mulige løsning for brugeren. Dette gøres ved at oplevelsesdesigneren fokuserer på at skabe tværfagligt samarbejde både internt i designudviklingen, på tværs af organisationer og gennem co-creation for at inddrage brugeren både i udviklingen og i selve oplevelsen. Dermed er det som element i skabelsen af kvalitative oplevelsesdesign væsentligt at fordre tværfaglighed. Samarbejdet mellem afsender og brugere er at foretrække, da dette er med til at skabe potentialet for meningsskabelse og autentiske oplevelser (Crumlish, 2009). Når samarbejde mellem afsender og brugere bygges på en åbenhed om afsenderens mål, understøttes udgangspunktet for co-creation (Boswijk et al., 2012). Endvidere lægger ISO (2010) og Paluch (2006) vægt på vigtigheden i tværfaglige samarbejder, som ifølge Boswijk et al. (2012) giver muligheder for at skabe de rigtige løsninger, når vi trækker på netværket mellem organisationer. For at kunne beskrive kategorien *tværfaglighed* og dens betydning for oplevelsesdesignet er der forskellige spørgsmål, som designeren bør stille sig selv i *strategi-fasen*



Figur 18: Oplevelsesdesign-framework - kategorien TVÆRFAGLIGHED ses fremhævet strategi-fasen

35

HOVEDSPØRGSMÅL
Skal der indtænkes co-creation i oplevelsen? (Boswijk et al., 2012; Crumlish, 2009)
Skal der indtænkes organisationssamarbejde?: (Boswijk et al., 2012; Crumlish, 2009)
Anvendes afsenderens netværk i oplevelsen? (Boswijk et al., 2012)
Er det let for brugeren og afsenderen at finde hinanden? (Boswijk et al., 2012)

AFSLUTNING

Dette afslutter beskrivelsen af oplevelsesdesign-frameworket, dets faser og underliggende kategorier og pointer. Formålet med oplevelsesdesign-frameworket er, at det skal fungere som retningslinje for udviklingen af kvalitative it-baserede oplevelsesdesign i både en akademisk og praktisk kontekst. Det er vigtigt, at oplevelsesdesigneren overvejer alle kategorierne under de enkelte faser af designprocessen. Endvidere bør relevansen af kategoriernes underliggende designkrav overvejes i forhold til den givne kontekst. Vægtningen af kategorierne og de underliggende pointer er således afhængig af formålet med oplevelsesdesignet og kan indtænkes i højere eller mindre grad. Denne vægtning er oplevelsesdesignerens vurdering, som sker på baggrund af det givne projekt. Endvidere bør kategoriernes underliggende spørgsmål og pointer fungere som vejledning til, hvad der bør indtænkes og overvejes i de enkelte kategorier.

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3.3. [P3] THE GAMIFIED MUSEUM

Madsen, K. M. (2018). The gamified museum – A critical literature review of gamification in museums. In T. Jensen, C. Rosenstand, & O. Ertløv (Eds.), *GameScope: The potential for gamification in digital and analogue places* (p.). Aalborg: Aalborg University. (in press)

The third paper was motivated by the two premises of the research project: both theoretically and practically. With experience design being an interdisciplinary design approach that borrows from other traditions combined with the reality of the museum experience at the Limfjord Museum, I found it interesting to research why and how gamification has been applied to museum experiences, with the hypothesis that gamification could be a driver for explorative user interactions. This paper comprises an informative and interesting journey into gamification studies within the context of museums, one which has inspired further research into how and which game principles can be used when designing explorative museum exhibitions. This paper emerged out of experiment [Ex_A] and created the foundation and initial inspiration for [P4] and [P5]. Following up on the research design, the table below summarises which research question and experiments are connected to this paper.

[SQ1]	What theoretical principles and criteria can be identified for IT-based experience design and exploration?
[Ex_A]	Reviewing, Defining and Clarifying Problem Area
Publication Ranking	Aalborg University Press: Level 1

Table 10: Overview of the sub-question and experiment connected to [P3].

The gamified museum

- A critical literature review and discussion of gamification in museums

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Abstract This paper is a discussion on the subjects in empirical studies on gamification in the non-game context of museums, based on a structured literature review. The paper examines the state of current research on the topic to determine the main subjects within the area of concern but also the gaps in existing literature. The review indicates a heightened focus on creating digital game add-ons to existing exhibitions. At the same time the review shows a lack in methods, theories and tools focused on gamification of museum exhibitions and a critical discussion about what can be qualified as gamification in the museum context. The findings of the review provide insights and directions for further studies categorised as five subjects.

Keywords Museum, exhibition design, gamification, gamified museum, literature review

Introduction

Do you remember your best museum experience? Were you a passive visitor or were you an active user in your museum experience? The museum landscape is changing and museum users are looking for experiences that are interactive and engaging in comparison to passive experiences as observing objects in glass display with their hands on their backs. This development strains the museums between their obligations as cultural institution and being experience attractions (Skot-Hansen, 2008). This means that museums need to re-evaluate their classic role as an information and knowledge institution and find ways to enhance their experience potential, but still maintain their authenticity and credibility (Skot-Hansen, 2008). So how do we shape the museum experience of the future to be both interactive and engaging as well as informative?

One way of approaching this change is by implementing gamification into the museum experience. Martens and Müller (2017) describe how game-based learning and gamification has gained a lot of interest in academia, edutainment and learning in a *Handbook of Digital Games and Entertainment Technologies* and this interest is also becoming visible within museums. The *NMC Horizon Report:*

2015 Museum Edition (Johnson, Adams Becker, Estrada, and Freeman, 2015) puts games and gamification as a trend within museum design over the next year. The report argues that museums have been using gamification as a way to increase engagement and enhance learning experiences in museums. Especially mobile games are highlighted as a way to enhance the visitor's learning experience without being a distraction (Johnson et al., 2015). In contrast Marten and Müller (2017) argue that we are still missing validation of the effect and ability of gamification to enhance motivation and learning.

Based on NMC's (Johnson, et al., 2015) forecast of gamification being trending within the museum context in 2016 and forth as well as Martens and Müllers' (2017) critique of missing validation of the effect of gamification, the focus in this paper is research done within gamification in the non-game context of museums. More specifically, this literature review will explore how gamification has been applied within the museum context in the last 10 years? And what can we say and learn based on this research? Even though NMC's (Johnson, et al., 2015) forecast of both games and gamification as trending in museums, this literature review focus on gamification and not games in its search. The interest of the literature review is to get an overview of research focused on implementing gamification into the museum exhibitions and not to look at games added to museums. This means that the literature review might miss some aspects of gamification but also opens up the opportunity for further research.

Positioning the understanding of gamification

The common idea of *gamification* is the introduction of game design elements into either a non-game context or system with the main goal to improve user experience and user engagement (Deterding, Sicart, Nacke, O'Hara and Dixon, 2011a; Deterding, Dixon, Khaled and Nacke, 2011b). Since *gamification* started to get its widespread adoption in the second half of 2010 (Deterding et al., 2011a), it has been contested as a research term that game and user experience designers challenge with other terms like *gamefulness* and *gameful design* (Matallaoui, Hanner and Zarnekow, 2017). There have been different definitions of gamification since Deterding et. al.'s definition of the term in 2011. The most recent examples are in the anthology *Gamification - using game elements in serious contexts* (Matallaoui et al., 2017) and the chapter *Gamification* in *Handbook of Digital Games and Entertainment Technologies* (Martens and Müller, 2017). Matallaoui et al. (2017) describe gamification as being distinguished from serious games and game design as it only partly uses game elements but is still rule-based and goal-oriented. Martens and Müller (2017) describe gamification as being closely related to game-based learning and game playing acknowledging that separating the traditions from one another can be a bit blurry. Martens

et al.'s (2017) and Matallaoui et al.'s (2017) definitions of gamification are basically not that different from Deterding et al.'s (2011a) description being the introduction of game design elements in non-game context. But Martens et al. (2017) and Matallaoui et al. (2017) elaborate on the application domains and pseudoknowledge of gamification. Nevertheless, Martens and Müller (2017) are somewhat critical about the effect and ability of gamification to enhance motivation, participation and learning because of the missing data to validate this effect (Martens and Müller, 2017). This paper does not aim to add another definition of gamification to research but instead examines the research within gamification in the context of museums and I will therefore approach this research paper with the broader understanding of gamification being the introduction of game design elements in non-game context (Deterding et al., 2011a).

The paper consists of five sections, starting with *methodology*, followed by *research areas within gamification in museums* which became visible through the literature review. Based on these research areas the next section focuses *on situating the subjects of The Gamified Museum*. This results in a section on possible *further studies* before wrapping up the paper with the *conclusion*.

Methodology

The method used in this study is desk research in form of a structured literature search and review. This section will explain the search strategy including choice of databases, keywords, delimiting factors, and the result of the literature search.

Database // Five databases were chosen for the search, *Taylor & Francis Online, Springerlink, ACM digital library*, *IEEE Xplore* and *Google Scholar*. Taylor and Francis was chosen because of their multiple journals covering museums and cultural heritages. Springerlink has a broad variation of publications, among others a couple of book publications from 2017 about gamification. ACM and IEEE were chosen because of their focus on research within HCI. Lastly, Google Scholar was chosen as a supplement to look for references within the chosen publications from the other databases.

Keywords // The search strategy had two main search terms; gamification and museum. For each term, there were found synonyms in one of the database thesauruses were found to broaden the search outcome. A couple of test searches were conducted before formulating the final search string: *gaming OR gam * OR play * OR "serious games" OR "game mechanic *" AND museum OR museology OR "museum studies" OR "cultural heritage" OR culture OR "culture institution" OR exhibition OR heritage.*

Delimiting factors // The search was further narrowed by focusing on peer-review research publications and searching for research published between 2007-2017.

Results // This search strategy resulted in 1.381 publications across the databases. Titles and abstracts of the 1.381 publications were read to identify relevant research papers addressing gamification in a museum context. The process had the purpose of identifying the scope of the different publications and whether or not they fulfilled the search criteria. Therefore, if the publication did not contain any mention of gamification and museums, the main term or the synonyms, or did not seem relevant by its focus to gamification in some kind of cultural context, they were cut from the relevant literature. This initial reading process reduced the publication pile to 64 publications. Next step was to read the full-text of the identified 64 publications that seemed within the scope of this literature review. The delimiting process here was the same as before, except for the fact that it was now based upon whether or not the publication as a whole was relevant and within the scope of the literature review. Reading the full-text of the 64 publications reduced the number of relevant publications to 26.

With the search complete, the 26 chosen publications were thoroughly re-read and organised in a table to visualise the subjects addressed in each publication (see Table 1). Table 1 creates an overview of the publications' subjects so that I can define the main subjects with the area of concern. The subjects are written into the table as they appeared in the text when reading through the publications. This process was an open categorization of the subjects based on either how gamification was applied, what kind of game-elements were used, technologies or other relevant or significant subjects appeared in the publication. This means that none of the subjects are pre-written into the table but developed throughout the literature review. Using this method has the advantage that when a new subject appeared, the previously read publications were revisited to see if they also mentioned these subjects.

When all 26 research publications were re-read and placed in the table, it became clear which publications have actually researched gamification in the museum context. If we take a look at the table (Table 1), there are 8 publications marked with green which are the most relevant publications that focus on gamification in museums. Whereas the other 18 publications in table 1 are interesting and do mention museums and gamification, their main research area is not in the combination of gamification in museums context. This does not make them irrelevant to discuss but these are not within the core of the literature review and therefore not all of them will be part of the literature

review. It is important to stress that the main focus in this literature review was to get an overview of research within gamification and museums, be it wide or narrow.

Table 1: The table includes Author(s), Year, Title, Conference/Journal, Database and the 21 subjects identified from the

Author(s)	Year	Title	Conference / Journal	Database	Gamification Background		Subject																				
					Gamification	Game-based learning (GBL)	Museum	History	Digital game	Cultural heritage	Experience	Trends in technology	Edutainment	learning	Technology	AR	Motivation	Gamified learning	Serious Game	Gameful design method	Play	Virtual world	Smartphone app	Online game
Alland, A. S. T., Hinderah, H., & Wuryandani, A. I.	2014	*Design and implementation of turn-based strategy (TBS) game as part of service-based alternate reality game (ARG)*	System Engineering and Technology (ICSET)	IEEE	1	1		1			1			1	1											
Aydin, S., & Schnabel, M. A	2016	*The Museum of Gamers: Unmediated Cultural Heritage Through Games*	Cultural Heritage in a Changing World (pp. 125-141). Springer International Publishing.	Springerlink	1					1	1						1	1								
Champion, E. M.	2008	*Otherness of Place: Game-based interaction and Learning in Virtual Heritage Projects*	*International Journal of Heritage Studies*	Taylor & Francis					1					1	1		1								
Coenen, T., Mostmans, L., & Naessens, K.	2013	*MuseUs: Case study of a pervasive cultural heritage serious game*	Journal on Computing and Cultural Heritage (JOCCH), 6(2), 8.	ACM		1		1		1		1	1	1	1		1						1			
Deterding	2015	*The lens of intrinsic skill atoms: A method for gamiful design*	Human-Computer Interaction, 30(3-4), 294-335.	Taylor & Francis	1	1							1	1	1					1						
Deterding	2014	*The ambiguity of games: Histories and discourses of a gameful world.*	Deterding (eds.): The Gameful World. Approaches, Issues, Applications. Cambridge, MA: MIT Press.	Google Scholar	1				1						1					1						
Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D	2011	*Gamification. using game-design elements in non-gaming contexts*	CHI'11 Extended Abstracts on Human Factors in Computing Systems	ACM	1	1	1							1	1											
Eleftheria, C. A., Chatzikiza, P., Iason, C. G., Athanasia, T., & Dimitrios, T.	2013	*An Innovative Augmented Reality Educational Platform Using Gamification to Enhance Lifelong Learning and Cultural Education*	*Information, Intelligence, Systems and Applications (IISA)*	IEEE	1	1			1	1				1	1	1	1									
Frasca, R., Mazzeo, A., Pantile, D., Ventrella, M., & Verreschi, G.	2015	*Innovative systems for the enjoyment of pictorial works the experience of Galleria dell'Accademia Museum in Venice.*	2015 Digital Heritage	IEEE	1	1		1			1			1	1											
Froschauer, J., Merkl, D., Arends, M., and Goldfarb, D.	2013	*Art history concepts at play with TheATRO.*	ACM J. Comput. Cult. Herit.	ACM		1		1						1			1		1	1						1
Hawke, S.	2015	*New memory spaces for cultural history*	2015 Digital Heritage (Vol. 1, pp. 417-418)	IEEE	1	1		1	1	1					1	1	1									
Hamari, J., Koivisto, J., and Sarsa, H.	2014	*Does gamification work? A literature review of empirical studies on gamification*	47th Hawaii International Conference on System Sciences	IEEE	1	1																				
Hernández Ibáñez, L. A., & Barneche Naya, V.	2012	*Joint spaces between schools and museums via virtual worlds: a case study*	Proceedings of the 2012 ACM workshop on User experience in e-learning and augmented technologies in education	ACM		1	1							1			1				1		1			
Hertzman, E., Anderson, D., & Rowley, S.	2008	*Edutainment heritage tourist attractions: a portrait of visitors' experiences at Storyon*	*Museum Management and Curatorship*	Taylor & Francis			1		1	1	1						1									
Johnson, L., Adams Becker, S., Estrada, V., and Freeman, A.	2015	*Games and Gamification*	NMC Horizon Report: 2015 Museum Edition	Google Scholar	1	1	1		1			1	1				1									
Kontogianni, G., & Georgopoulos	2015	*A Realistic Gamification Attempt for the Ancient Agora of Athens*	2015 Digital Heritage (Vol. 1, pp. 377-380)	IEEE	1	1		1	1	1		1	1				1									
Marache-Francisco, C. & Brangier, E.	2015	*The Gamification experience - UXD with a Gamification background*	Gamification: Concepts, Methodologies, Tools, and Applications	Google Scholar	1	1																				
Martens, A., and Müller, W.	2017	*Gamification*	*Handbook of Digital Games and Entertainment Technologies*	Springer	1	1																				
Matallaoui, A., Hanner, N., and Zarnekow, R.	2017	*Introduction to Gamification: Foundation and Underlying Theories.*	*In The Book "Gamification" by Springer International Publishing*	Springer	1	1																				
Metzger, S.A., & Paxton, R.J.	2016	*Gaming History: A Framework for What Video Games Teach About the Past*	*Theory & Research in Social Education*	Taylor & Francis			1		1	1				1	1		1									
Nicholson, S.	2012	*Strategies for meaningful gamification: Concepts behind transformative play and participatory museums*	Presented at Meaningful Play 2012. Lansing, Michigan	Scholar	1	1					1			1			1	1			1					
Prakash, E. C., & Rao, M.	2015	*Gamification in Informal Education Environments: A Case Study*	Technology Enhanced Learning and IT Management through Gamification (pp. 73-97). Springer International Publishing.	Springerlink	1	1	1	1						1	1		1				1					
Rubino, I., Barberis, C., Xhembulla, J., and Malnati, G.	2015	*Integrating a Location-Based Mobile Game in the Museum Visit: Evaluating Visitors' Behaviour and Learning*	*ACM Journal on Computing and Cultural Heritage*	ACM	1	1	1				1			1	1		1									
San Chee, Y.	2015	*Games-to-teach Or Games-to-learn: Unlocking the Power of Digital Games for Learning through Participation*		Springer	1	1			1					1												
Shih, J.L., Jheng, S.C., & Tseng, J.J.	2015	*A simulated learning environment of history games for enhancing players' cultural awareness*	Interactive Learning Environments	Taylor & Francis		1		1	1	1		1	1	1			1									
Uskov, A., & Sekar, B.	2015	*Chapter 2: Smart gamification and smart serious games*	In Fusion of Smart, Multimedia and Computer Gaming Technologies (pp. 7-36). Springer International Publishing.	Springerlink	1	1								1	1											
Results					9	19	17	10	9	14	6	7	3	3	16	12	3	18	5	3	4	1	1	1	1	1

publications. The 26 publications are structured according to alphabetic order. A 1 is placed in the publication row under subjects relevant to the research. At the bottom of the table, the total of publications mentioning the different subjects are counted; as an example, 17 publications write about Game-based-Learning. Lastly, the 8 green publications are the ones focusing on gamification in a museum context.

Research Areas within Gamification in Museums

Based on the above mentioned structured literature review (table 1), this next part focuses on identifying the main subject represented in the current research within gamification in the museum context. This part is divided into five headings; the first is *theoretical gamification*, where we start with general theoretical literature within gamification and then move on to specific theoretical literature within the area of concern. This leads to *motivation, add-on-games* and *game-based-learning* and, lastly, *situating "the gamifies museum"* that sum up the main themes and subjects represented in the current research within the area of concern. As mentioned in the previous part, the research of 8 main publications is focused on gamification in the museums context. Therefore, these 8 will be dominant in the following discussion but supported by the other 15 publications when relevant.

Theoretical Gamification // There has been a steady increase in academic research within gamification since 2010 (Hamari, Koivisto and Sarsa, 2014) when the term saw its widespread adoption (Deterding et al., 2011a). Within the last three years, four books on gamification have been published, based on the structured literature review. This might not be a complete list, but these are the books identified through the literature search. In 2014, Baek and Marsh published an anthology about the trends and applications of serious gaming and social media. Walz and Deterding (2015) set out to examine the key challenges of gamification and the ludification of culture in the anthology *The Gameful World.* San Chee took a closer look at gamification in a learning perspective in 2016 with *Games-to-teach or Games-to-learn: Unlocking the Power of Digital Game-based Learning Through Performance*. Lastly, Springer published the *Handbook of digital games and entertainment technologies* where Martens and Müller (2017) contributed with a chapter focusing on gamification.

When restricting the search to only entail academic peer-reviewed research about gamification in a museums context, the first relevant publications are dated 2012 and the number of publications increased through 2015. This supports NMC Horizon Report's (Johnson et al., 2015) notion to predict gamification as being the time-to-adopt trend in museums from 2016. At the same time, however, Baek and Marsh (2014), Walz and Deterding (2015), San Chee (2016) and Martens and Müller's (2017) publications on gamification do not include the perspective of gamification in the

museum context. Baek and Marsh (2014) mention museums in a discussion about using games as a way to let people visit museums that are out of their economical, graphical or physical reach. Walz and Deterding (2015) mention gamification in museum installations as an example of the rhetoric use of pleasure in designing user experiences. Martens and Müller (2017) refer to the New York Museum of Modern Art as an example of using gamification to gamify school kids' learning opportunities. And lastly, the publication by San Chee (2016) does not share any examples or use of gamification in the museum context.

The gamification-focused publications indicate a lack in the research about gamification in the museum contexts. In the literature search, a publication by Nicholson (2012) was found. Nicholson (2012) researches strategies and concepts for meaningful gamification behind transformative play and participatory museums. He describes museums and other leisure settings like libraries and zoos as having potential as Ludic Learning Spaces for meaningful gamification. This is not a method but rather a strategy for working with gamification in the museum context Nicholson (2012) focuses on *Meaningful Gamification* which is centred around adding an overlay of play elements to a real-life setting as explained in this quote:

> "The designers of a ludic learning space combine play opportunities along with limits to create a space where participants can choose to enter, leave themselves behind, and engage with play. If opportunities are created, participants can explore this space, discover what is meaningful, engage, reflect, and allow themselves to be transformed." (Nicholson, 2012 p.6)

Important to note here is that Nicholson (2012) approach to gamification is based on play and ludos rather than games, and he therefore argues for replacing some of the basic game structures like external rewards and badges with engaging play. Nicholson (2012) describes that the purpose of meaningful gamification is to create playful information-based spaces that allow visitors to play by exploring on their own terms and because of their internal motivation.

Motivation // Motivation is a key element in gamification as showed by the focus on motivation in one of the underlying definitions (Matallaoui, Hanner and Zarnekow, 2017). Motivation is based in psychology meaning to be moved to do something, being energized or activated to an end (Ryan, and Deci, 2000). Motivation is classically divided into intrinsic and extrinsic motivation (Ryan and Deci, 2000). In gamification, Nicholson (2012) describes this differentiation as Meaningful and BLAP gamification (BLAP being an abbreviation of Badges Levels and Leaderboards,

Achievements, and Points). Meaningful gamification is based on intrinsic motivation because it focuses on the user's internal motivation and opportunity to play by exploring on their own terms as described above. This stands in contrast to extrinsic motivation, which Nicholson (2012) describes as being connected to BLAP gamification. BLAP is described as the overlay of points, levels, achievements, and badges to real-life settings, focusing on goals, structure and external rewards to motivate the visitor. This type of gamification is based on the user's extrinsic motivation. This is both an interesting understanding of the division of both gamification and motivation. Nevertheless, this is also a very limited understanding of something as fluid as motivation. Extrinsic motivation can be present in play, as well as intrinsic motivation can be present in games depending of the context and the format of a game, play or the gamer or player. The research papers identified in this literature review varies in mentioning motivation. The studies by Rubini Barberis, Xhembulla and Malnati (2015) and Afand, Hindersah and Wuryandari's (2014) describe wanting to use gamification as a mean for user motivation, but do not distinguish between extrinsic or intrinsic. Whereas Prakash and Rao (2015), Fransca et al. (2015), Konogianni and Georgopoulos (2015) and Hernández Ibáñez and Barneche Naya (2012) do not deal with motivation in their use of gamification.

Add-on Games // The majority of publications found in this study writes about gamification in museums in connection with games added on to the existing museum experience, arguing to motivate users in informal environments by creating a game that is added onto the museum experience. Rubino, Barberis, Xhembulla and Malnati's (2015) study on location-based mobile game in the museum visit capitalize narrative and game mechanics as being the prime factors in fostering young visitors' motivation to explore a museum and facilitate their meaning-making process. Their game-based-learning approach to gamifying the museum is focused on creating a game to add to the museum experience with the aim of fostering motivation by creating tasks and rewards in the storyline of the game (Rubini et al., 2015). Afand, Hindersah and Wuryandari's (2014) study on the mobile alternate reality game Popo, uses motivation as a nudge to attract visitors to a museum. This is as Rubini et al. (2015) a game added on to an existing experience. Both the studies by Rubino et al. (2015) and Afand et al. (2014) revolve around the creation of mobile games with the purpose of gamifying the museum experience. Four additional studies, Prakash and Rao (2015), Fransca et al. (2015), Konogianni and Georgopoulos (2015) and Hernández Ibáñez and Barneche Naya (2012), represent add-on games for a museum context and identify their game concept as being gamification.

Game-Based-Learning // Konogianni and Georgopoulos (2015) created a serious game about the ancient Agora in Athens. Konogianni and Georgopoulos' (2015) research is based on an online desktop-based game on 3D models of monuments and a quiz. The purpose of the quiz is for the users to be able to gain simple knowledge about the cultural heritage of the monuments. Konogianni and Georgopoulos (2015) do not elaborate on what game elements they have used or why they argue that a quiz is a serious game or how this game will motivate their users. Their main subject in this publication is a serious game that can communicate knowledge making the purpose of the project game-based-learning. They make a worthy remark in the introduction describing serious games and gamification as being equivalent. This, I will get back to.

Furthermore, Fransca, Mazzeo, Pantile, Ventrella and Verreschi (2015) have created an Augmented Reality (AR) and game-based app for Gallerie dell'Accademia Museum in Venice, Italy, to enrich and create an immersive user experience. Gamification is a keyword in their publication, and they conclude that they have created the opportunity for learning through gaming by adding the AR and game-based app to the exhibition. Fransca et al. (2015) do not go into details about the game elements they have focused on in their app and discuss the motivational level of their game. What sets Fransca et al.'s (2015) study apart from the others mentioned in this paper is that their AR and game-based app is developed as part of a larger multimedia initiative (mostly screens and videos) in the museum.

Prakash and Rao (2015) have made a case study on gamification in informal education environments. In this study, they wanted to test the application of virtual reality, mixed reality, video games and their interactive capabilities to gamify the museum or cultural heritage experience. They have created and tested two different web-based video games that are not site-specific (Prakash and Rao, 2015). The publication focuses on describing the video games and the game mechanics and development, which comes down to narratives, learning opportunities and the virtual spaces. Nevertheless, they conclude that they, through the study, missed methodologies and tools for efficient production of gamification and serious games. Their study did not comment on user motivation or how games can be implemented in an exhibition, which makes this another example of an add-on game.

Hernández Ibáñez and Barneche Naya (2012) presents an evaluation of a game that joins the space between schools and museums through a virtual online quest. Hernández Ibáñez and Barneche Naya (2012) refer to gamification in analysing the learning aspect of their game to argue that the users of the game were having an enjoyable experience based on the motivation, means and mechanics of

gamification implemented in the game. They do not elaborate on this aspect but conclude that the playful approach of the game permits the users to acquire knowledge.

Prakash and Rao (2015), Fransca et al. (2015), Konogianni and Georgopoulos (2015) and Hernández Ibáñez and Barneche Naya's (2012) studies have a common factor: except from being examples of add-on games to a museum context, they focus on game-based learning which was also the most mentioned subject in table 1 with 17 out of 26 articles having mentioned this subject.

Situating the subjects of "The Gamified Museum"

Based on the presentation and discussion of the subjects from the literature review presented above, there are four main subjects in this study. One of them is *add-on games* which shows that, up until now, research within gamification in museums has been conducted by adding a game onto an existing exhibition through some kind of digital technology. This section of the paper will discuss how we can situate the subject of gamification in museums based on the research areas identified in the previous section.

The majority of publications in this study represent either a case or example of an add-on game. This means that none of these studies research implementing gamification into the museum exhibition design but rather create a game to add to an existing exhibition in an attempt to enhance the learning experience. This raises a question, because can we call this gamification? As previously stated, gamification is, in its simple form, the integration of gaming elements and mechanics into a non-game situation or context for motivational purpose. So adding a digital mobile game to an existing exhibition: is that gamification? Or is it rather a game that supports the learning potential in the exhibition design? This is a point that Deterding et al. (2011b) emphasize:

> "Another important point is the high level of subjectivity and contextuality in identifying "gamification". It is not possible to determine whether a given empirical system 'is' "a gamified application" or "a game" without taking recourse to either the designers' intentions or the user experiences and enactments."
> (Deterding et al., 2011b, p14)

Even though most of the research represented in this literature review cannot be directly identified as gamification that does not mean that it is not. Rather, since the researchers who designed the add-on concepts describes their research as gamification, it will be qualified as such. This might be a

nuance of gamification that needs to be further discussed, especially considering that games and gamification are trending in museums (Johnson, et al., 2015).

Furthermore, in most of the research relevant to this study, gamification has been mentioned alongside learning, education, training and as basis for game-based-learning. But does the purpose of gamification have to be learning, when applied in museums? Nicholson (2012) focuses on meaningful gamification along with ludic learning spaces but he also describes meaningful gamification as creating a space where participants can explore this space, engage with play, discover what is meaningful to them and reflect on their own experience to be transformed. This does not mean that meaningful gamification has to be a learning experience or a ludic-learning-space but rather a space to experience.

On the other hand, Martens and Müller (2017) distance gamification from learning and refer to the area where gamification and edutainment cross paths. They argue that gamification is not instructional at its core but it should be fun whereas if the purpose of applying game elements becomes educational, we would be talking about serious games (Martens and Müller, 2017). Martens and Müller (2017) distinction between the different traditions can be seen in figure1:

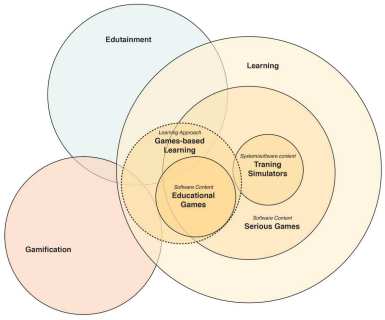

Figure 1: Relation between game-based-learning, gamification and edutainment (after Martens and Müller, 2017).

What is interesting about this illustration compared to this study is the relationship between game-based-learning and gamification. The vast majority of research presented in this paper writes about game-based-learning, and game-based-learning in connection to gamification. This means that a great deal of the research within gamification in the museum context is placed in the area overlapping gamification and game-based-learning. Whereas only a few studies write about serious

games and gamification as being one and the same, which is improper if follow Martens and Müller's (2017) argumentation, since serious games and gamification have no shared area between them (figure 1).

Another main subject that can distinguish the different design traditions from each other is *motivation*. Motivation was the most mentioned subject in the literature review. Motivation is often mentioned in connection to the user experience or user interaction. A few of the publications like Afand et al. (2014) also write about the distinction between intrinsic and extrinsic motivation and how the users can go from extrinsic to intrinsic through their game. Most significant was Nicholson (2012) who embraces the main area of concern of this study with his publication on strategies and concepts to create exhibition designs in a participatory museum based on meaningful gamification. Like mentioned in the section *motivation*, Nicholson (2012) sets intrinsic motivation as the main user motivation in meaningful gamification.

The figure and the relation between the design traditions can be discussed depending on the project or research at hand, maybe a concept will be able to create new connections. Nevertheless, the figure visualize this rather complex area as well as the relation between them. Based on the studies presented in this literature review, an illustration of this kind is needed. More of the studies show signs of confusion about gamification and the relation of the term to other areas such as serious games, games and game-based-learning. As well as the relationship or differences between games and play/ludos.

Further Studies in The Gamified Museum

In this section I will suggest and discuss potentials for further research and implementation of gamification in museum. This study has identified four main subjects within the research of gamification in the museum context: *add-on games, game-based-learning, motivation and lack of methods and theories.* With games and gamification trending in museums (Johnson et al., 2015), these main subjects represent at least five areas of interest for further research to understand the effects and abilities of gamification (Martens and Müller, 2017) in the museum context.

Critical discussion // First of all it would be interesting to conduct a critical analysis and discussion on whether a game that has been added onto an existing exhibition in an attempt to enhance the learning experience can be called gamification, as had been suggested in most of the research presented under the subject *add-on games*. As mentioned earlier, the majority of studies in this study presents add-on games as the means to gamifying the museum experience (*Add-on Games*).

The distinction between games and gamification seems to be fluent in the different studies, and a critical discussion on this distinction between the two is important for designer or museum professional who wants to or are trying to implement gamification in their museum designs. Even though Deterding et al. (2011b) states that it is impossible to determine whether a system has been gamified without taking recourse to the designers' intentions, it is important to understand the difference between using gamification in exhibition design or create a game experience, whether it is an add-on game or a implemented part of the exhibition.

Literature review on Games in Museums // In continuation of the discussion about add-on games, a literature review on games in museums could potentially be valuable. This literature review "The Gamified Museum" has not searched for games in museums but rather gamification in the museum. Based on the representation of games in the literature review and the NMC report (Johnson et al., 2015), a tendency to introduce games to the museum context exists. Therefore, it is to be expected that more publications available for analysis can be found. So a literature review on and discussion about games in a museum context and the effect of those games will also be a relevant contribution to gamification as a research area.

Gamification = game-based-learning? // From the identification of research areas within gamification in museums a vast majority of studies defined game-based-learning as gamification in a museums context. However, when reviewing the illustration by Martens and Müller (2017)(figure 1), only a small area of gamification overlap with game-based-learning. This contradiction indicates that there is potential for a more elaborate discussion on whether gamification is equivalent to game-based-learning. It is interesting whether or not games can be used as a mean to enhance leaning potential, but the notion that gamification and game-based-learning are equivalent to each other might be a misconception. Maybe what we can say is that game-based-learning is a way of gamifying the learning experience, but does a gamified experience has to be a learning experience?

Effect of gamification in museums // As pointed out in the introduction, Martens and Müller (2017) point to a lack of validation of the effect and ability of gamification to enhance motivation and learning. Since a majority of the studies in this literature review writes about motivation and learning in connection to gamification or games, there is a need to establish a study or literature review researching the effects of gamification and games in non-game contexts. The studies referred to in this paper all focus on how to create a gamified experience with a specific goal, such as learning or the like, but none of them focuses on the effect of using games or gamification in

comparison to regular methods of communicating, learning or experiencing. It would therefore be interesting to collect or research the potential effect of using gamification or games.

Framework // Lastly, the literature review made it clear that there is a lack of methods, frameworks or theories within gamification and the museum context. With only one publication focusing on strategies to create meaningful gamification in participatory museums, Nicholson (2012) presents the initial ideas for a framework. Apart from Nicholson (2012), this literature review has identified and been referring to general theories on gamification presented by Martens and Müller (2017), Baek and Marsh (2014), Walz and Deterding (2015), Deterding et al. (2011a; 2011b) and San Chee (2016). Therefore, it would be interesting to elaborate on Nicholson's (2012) publication on meaningful gamification in an attempt to define a framework of gamification in a museum context or discuss whether or not there are any difference between general gamification theory and applying gamification in museums.

Conclusion

This study has shown that gamification and games are already being used in museum contexts to create more interactive and engaging experiences, and thereby are part of shaping the museum experiences of the future. But there are still some challenges in understanding the possibilities and use of gamification and games in museum experiences as well as the effect of applying these approaches. As well as distinguishing the differences between concepts such as gamification, games and game-based learning. But what have we learnt from this study? There is an increase in studies within gamification in the museum context from 2015, which reflects the prediction of NMC (Johnson, 2015) of games and gamification trending in museums. Based on the research presented in this study, we can point to three main trends in research of gamification in museums context. *Game-based-learning*, *add-on games* and *motivation*. Looking at the examples of research in gamification in museums contexts, it becomes clear that up until now gamification has been researched by adding a game onto an existing exhibition through some kind of digital technology. There are no studies that research the implementation of gamification into an exhibition design and thereby create a holistic exhibition rather than an add-on game to an existing exhibition. This does not mean that no museums have actually gamified their exhibition design, but rather that research has not been done on the effect of this. This tendency raises the question of whether or not games can contribute something that gamification cannot. With gamification being a rather new design tradition in connection with museums, it can be argued that the easiest way to research how game-elements could be applied to a museum context is by adding a game to an existing exhibition rather than re-designing an exhibition based on gamification.

Moreover, gamification research in general points to a lack in evidence of the effect and ability of gamification to enhance learning and motivation, which needs to be further researched. At the same time, however, the relevant studies to this paper show a tendency to view gamification as being equal to game-based-learning. This might not be an inaccurate assumption in some cases but if we focus on the definition of the two traditions they are different approaches. This indicates a need for further discussion or research on this matter to understand the differences between the traditions and the purpose of either one. At the same time, it could also indicate a need for a framework for working with gamification in museums (or in general) that differentiates different design traditions and their purposes. In the last couple of years, quite a selection of books on gamification have been published. What is interesting about them in regards to this paper is the lack of focus on the museum context, which also refers to the earlier mentioned lack of methods or frameworks for gamifying a museum. It can, therefore, be argued that the gamified museum is still at its beginning stages, and many application possibilities and studies can be further explored in the future.

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3.4. [P4] DESIGNING FOR EMERGENT INTERACTIONS

Madsen, K. M., & Vistisen, P. (2019). Designing for emergent interactions: Strategies for encouraging emergent user behaviour & serendipitous research findings. *The Design Journal, 22*(1), 1807–1820. Taylor & Francis.

The fourth paper is, as mentioned, inspired by [P3] and the hypothesis that principles within gamification or game design could be a driver for explorative user interactions. This permitted my research into *emergent narratives*, which has been a topic within game design for 20 years. This theory made it possible to derive criteria for emergent interaction to add to the research project's design process, thus adding principles of emergence to the experience design framework. Emergent interaction has become a way in which to design for explorative user interaction, since it focuses on designing for emergent narratives, which is in turn led by users' active exploration of a context or story world. These criteria were applied to the exhibition design developed throughout this research project [Ex_E]. These criteria were developed into four strategies for understanding and designing for emergent narratives. This paper was written based on experiments [Ex_A], [Ex_D] and [Ex_E]. One of these strategies also framed [P5]. Following up on the research design, the table below summarises which research question and experiments are connected to this paper.

[SQ1]	What theoretical principles and criteria can be identified for IT-based experience design and exploration?
[SQ2]	How can experience design principles and criteria for exploration be implemented into an exhibition design?
[Ex_A]	Reviewing, Defining and Clarifying Problem Area
[Ex_D]	Mapping Communication Approaches
[Ex_E]	Exhibition Design: 'The Amazing Eel'
Publication Ranking	The Design Journal: Level 2

Table 11: Overview of the sub-questions and experiments connected to [P4].

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Designing for emergent interactions: Strategies for encouraging emergent user behaviour & serendipitous research findings

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Abstract: In this paper, we discuss emergent interactions as a design strategy in the context of cultural museum exhibitions, and how we can use these strategies to be more open to serendipitous findings in design research. We propose that emergent narratives can be transferred to the design of interactive exhibitions, and thereby removing the constraints and open use situations for more personalized, and potentially structure-breaking user experiences. Whereas much research in accidental discoveries in design focus on discovery in the design process, we propose the same accidental discoveries might be transferred as design strategies aimed at the end-users themselves making emergent interactions that can inspire serendipitous discoveries in research and design. As such, we ask the research question if we can leverage serendipitous findings from the design process to create the potential for emergent interactions for the user?

Keywords: emergent interactions, emergent narratives, design strategies, research through design, cultural exhibitions

1. Introduction

In 2017 Nintendo released The Legend of Zelda: Breath of the Wild (BotW) – 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: Stills 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 the user experience with 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). Furthermore, a tendency in this wave of digital game design strategies is for the designers themselves to change their mindsets towards how to approach unexpected serendipitous findings from the design process. 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. Now, this level of experimentation, pushing the boundaries is not only allowed, but actively encouraged, and often being later transformed by the designers from a bug into a feature of the system (Brown, 2016). This tendency in game design can be seen as a way of utilizing emergent behaviours actively; i.e. treating them as happy accidents in the design process. Here we understand emergence as novel and unexpected properties discovered in a system as whole, without them being deducible from the individually designed components of the system (Goldstein 1999). It is in a sense, a design strategy aiming to allow the whole to become greater than the sum of the design's individual parts.

This observed tendency aligns with the rise of personalized technology over the last two decades and new demands raised by users wanting to customize and personalize their cultural experiences. This leads us to ask what we can learn from the utilization of emergent behaviours arising in games? Can we apply this notion of designing not only for, but also through unexpected user behaviour and use the game fields' open story worlds and/or emergent gameplay in other physical contexts to give users a chance to break structure and creatively play with their own narratives? And how does that affect the potential for serendipitous findings through, and with design research and user studies?

In this paper, we approach these questions from the context of cultural exhibition design, such as museums, zoos, and galleries. 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 personalizing meaningful experiences (Drotner et al., 2011; Skot-Hansen, 2008). This 'flux' in the field makes it a relevant context for discussing how to both design for, and design through serendipitous emergent user behaviour, and whether emergent interaction design is a viable design strategy within design research.

2. From emergent narratives to interactions

In 1999, Goldstein described emergence as a construct, building on theorists such as Bedau (1997), writing *"[…] arising of novel and coherent structures, patterns and properties during the process of self-organization in complex systems."* (Goldstein, 1999; p49). Aylet (1999) further described emergent narratives as structures constituted by, or generated from underlying processes of a user experience. In Aylett's research, she challenges different narrative approaches to understand how far a pre-determined nature of narratives can be relaxed by approaching the behaviour of emergent narratives as bottom up experiences that happen through the interactions between essential but simple components in virtual environments (Aylett, 1999).

Jenkins (2004) described emergent narratives in connection with understanding game design as a narrative architecture. He argues that emergent narratives are not pre-structured, but taking shape through game play by having game spaces that are designed to be rich with narrative potential. Juul (2005) describes emergent narratives along the lines of Jenkins, but in a game design setting. Juul simplifies the understanding of emergent narratives by describing the term as being equal to a player's experience of a game, or rather the stories that a player has created while playing a game. Dorman (2008) further explores the design consequences in addressing the complexity of designing for behaviour that *"[…]is notoriously difficult to predict and can uncomfortably feel like magic"* (Dormans, 2008; p1).

Swartjes (2010) also notes this complexity of emergent interactive stories where emergence can be seen both as *"[...] the paradox between free-form interactivity from a first-person perspective and narrative structure, and as a design approach."* (2010; p69). Swartjes states that a narrative is emergent if there is no pre-determined plot, and when the narrative is the result of how the user accumulates past actions and events as coherent and meaningful. Emergent narratives might exist alongside a traditional plot structure, if a meaningful experience is possible outside the plot. Walsh (2011) frames this accumulative structure of emergence as a more general characteristic of interactive media – not just a genre of game design. Walsh's focus is not just on emergent narrative, but also its relation to emergent behaviour, arguing that story arises from behaviour, and behaviour is enabled by forming narrative meaning.

2.1 How to understand unexpected interactions as they emerge

Emergent interactions happen when a user takes unexpected or unintended action in a context using the mechanics and agency given to them, building upon a pre-defined structure. Thus, emergent interactions are users' creative interpretation and negotiated meaning of an interactive context, whether it is going with or against the intended use. We can view this through the optic of Hall's (1980) encoding and decoding positions, for how a user negotiates the decoded meaning behind designed structures. Hall (1980) described three hypothetical positions for decoding a respective encoding; *preferred, negotiated* and *oppositional readings*. *Preferred reading* being full and straight decoding of a message, *"the perfectly transparent communication"* (Hall, 1980; p125). *Negotiated reading* is when a user understands how a message should be decoded, but deliberately negotiates the meaning-making process, which Hall describes as "a mixture of adaptive and oppositional elements" (1980; p127). Lastly *oppositional readings* being the diametrical opposite decode of *preferred readings*, where users know and understand the preferred reading of a contexts but choose to *"decode the message in a globally contrary way"* (Hall, 1980; p127).

Hall's position enables us to categorise emergent interactions as what happens when users either intentionally or unintentionally negotiate or (intentionally) oppose their reading of a context. This means that an interaction becomes more than mere functionality for one specific decoding, and more a potential variable for the design to carefully consider and observe how it might reveal emergent behaviours. As such, the emergent interaction is not a function of the system itself, but a combination of negotiated or opposed interactions with the system in highly contextually dependent situations. If design researchers are willing to loosen the structure of designs and open the design process so as not to view users' creative interpretation and negotiation as 'bugs' to fix, but rather address emergent behaviour as a possible feature of a design. It is from this position we create a space for design researchers to observe unintended and emergent behaviour, interactions and uses that can inspire serendipitous findings for further design iterations.

3. Emergent Interactions: As Principles

In this section, we approach the idea of loosening the structure to inspire serendipitous findings, by looking at how we can design for emergent interactions. Based on Aylett and Swartjes definitions of emergent narratives, we point to four main characteristics of designing for emergent interaction. These four characteristics are; *User-mindset, Agency, Storification* and *Narrative Closure.*

Table 1. Principles of emergent interactions

Principles	Description
User-mindset	For an emergent gameplay to happen and an *emergent narrative to be created, users must be willing to explore the story world that they are* presented with. How can we through our design (process) affect users' mind-set to be curious and explore the given context?
Agency	Agency refers to users' ability to act and interact in an environment. To evoke users' agency, they have to be able to move freely in a story world and have a social presence in the environment.
Storification	The subjective assimilation of events unfolded dependent on users' actions within an environment. For users to create their own storyline or narrative they must be active explorers and be given the agency to interact and act. Thus shaping their own path and thereby narrating their own subjective meaning.
Narrative Closure	For a narrative to be desirable it must have an ending. To achieve narrative closure in an emergent narrative, it is necessary to have a debrief at the end of the experience or to create the opportunity for a discussion.

It is evident that the four principles focus on users' ability to freely engage in an experience and support them in their creation of personalized narratives, despite the necessary existence of an underlying structure. Even though emergent narratives are defined for virtual environments, the opportunity for deploying these principles into a physical context does, in theory, seem possible. None of these four principles necessitate to be strictly constrained to virtual spaces or a game context. Emergent narratives demand a free-form interactivity in a non-linear and high-agency environment (Swartjes, 2010) which in principle can be a challenge when considered in a physical context such as exhibitions. They are, despite their increasing implementation of interactive experiences, still institutions where the main purpose is to enlighten citizens about nature and

cultural heritage. This means that most exhibitions focus on creating linear storylines or near-curriculum structures to ensure the correct communication of history, even though exhibitions are referred to as free-choice learning spaces (Falk & Dierking, 2013), thus creating a paradox where the structure creates limited options for users' free-choice experiences.

Considering this, the proposal for applying emergent interaction in physical exhibition contexts is a proposal to approach the design research process of such contexts through the lens of using emergent behaviour as active design inspiration; not just to allow users to experiment, but to actively encourage them to make *negotiated* and *oppositional* readings and form their own meaningful experiences.

4. Strategies of Emergent Interactions

Our point of departure is to examine whether the design of exhibitions can utilize the potential of users' emergent behaviours as seen in digital open world games. We argue that this is not just a question of providing more choices, but rather to let the experience be causally dependent on an established structure where the emergent narratives evolve alongside, or even in spite of the existence of said structure. We argue that we design a space for design research and user studies that allows for serendipitous findings by removing constraints and structure through the idea of open story worlds and emergent interactions that allow users to explore storylines and exhibition installations as they see fit, rather than how the museum designers or researchers have pre-structured. From studying a series of exemplary cases in which the authors have experimented with emerging interactions in museums, we suggest four strategies for designing both for- and through emergent interactions; *by design, by re-design, by creative play* and *by hacking*.

Table 2. Table of the four strategies of Emergent Interactions divided under Design Driven and User Driven

Strategy	**Description**
Design Driven	*By design* and by *re-design* we define as being *design-driven* strategies of emergent interactions, focused on creating potential for emergent interactions based on active intervention from the designers.
by Design	A strategy for designing museum exhibitions that encourage emergent behaviour by applying the four principles of emergent interactions to the design process.
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.*
User Driven	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.*
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 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 next section provides empirical exemplary cases for each strategy, mainly derived from research-through- and research-on-design practices (Koskinen et al., 2011) in which the authors have been involved.

4.1: by Design

We define 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. This is a paradox, having already defined emerging interactions as *negotiated* and *opposing* readings, and thus not something we can plan for as encoded prior to users' exploration. Therefore, with this strategy the four principles of emergent interactions become essential - both as general design principles and as design research principles to translate serendipitous findings from the research process into open-ended features in the final design outcome.

We have applied *by design* when designing a temporary exhibition at a Danish maritime museum 'Limfjordsmuseet' (see figure 2), using the four principles as part of the design guideline. The purpose of applying *by design* to this exhibition, was to challenge the museum users to have a more exploratory behaviour, and challenge the cultural convention of what it means to visit an exhibition. The four principles were embedded in the design process of the exhibition so as to design a more open story world around the history of the significance of eels for people living by and off the fjord through time, and thus create a space that inspired creative play and exploration of the exhibition's potentials and boundaries.

User-mindset became the most challenging principle. What we wanted users to do in the exhibition was far from their natural behaviour in a museum space. In an attempt to affect *user-mindset* we told users how we wanted them to act and interact; be curious, explore, touch and interact. We designed for *agency* by removing all glass displays and placing all artefacts openly in the exhibition. Some artefacts were placed in ways that forced users to interact with them. Hidden around or on these artefacts were small notes with *"did you know…"* facts, bottles with messages, sensor activated audio stories and personal letters from fishermen to their loved ones. This, together with the traditional explanatory posters gave the users option of choice of which stories and narratives they wanted to read and follow, creating their own *storification*. And lastly, we applied the principle of *narrative closure* by providing a dialogue question at the end of the exhibition, where users could reflect on what they had learned.

Figure 2: Stills from the temporary exhibition 'The amazing eel' at 'Limfjordsmuseet'.

As such, we designed an exhibition that loosened the structure of the communication design with multiple story layers. The exhibition provided users with a higher degree of *agency* and potential for interaction, by allowing them to physically interact with all artefacts. This provided the potential for emergent behaviour and exploration, but *user-mindset* was a challenge. Being curious and wanting to explore what we find interesting is a natural state for human beings but, our cultural conventions when it comes to our behaviour in museum spaces, created a challenge in getting people to let go and freely interact and challenge the museum exhibition. Wanting emergence as a preferred behaviour was thus inhibited by conventions of much more strict structure than the experimental and explorative space offered. This was responded to by having the custodian introduce and explain the "rules" of the exhibition to users.

Again, this shows the paradox of actively planning to design for emergent behaviour by ending up needing to design a service introduction (a structure) to enable exploration of independent behaviours through exploring many different and unplanned interactions. Thus, an important lesson learned is, that the *by design* strategy will almost certainly require the design researcher to continuously adapt and adjust the structures iteratively, in order to accommodate users forming emerging behaviours *despite their culturally* dependent expectations to the structure of a given design space. This is what we will define as *re-design* strategy for emergent interactions.

4.2: by Re-design

We define *by re-design* as potential adjustment of an existing design, based on observed emerging behaviour amongst users, 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*. Which means that a redesign is inspired by users' *negotiated* or *oppositional readings* (Hall, 1980) of an existing context.

In our experiments we worked with the aqua zoo 'North Sea Oceanarium' on a mobile augmented reality (AR) application design for smartphones (see Vistisen, Østergaard & Krishnasamy, 2017). The app was designed to be used throughout the entire exhibition, encouraging users to find seven

locations to film short video clips of their families with live added AR animations of various aquatic elements (see figure 3). After filming in all locations, the app creates a small 1-minute movie with special effects of the visit. As such, the preferred reading of the design was to give a certain degree of free *agency* to users (i.e. the order of the locations was not strict) and provide a story-driven structure with a clear *narrative closure* and ending with the final AR movie.

However, upon the first prototype implementations, and well into the actual implementation, the design team discovered that many users seemed to follow several different diverging paths for creating the seven film clips. While some users followed the structure (find location, film, find new location etc.), just as many users chose to play with effects at various other locations throughout the aqua zoo. Here, users sought to explore how they could manipulate the AR effects in new ways and, to our surprise, how to actively incorporate this in reflecting upon the real-life behaviour of the animated flora and fauna.

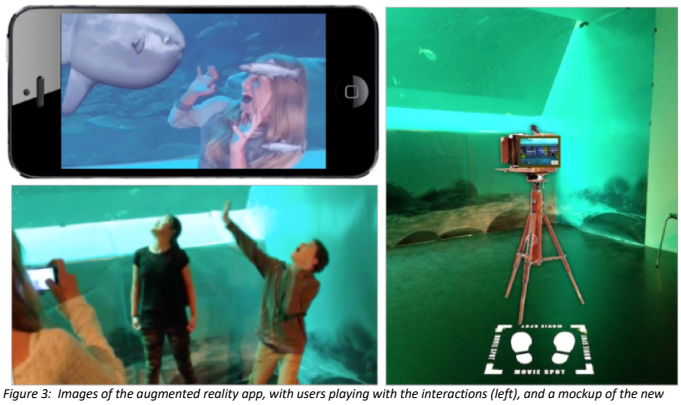

Figure 3: Images of the augmented reality app, with users playing with the interactions (left), and a mockup of the new stationary app re-design (right).

As such, we observed how *user-mindset* was much more curiosity driven than anticipated, and driven towards exploring how far they could push the constraints; thus, showing a much higher degree of *agency* than anticipated. Most fundamentally though, the strict structure of the seven locations, and their pre-defined story and *narrative closure* was clearly being negotiated into individual, but just as meaningful, emerging interactions with app and the zoo context.

Initially a *re-design* iteration was made, attempting to guide the user into the structured *mindset* of following the seven locations around. This was done by sign posts, advertising, zoo personnel interactions, and social media posts. While this attempt to enforce the strict structure had some impact on users' behaviour, it did not supress the emerging uses of the app. Rather, it made more guests aware of the app, and thus sparked an even larger wave of variations in use. This finally led to the most recent re-design, in which the app has been changed from being focused on users' own smartphones, to be a stationary large screen version, mounted as a 'film playground' in the zoo. Here, *agency* is adjusted to be more constrained (stationary vs. mobile), but at the same time increased in terms of interplay between user and app, since the 'goal' of the app is now much less structured, and open to individual interpretations. The *storification*, of this *re-design*, is not

emphasised towards completing all seven film clips, but rather for families to explore what creative ways they can interpret, adjust, and manipulate the mechanics so as to create meaningful experiences. These accumulated *negotiated* readings of the stationary app experience encourage emerging interactions observed through the design research process, and re-assigned these unexpected behaviours into use for the re-design.

4.3: by Creative Play

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* (Hall, 1980) their reading and playing with the *agency* given to them. This strategy is *user driven* and, therefore, an emergent behaviour we can observe or design for through the *design driven* strategies.

An example of creative play can be observed at LEGOs new museum LEGO HOUSE, where they have built a waterfall entirely of LEGO components (see figure 4). Around the waterfall are large pits of LEGO bricks for the users to build, play with and exhibit on plateaus placed around the sculptures. The waterfall is glued together, which indicates that LEGO does not want people to reshape the waterfall. But with LEGO being a building solution, users have started to exhibit their small creations on the waterfall instead of on the plateaus. Thus, if it is not behind glass users might read it as not being off-limits. Consequently, users play with everything they have at hand and become part of evolving the waterfall through creative play. This might or might not have been intended, but as users might perceive their actions as a negotiated reading, with the waterfall being glued together, their actions become *creative play*.

Figure 4: The image on the left shows LEGO HOUSE's waterfall installation. The two images on the right show some of the small additions added to the waterfall by users through their creative play.

Users visiting LEGO HOUSE are in a *mindset* of playing and building when visiting the home of the LEGO brick. They are given *agency* with LEGO bricks being everywhere for users to play with, build and

display. Thus, users create their own LEGO creations and they create small narratives for each new creation to shape their *storification*. LEGO HOUSE provides a *narrative closure* by providing photo-stands on all levels, where users can take photos of their creations in a scenario connected to the level they are on. The photos are uploaded to a personal account for users to download when they finish their visit. This emergent behaviour of creative play might promote the design team to redesign their waterfall and encourage users negotiated reading of the waterfall, or they might use it to stop the 'bug'. Either way, being aware of this behaviour in the design process might lead the design researcher to unexpected findings.

4.4: by Hacking

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.

One example of such oppositional readings can be found in another design case from the aqua zoo 'North Sea Oceanarium' – a didactic learning design around the oxygen capacity for different animals. Here, users are asked to hold their breath while pushing a big button that counts time. Meanwhile an oxygen bar shows how a user compares with different animals (e.g. seals, dolphins etc.), and provides the user with an AR effect projected on their face each time they surpass one of the given animals (see figure 5).

Figure 5: The 'Hold your breath like aquatic animals' installation, where users receive augmented reality effects as progress rewards, with users to the left just pretending to hold his breath for 55 seconds to see the final effects.

During user testing many users adhered to this rather strict structure and interaction, competing to see who could compare with the best performing animals. However, many users were also greatly

challenged when having to compete with e.g. a seal's ability to hold its breath underwater, and it was practically impossible to hold the breath to reach the level of the dolphins and whales - even though the scale was adjusted from 1:1. Instead of retrying to beat their time, we observed an emerging behaviour where users immediately understood the structure of the product (hold your breath, and hold the button down to play), but also immediately opposed the structure. Here, users 'acted' as if they held their breath by breathing through their noses, while still blowing up their chins to act as if they followed the structure while still holding down the button, and achieved the different AR rewards. Thus, users opposed the structure, and formulated their own goal (to see all the information the product could offer) and interacted accordingly. Interestingly, the aspect of 'acting' as if they followed the structured also reveals how the hacking strategy often emerges from a previous creative play strategy. This situation might earlier have promoted the design team to do an iteration of the product, changing the product so most users would be able to hold their breath for the entire session. But due to a continuously observed emerging behaviour, this *re-design* was abandoned to let users benefit from their 'hack', and feel more creative and empowered while still achieving the same *narrative closure* as the *preferred* reading.

Oppositional interactions can emerge not only from the end-users, but also from an organisation 'hacking' a product to e.g. better serve user needs. This type of emergent interaction happened during the first months of testing a new 100m2 interactive screen installation at the North Sea Oceanarium. The screen was made to enable visitors to experience whales in full size and use mounted tablets to play through the food chain in the ocean. However, the staff realised that at some points during the day, visitors were also inclined towards not playing, and instead requested deeper narratives to form a clearer *storification*. By an unexpected tweaking of the game system, staff and designers saw they could load other content on top of the large 3D game environment; i.e. PowerPoint slides, video footage, and interactive infographics (see figure 6).

Figure 6: Pictures of the employees hacking the 100 m2 LED screen software to use for presentations and infographics instead of didactic games as seen on upper left image.

This emergent interaction happened by exploring the *agency* provided by the back-end system; not as a direct instruction or through a clear structure, but rather as an oppositional reading from staff with a *mindset* aimed at exploring the systems mechanic to continuously adapt to user behaviour. The common factor, for both the end-user and staff variants of by hacking is the clear *user-mindset* of acknowledging the preferred structure, but then actively opposing it through the *agency* of exploring what other possible interactions and narratives might be possible with the emergence of unexpected interactions.

5. Discussion

As exemplified through the strategies, designing for emergent interactions, be it by design or by redesign, strives to stimulate the *user-mindset* to creative play or *hacking* by giving users *agency* in their experiences. The strategies are inevitably interconnected but provide us with an opportunity to perceive emergent behaviour and interaction from both a design and user perspective. Thus, using the four principles of emergent interactions across the strategies provides us with a design research framework for design or analytical acknowledgement, and iterations based on unexpected emergent behaviours. Consequently, arguing that both strategies and principles can be effective tools in research-through-design, where the optic of emergent interactions supports processes more open to serendipitous findings, where the unexpected is not just considered as 'bugs' or anomalies to be corrected, but possible features to appreciate, and maybe integrate to broaden exploratory *user-mindsets*, given users' *agency* to form their own *storifications* and finally their own *narrative closure*. While Hall's (1980) encoding/decoding positions are not meant for the context of design, but for communication, we argue that the three positions provide a valuable language for design researchers to articulate what happens when users negotiate and oppose the structures presented in a design with unexpected results. This articulation is the first step towards transferring the emergent narrative design from the game industry to physical contexts such as exhibitions, giving designers an optic through which to understand why experimentation, exploration, and independent user interpretations should not just be allowed, but maybe even encouraged.

While our presented cases have shown examples where unexpected behaviour became either encouraged or directed into a re-design, we do not suggest that all 'bugs' are equal and can be serendipitous findings that can improve a design. Traditional iterations based on e.g. usability are still, and should be important considerations in the design process. However, we do argue for emergence to keep an open mind to the possibilities of loosening structure and allowing users the agency to challenge the designs and ideas through creative play and hacking to provide us with new insights. We are not, in this paper, arguing that emergent interactions provide more or less enjoyable experiences for users, but rather view unintended user behaviours as serendipitous opportunities for design rather than bugs that needs to be fixed.

Another point of discussion is the context in which we have applied the strategies. A museum space is a context in which research is done within different traditions and a context open for experimentation in the light of challenges from the experience economy and users' demands for experiences (Skot-Hansen, 2008). This makes museums open to challenging their exhibition practices. Therefore, they provide an interesting context in which to employ research through and with design, and design process focused on emergent interactions. This does not seclude the strategies and principles to a physical space of exhibitions, as they can potentially also be applied to other physical contexts.

6. Conclusion

Inspired by game design theory, we have derived four essential characteristics for emergent interactions from literature on emergent narratives and emergent gameplay, which we argue can be applied to a physical context such as a museum. With these principles we have a guideline for designing both for and with emergent interaction, and for identifying emergent user behaviour throughout a design process. Taking the principles from theory into studying a series of exemplary cases in which the authors have experimented with creating emerging interactions, four strategies have derived; *by design, by re-design, by creative play* and *by hacking.*

These strategies provide an insight into how we can both design for more emergent interaction in physical contexts (*by design* and *by redesign*) and be aware of emergent behaviour throughout our design processes (*by creative play* and *by hacking*). We argue that if we as design researchers are willing to loosen the structure of our designs and design process to give the user more agency, we create a space for users to explore and challenge boundaries of a context's mechanics. Thus, loosening structure provides design researchers with a space for observing unintentional and serendipitous behaviour, interactions and uses that can inspire further research and redesigns. And if we acknowledge these findings from the design process as potential enablers of emergent behaviour for the end-user, and not simply as 'bugs' and 'anomalies' to be avoided or 'patched', there is a potential for accidentally discover new insights into a design, uses or behavioural enablers. To this end, serendipity in design research might be supported through encouraging emergent interactions to show how the designed whole can become larger than the sum of its parts.

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Kristina Maria Madsen is a Ph.d. Fellow at Aalborg University with a research interest in the intersection between experience design and exhibition design for cultural heritage. Kristina's research focuses on exploring experience design as a design approach for designing exhibitions that enhances learning potential.

Peter Vistisen, Ph.d., is assistant professor at Aalborg University, with a research interest in the intersection between technology and the liberal arts. Peter's research focuses on developing design approaches for early exploration of the viability, feasibility and desirability of digital technologies.

3.5. [P5] HOW TO DESIGN FOR EXPLORATION

Madsen, K. M., Skov, M., & Vistisen, P. (2019). How to design for exploration through emergent narratives - Steps in a collaborative design process for cultural heritage exhibitions. *The Design Journal*. Taylor & Francis. (under review)

The fifth paper expands on the *by design* strategy from [P4] to more thoroughly unpack further perspectives on emergent narratives as a driver for exploration in an exhibition design and how these criteria are incorporated into the design process and take shape in an exhibition at the Limfjord Museum. Furthermore, methodologically, this paper presents, in brief, how the collaborative design process was facilitated and how it emphasised the importance of finding a balance between content and form when collaboratively designing for exploration. It becomes a question of creating a narrative structure that allows for choices but has a core narrative. Thus, this paper was the result of continual collaboration with the Limfjord Museum throughout the research project, collaboration which culminated in a best practice example or prototype for how we can design for exploration through criteria for emergent narratives. This paper contributes to two of the sub-questions and builds on experiments [Ex_B], [Ex_C], [Ex_D] and [Ex_E]. Following up on the research design, the table below summarises which research question and experiments are connected to this paper.

[SQ1]	What theoretical principles and criteria can be identified for IT-based experience design and exploration?
[SQ2]	How can experience design principles and criteria for exploration be implemented in an exhibition design?
[Ex_B]	Collaborative design process
[Ex_C]	Design Insights
[Ex_D]	Mapping Communication Approaches
[Ex_E]	Exhibition Design: 'The Amazing Eel'
Publication Ranking	The Design Journal: Level 2

Table 12: Overview of the sub-questions and experiments connected to [P5].

** When this dissertation was submitted, [P5] was still under review, and therefore not published digitally with dissertation, to avoid publication issues. On the next page is a preview of the first page of [P5]. The copyright of this paper is the property of the author, when [P5] is published. For more information, contact author.*

How to Design for Exploration through Emergent Narratives

Steps in a Collaborative Design Process for Cultural Heritage Exhibitions

Kristina Maria Madsen, Mette Skov, and Peter Vistisen
Aalborg University - Department of Communication & Psychology

Abstract: This paper presents emergent narratives as a model for designing cultural heritage exhibitions and discusses how criteria of emergent narratives can support exploratory user behaviour. We propose that emergent narratives can be transferred to the design of interactive exhibitions, thereby removing constraints and allow for more personalized and potentially structure-breaking user experiences. Whereas exhibition design often either focuses on form or content, we propose that by designing for exploration through criteria of emergent narratives, a balance can be found between content and form that encourages explorative behaviour in the exhibition. This paper answers the research question of how theory of emergent narratives can be used to design for exploration.

Keywords: experience design, exhibition design, emergent narratives, cultural heritage, exploration, collaboration

Introduction

In game design, open storyworlds leave the creation of the narrative up to the gradual emergence of how the user plays the game—as opposed to the user just progressing through a firmly set structure (Juul 2002). An example of this is *Zelda Breath of the Wild* (Gray 2017), an open world game in which players can either follow a structured narrative or explore the game mechanics and their possible impacts on the world, setting their own quests and paths. Like game design, museum exhibition design is another context that relies heavily on narratives. Museum exhibitions use narratives to communicate history to their users. Some museum narratives are reproductions of written history, while others communicate a historical period, artefact, or event through fictionalization of historical facts and objects to recreate or represent history and constitute a coherent representational universe (Macdonald and Silverstone 1990). Even though different approaches to narratives and story building are used, most museum exhibitions use a structured and often chronological storyline, like the 'main quest' in video games such as *Zelda Breath of the Wild*. Lupton (2017) even speaks about the

3.6. [P6] LEARNING THROUGH EXPLORATION AT MUSEUM EXHIBITIONS

Madsen, K. M., & Jensen, J. F. (2019). Learning through exploration at museum exhibitions. *Visitor Studies*. Taylor & Francis. (under review)

The sixth and last paper was a user study that evaluated and discussed the learning potentials of explorative museum experiences. This paper sought to evaluate the informal learning effects of exploration, with the purpose of balancing enlightenment and experience. The definition and characteristics of exploration in this study took as their point of departure the criteria of emergent narratives defined in [P4] and [P5], which framed the case descriptions and data analysis in this paper. The effects of exploration experiences were studied within two museum exhibitions: Øhavsmuseet Faaborg's exhibition, *Savn & Brand* (*Anguish & Fire*) and Limfjordsmuseet's exhibition, *Den Fantastiske Ål* (*The Amazing Eel*). This paper emerged out of experiments [Ex_E] and [Ex_F], where we evaluated how users experience exhibitions which are designed based on criteria for exploration, and thus how this affects their experiential learning. This user and case study evaluated users' experiences based on the principles defined in [P4] and [P5]. Following up on the research design, the table below summarises which research question and experiments are connected to this paper.

[SQ3]	How can exploration support informal learning?
[Ex_E]	Exhibition Design: 'The Amazing Eel'
[Ex_F]	A user study of the affects of exploration
Publication Ranking	Visitor Studies: Level 1

Table 13: Overview of the sub-question and experiments connected to [P6].

** When this dissertation was submitted, [P6] was still under review, and therefore not published digitally with dissertation, to avoid publication issues. On the next page is a preview of the first page of [P6]. The copyright of this paper is the property of the author, when [P6] is published. For more information, contact author.*

Learning Through Exploration at Museum Exhibitions

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Abstract: The aim of the present article is to discuss the potential of exploration in museum exhibitions as a means of balancing enlightenment and experience. Hypothesizing that exploration can be one approach to dissolving the enlightenment—experience conflict by embedding both aspects within the concept of exploration, users reach enlightenment through explorative experiences. Exploration is discussed, theoretically and empirically, as a structure for creating a space for exploration, providing users with multiple levels and types of interaction and experience potential. Throughout the paper we argue that a *simple thematic*, *user-mindset*, *agency*, *storification* and *narrative closure* are key criteria for an exhibition to further the potential for exploration by creating multiple perspectives, interaction potential and depth on a specific area of interest, thus maintaining the users' curiosity and focus. Empirically, we explore how explorative exhibitions affect users' museum experiences through a user study at two exhibitions designed for exploration: *Anguish & Fire* and *The Amazing Eel*.

Keywords: Experiential learning, exploration, case study, museum exhibition

Intro

Throughout the last 20 years there has been an ongoing discussion in regard to the enlightenment—experience relationship in museum dissemination (e.g. Christensen & Haldrup, 2019; Floris & Vasström, 1999; Kirschenblatt-Gimblet, 2000; Sæter, 2004; Skot-Hansen, 2008)—a discussion based on different positions ranging from dichotomic to symbiotic. Sæter (2004) argues for the museum's focus on classical enlightenment and is strongly opposed to the use of experience and entertainment-based dissemination in exhibition design, arguing that museums are being disneyfied when they are experience-focused. In opposition to Sæter (2004), Kirschenblatt-Gimblet (2000) positions herself as critical of the classical museum's enlightenment, and is in favor of a more performative, experience-orientated, engaging exhibition practice. Skot-Hansen (2008), on the other hand, argues that the discussion surrounding, respectively, enlightenment and experience, is not as simple as being "for" or "against" either approach. Rather, the relationship between the two approaches takes the form of a means to an end; that is, using experiences and the experience economy as instruments to promote the core

“If I have seen further it is by standing on the shoulders of giants.”

- Isaac Newton

4

connecting the dots

4. CONNECTING THE DOTS

This fourth chapter will summarise, comment and reflect on the findings from the research contributions in [P1]–[P6], presented in the previous chapter in correlation with the research questions posed in Chapter 1. In this summarised chapter, redundancy in relation to the individual papers will occur, as it condenses the insights and lessons learned. Nevertheless, they will be presented in a more general manner in order to connect the different papers' contributions to a collective answer for each sub-question. Thus, how is the question answered, and how does this expand and contribute to the field of *museum experience design*? This chapter is divided into four sections. The first three sections each revolve around one of the three sub-questions, [SQ_1]–[SQ_3], which were defined in section 1.7. Whereas in the last section, 4.4, how these findings have collectively expanded the field are summarised, before moving on to the conclusion in Chapter 5.

4.1. DESIGNING EXPLORATIVE EXHIBITIONS

This first sub-question seeks to understand and explore, how we can design explorative exhibitions through an IT-based experience design approach. Thus, to be able to apply principles of IT-based experience design in a design process with the museum, the first step was to define principles of experience design to apply to a design process. This was followed by researching which criteria can be further applied to specifically encourage and design for explorative user interaction in an exhibition. With experience design being a design tradition that borrows principles and design criteria from other design traditions, this sub-question explores theories on experience design, game design and gamification to understand what design criteria can encourage an explorative user interaction. This sub-question was addressed and researched through [P2] *Retningslinjer for udviklingen af It-baseret oplevelsesdesign*, [P3] *The Gamified Museum - A critical literature review,* [P4] *Strategies for designing emergent interactions* and [P5] *How to design for exploration through emergent narratives.* The first sub-question was formulated as follows:

[SQ1] What theoretical principles and criteria can be identified for IT-based experience design and exploration?

This sub-question was developed as a theoretical contribution, one which covers how we can design for exploration through experience design by identifying theoretically founded criteria and principles from both experience design and emergent

narratives, which can then be implemented into a collaborative design process and further evaluated based on the users' learning experience.

The initial step to answering [SQ_1] was [P2] *Retningslinjer for Udviklingen af IT-baseret Oplevelsesdesign*, which identified principles of experience design which could be applied to a design process. Using Alban's (1996) *quality of experience*, I have identified relevant principles for experience design and further categorised these into a design process. This provided the first contribution for [SQ_1], an *Experience Design Framework* (XD-Framework) (Figure 11), which contains essential experience design principles to think through or be aware of when designing for experiences.

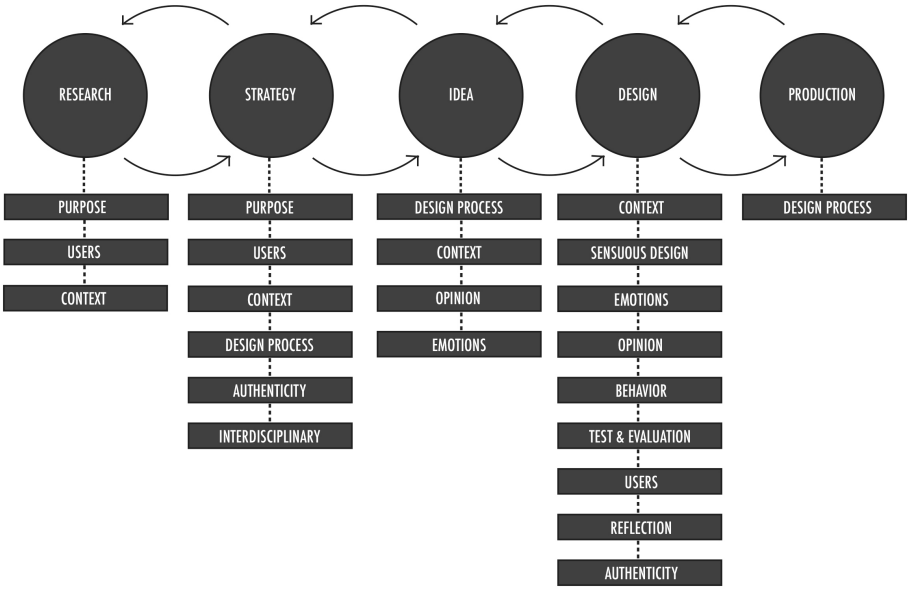

Figure 11: Simplified version of the XD-framework as presented in [P2] and evolved through [Ex_A], showing the phases of the design process and the underlying categories. A full version of the framework can be found in appendix folder A8_Contribution (8.1_The_XD_framework_Unfolded).

As mentioned in the introduction, [P2] was central to the research, both as the motivation for this research endeavour and as the driver for applying experience design to the collaborative design process with the museum. The purpose of the XD-framework is to create a collective overview of what should be thought through when designing for experiences. Even though experience design as a design approach is described by multiple researchers (e.g., Alben, 1996; Boswijk, Peelan, & Olthof, 2012; Crumish, 2009; Hassenzahl, 2010; Jensen, 2013; McCarthy & Wright, 2004, Oppelaar, Hennipmann, & Var der Veer, 2008), they only partly connected the different perspectives to a design process that bridges theory and practice. Nevertheless, this framework is not specific to the museum context, collaborative

processes or exploration, but rather acts as a framework for IT-based experience design in general. Since the XD-framework is structured around a five-phase design process, it could support and frame the progression of the collaborative design process, making sure that all perspectives of experience design are discussed and thought through and thus providing the theoretical foundation for the collaborative process.

[P2] outlines a framework for designing for experiences, but [SQ_1] seeks to understand and contribute to how we can design for *exploration* through IT-based experience design. Thus, a specific *purpose* for approaching exhibition development through experience design. Therefore, criteria specifically for encouraging exploration in exhibitions needed to be added to this framework. This is why and how [P3] *The Gamified Museum* came into being, as an experiment, [Ex_A], into whether or not I could derive criteria of gamification to encourage exploration in an exhibition. This experiment was built on an assumption (or rather, hypothesis) that gamefulness and playfulness facilitated through games or gamification in museum exhibitions could potentially be a driver for exploration. Games and gamification within HCI are notorious for encouraging more gameful or playful behaviour from the user and thus seemed like an interesting area to research, in regard to what gamification is and how it has been applied to museum experiences. As stated earlier, [P3] became an informative and interesting journey into gamification studies within the context of museums, one which became the inspiration for further research into how and which game criteria could encourage exploration in museum exhibitions.

Through this experiment and paper, three main subjects within gamification in museum contexts were identified: *Theoretical Gamification*, *Add-on-Games* and *Game-based learning*. This indicates that museums are spaces for both exploring the potentials of game designs by adding games to existing exhibitions and gamifying learning initiatives at the museum. At the same time, theoretical contributions to gamification are on the rise, with examples of applying a gamification element to museums, but none have thus far focused on integrating gamification into the design process. Furthermore, through the literature review, I found *The NMC Horizon Report: 2015 Museum Edition*, by Johnson, Adams Becker, Estrada and Freeman (2015), who claimed that gamification and games would be a trending topic within museums in the coming five years. Thus, this is an overall indicator of gamification and games becoming increasingly researched within a museum context; but more often than not, in studies applying gamified products to existing exhibitions rather than designing exhibitions through gamification.

[P3] does not give a solution for applying criteria for exploration to the XD-framework, but rather provides an indicator of the potential of filling a gap or approaching the collision between gamification and exhibition from another perspective. I might argue that this experiment and paper can be categorised as one of the drifting activities, referring back to 2. *Research Design* and Krogh et al. (2015),

and as an interesting experiment, but it would not have a larger impact on the final conclusion, since it in some ways drifts (Krogh et al., 2015) from the original research question. Nevertheless, this paper opened up the potential for further exploring theories on games and gamification to identify criteria for exploration, which leads us to [P4] *Designing for emergent interactions*, and [P5] *How to design for exploration through emergent narratives*, in which I argue that one approach to designing for exploration could be through the ideas of an emergent narrative (Aylett, 1999, 2000; Swartjes, 2010) and open story worlds, inspired by games such as *Zelda - Breath of the Wild* (Gray, 2017). Thus, this approach stays within game theory but focuses on narrative construction (Ryan, 2015). Both [P4] and [P5] explore different aspects of identifying criteria and potentials of emergent narratives, regarding how these can be added to an exhibition design.

[P4] identifies four primary criteria for emergent narratives: *user-mindset*, *agency*, *narrative closure* and *storification*, based on Aylett (1999, 2000) and Swartjes (2010), and moves on to define four strategies for designing: *by Desig*n and *by Redesign*, and for identifying emergent interactions in exhibitions, *by Hacking* and *by Creative Play*. Both criteria and strategies are exemplified with different case studies. This experiment and paper defined emergent narratives as a way to design for explorative user behaviour, since it focuses on designing for emergent interactions, which happen when a user actively explores a context or story world. The *by Design* strategy's structure and criteria are further explained and explored in [P5] *How to design for exploration through emergent narratives*, which contributes to answering both [SQ_1] and [SQ_2]. [P5] thoroughly unfolds further perspectives on emergent narratives as a driver for exploration in an exhibition design and how these criteria are incorporated into the design process and took shape in an exhibition at the Limfjord Museum.

[P2] to [P5] mainly theoretically explored how we can design for exploration in museum exhibitions through experience design with added criteria for emergent narratives as the main driver for exploration. Furthermore, when adding criteria for exploration to the XD-framework, it is not a question of adding a thirteenth category, but rather of extending and specifying the category, *Purpose*. This research project has sought to apply experience design as an approach to design for exploration in exhibitions. Thus, the purpose of applying experience design to the design process is to encourage user exploration in an exhibition.

That said, I am not claiming that these are the only criteria, theories or approaches to design that can encourage exploration in exhibition, but rather that these are some example thereof. Nevertheless, I do argue that the many categories and underlying principles in the XD-framework are up for assessment depending on the project or design process in which it will be applied, a perspective which became important for [SQ_2], which concerns implementation.

4.2. IMPLEMENTING EXPLORATIVE EXHIBITION DESIGN

The second sub-question focused on how experience design principles and criteria for exploration can be implemented in an exhibition design. This sub-question sought to discuss and exemplify how the principles of experience design and criteria for exploration, researched in [SQ1], can be applied in a collaborative design process between a design researcher and museum professionals. This sub-question was mainly addressed in [P5] *How to design for exploration through emergent narratives - steps in a collaborative design process for cultural heritage exhibitions* and methodologically unpacked in Chapter 2: Research Design. This second sub-question was formulated as follows:

[SQ2] How can experience design principles and criteria for exploration be implemented in an exhibition design?

This sub-question was developed as a normative contribution, with a best practice example of an exhibition design that encourages exploration based on criteria of emergent narratives and how collaboration between museums, researchers and museum curators can balance content and form in the pursuit of design, such as an exhibition.

The XD-framework described in [P2] was structured according to a five-phase design process, thereby creating the structure for the research through design process within this research project (as explained in section 2.4.2: Ex_B: Collaborative Design Process). By framing the design process based on the XD-framework, Ex_B went through the principles and questions in the different phases, as relevant, in order to incorporate experience design into the core of the exhibition. Within the XD-framework, there are two categories, called *Interdisciplinarity* and *Design Process*, in which focus is placed on the collaborative needs for the experience design (Boswijk et al., 2012; Crumlish, 2009), in regard to both professional skills and user participation (Sanders, 2008).

In answering this sub-question, focus was placed on a collaborative design process (i.e., a collaborative effort between museum practitioners and design researchers) that would create an exploratory exhibition design based on the criteria of emergent narratives. Thereby, creating potential for exploration through emergent narratives in museum exhibitions is not just a question of creating multiple layers of narratives with different media, but rather – and most importantly – about communicating and representing history. Therefore, this is not just a design case focused solely on creating exploration and emergent narratives, but one in which an exhibition is created that makes space for exploration through emergent narratives that communicate history in the best possible way. Thus, this design process requires a

collaborative effort to balance form and content. The collaborative effort and design process seeks to both optimise content and form. The museum practitioners, who are obligated to communicate history within and through exhibitions, focus on content: what needs to be told and how it needs to be told, to make sense of history. Whereas a designer, who is trained to give shape and communicate through design, focuses on form, on how best to communicate history through materials, and on how to compose content and form to optimise this communication. Thus, given the collaborative design process, the iterative nature of the process shifted between content and form in a continually collaborative process.

Knudsen and Olesen (2018, p. 205) argued that '[...] museum literature often deals with collaboration in relation to overall perspectives and outcomes, rather than on how collaboration is actually practiced as a complex work process across various stakeholders'. This means that we can find few examples documenting collaborative efforts or how they were shaped. Although they explained that the different collaborative constellations '[...] seem to be particularly important for developing museum communication today, signalling a need for involving expertise about museums, about design and different media types and about usage' Knudsen and Olesen (2018, p. 206) also indicated that living up to today's communication standards in a museum context requires that different types of expertise come together in collaborative constellations for design exhibitions.

Even though this is still a rather poorly documented area within museum literature, following Knudsen and Olesen's (2018) argument, collaborative design processes are not a new area within design research. A large body of literature has been written on co-design and co-creation. Sanders and Stappers (2008, p. 6), for example, described these collaborative processes as referring '*[...] to any act of collective creativity, i.e. creativity that is shared by two or more people. [...] By co-design we indicate collective creativity as it is applied across the whole span of a design process [...]. Thus, co-design is a specific instance of co-creation.'* They further described co-design as *'creativity of designers and people not trained in design working together in the design development process'* (Sanders & Stappers, 2008, p. 6). This refers back to the case study or the museum's development processes, with the museum practitioners being people not trained in design and the designer either being a researcher or not.

Even though we, in theory, do not know too much about collaborative constellations and processes, we do know quite a lot about different approaches to collaborative design and creation, which is what we applied in this case study to drive a collaborative design process focused on the creation of emergent narratives for explorative interactions. Thus, by designers and museum practitioners working together in a design development process for creating a new exhibition, it is necessary to break down the process of design to give room for the creative and iterative nature of collaborative design processes to shift between content and form.

In the fifth paper, the *by Design* strategy from [P4] is more thoroughly unveiled with further perspectives on emergent narratives as a driver for exploration in an exhibition design and how these criteria specifically took shape in the exhibition at the Limfjord Museum. Furthermore, this paper describes how the collaborative design process was facilitated as steps in the design process, and how this process emphasised the importance of finding a balance between content and form when collaboratively designing for exploration. The paper concludes that designing for exploration, from an emergent narrative perspective, becomes a question of creating a narrative structure that allows for choices but has a core narrative (Figure 12).

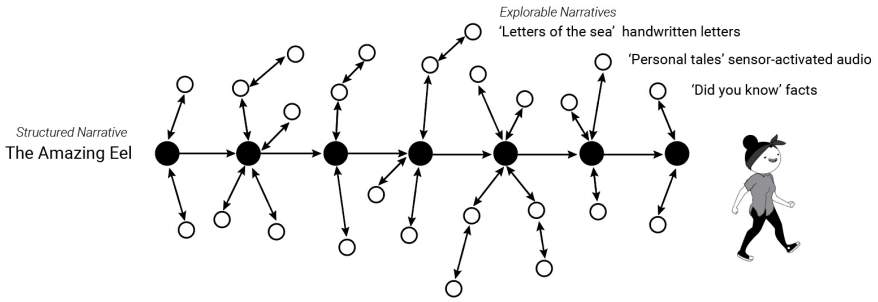

Figure 12:The emergent narrative model for the exhibition, 'The Amazing Eel', as presented in P5. The model was drawn based on Ryan's (2015) vector with side branches narrative model.

This structure does not revolve just around the content, history and stories that a museum wants to communicate to its users, but also around the way that the stories are communicated, i.e., the form or type of representation medium chosen to best tell this story. Thus, a balance between content and form is sought through the collaborative process. This gives the design researcher the role of knowing and advocating for shape giving, and the museum curator the role of advocating for the content and how the stories need to be told to make sense and be as correct as possible. Consequently, by collaborating and respecting that we each have our own profession and expertise, we can further the design and continuously shape and reshape it to optimise both storytelling and medium.

When dwelling on this collaborative process, then it would be interesting to visualise it through a Venn diagram (Figure 13). Doing so would show how the designer, curator and user each have different stakes or competencies, which need to come together to succeed with an explorative experience design (ExD). Moreover, intersections between each of these actors occur: between the curator and the designer is the collaborative process of creating an explorative exhibition, which will only succeed as such if the user indeed explores it. On the other hand, there is the intersection between curator and user, which can represent both what the curator wants the users to know and learn about and what the users want from the museum experience. Lastly, the intersection between designer and user can represent the

knowledge and understanding that a designer has about a medium's capability and interaction potential and the user's use and interaction with these potentials when and in which constellations.

This construction and its intersections would be interesting to explore further in different collaborative constructions, as described by Knudsen and Olesen (2018), and how they could change depending on the design approach a project takes (Sanders, 2008): research- or design-led, with an expert- or participatory-mindset. Furthermore, the different approaches and purposes for an exhibition design would also change the core from ExD to whatever else could be the purpose of an exhibition.

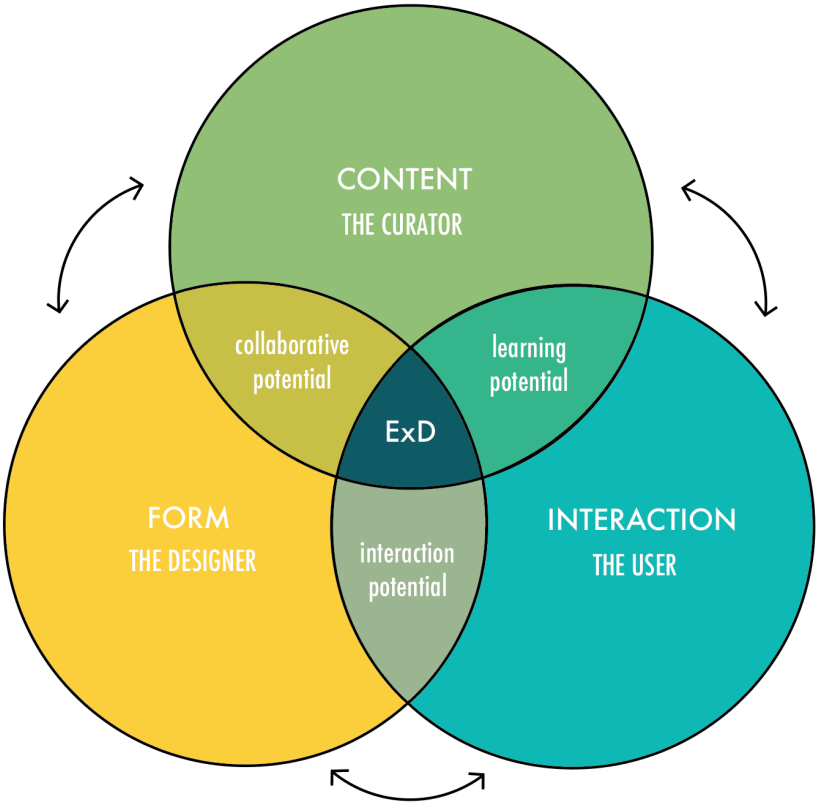

Figure 13: Venn diagram for visualising the iterative process of creating an explorative experience design [Ex_D] through a collaborative experience design process.

Even though the empirical knowledge generated throughout this research project has been highly dependent on the case study and on the collaborative process to do research through design, the effects on the museum practice and on the facilitating

methods have not been expanded upon further within the scope of the research project, except within [P5] and as the project's fundamental methodological structure in *2: Research Design*. Thus, this is an issue that can be further explored in future research, perhaps as a comparative study, with multiple cases rather than just one.

Returning to [SQ_2] and the question of how criteria for exploration can be implemented in an exhibition design, both [P4] and [P5] focus on emergent narratives and interaction, concluding that exploration and emergence is not a question of no structure but rather of experiences despite structure. As described from [P4] to [P6], theory on emergent narratives became, in this project, an approach to encourage user exploration in museum exhibitions. Design criteria were thus defined to loosen structure and provide the opportunity for emergent interactions through free exploration in the museum space. This was done fully aware of the fact that we cannot guarantee emergent narratives or interactions, because they must happen through the user's interaction with the exhibition, yet what we were trying to achieve was the creation of the potential and opportunity for these explorative experiences to emerge. Thus, as Figure 12 depicts, there is a structured narrative which a user can experience if they walk directly through the exhibition without exploring it. But if the user wants to explore, they must have the opportunity to discover more than the structured narrative and in spite of its structure.

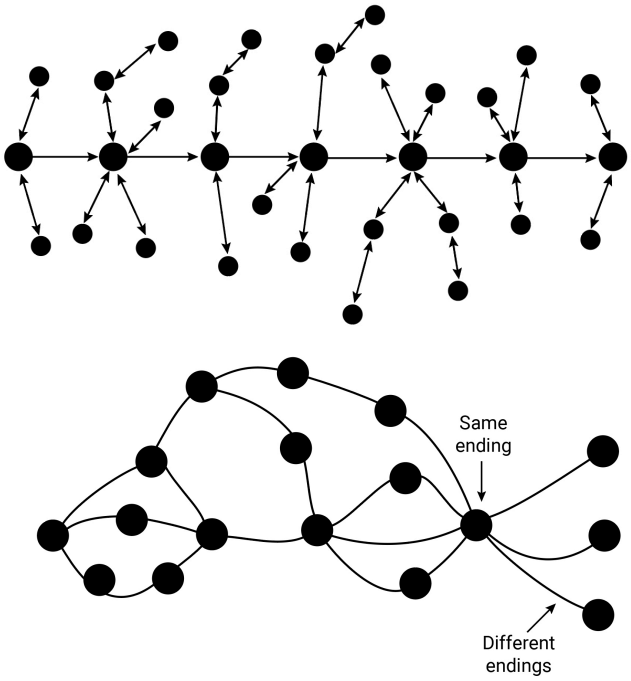

Figure 14:The flowchart narrative model and the vector with side branches model redrawn based on Ryan's visualisations (2015).

In [P5], I present Ryan's (2015) *flowchart* and *vector with side branches* (Figure 14) narrative models as examples of how to visualise the narrative structure of exploration and emergent narratives, and thus how we can visualise the complexity of emergent narratives in order to understand, analyse and design them as such. As with Figure 14, these models will undoubtably change shape depending on the size, structure, historical extract and context of an exhibition. As indicated in both [P4] and [P5], it would be interesting to loosen the structure even more and to create a sandbox design (Breslin, 2009; Domsch, 2013; Jenkins, 2004) to see how this would affect the museum experience for the users and the narrative construction. A sandbox design can be defined as an environment within which players or users can define their own goals and write their own stories. Aligned with the previous narrative model presented by Ryan (2015), the sandbox model can be compared with the *Action Space, Epic Wandering, and Storyworld* model (p. 176), which removes the overarching narrative and focuses instead on 'an epic structure of semi-autonomous episodes' (Ryan, 2015, p. 175). Nevertheless, no matter which of these models and approaches is chosen, Ryan's visualisations of the narrative models provide once again a valuable tool for the collaborative design process and planning.

The Amazing Eel exhibition created throughout this research project with the Limfjord Museum is one example of how we can design for such explorative narratives, as presented in both [P4] and [P5]. Nevertheless, this exhibition was seen as a prototype and therefore as technologically basic, because of the economic aspect. It would be interesting to upscale the structure to determine how the exhibition and user experience would evolve with multiple digital side branches or alternative storylines. It would also be interesting to see what would happen if the narrative models were not isolated to one exhibition but applied to a whole museum instead. Especially, the flowchart model's construction would be interesting in that instance, as would ensuring that users followed a vector model throughout a whole museum visit.

4.2.1. AN EXD-FRAMEWORK

From Figure 11 and [P2]'s initial XD-framework, we have, through [P4] and [P5], identified exploration as the purpose for encouraging enlightenment through experiences in exhibitions; furthermore, the collaborative design process has generated insights into what is relevant within the XD-framework for this type of research endeavour. As stated in [P2], following Buxton's (2007) argument for avoiding standardised design processes, reshaping and choosing the relevant aspects of the XD-framework for this research purpose was essential to not forcing an unnecessary process and instead yielding a flexible XD-framework, one which provides an overall perspective on designing through/with experience design. Nevertheless, this left me to reformulate the XD-framework based on the relevance of designing for explorative user interactions through a collaborative design process. I therefore, in this summary of the contributions, would like to present a modified version of the XD-framework, one based on the findings generated throughout the

different experiments and papers: The Exploration Experience Design Framework – ExD-framework (Figure 15). Both the phases and the categories have been modified for relevance to the collaborative pursuit of encouraging user exploration in exhibitions.

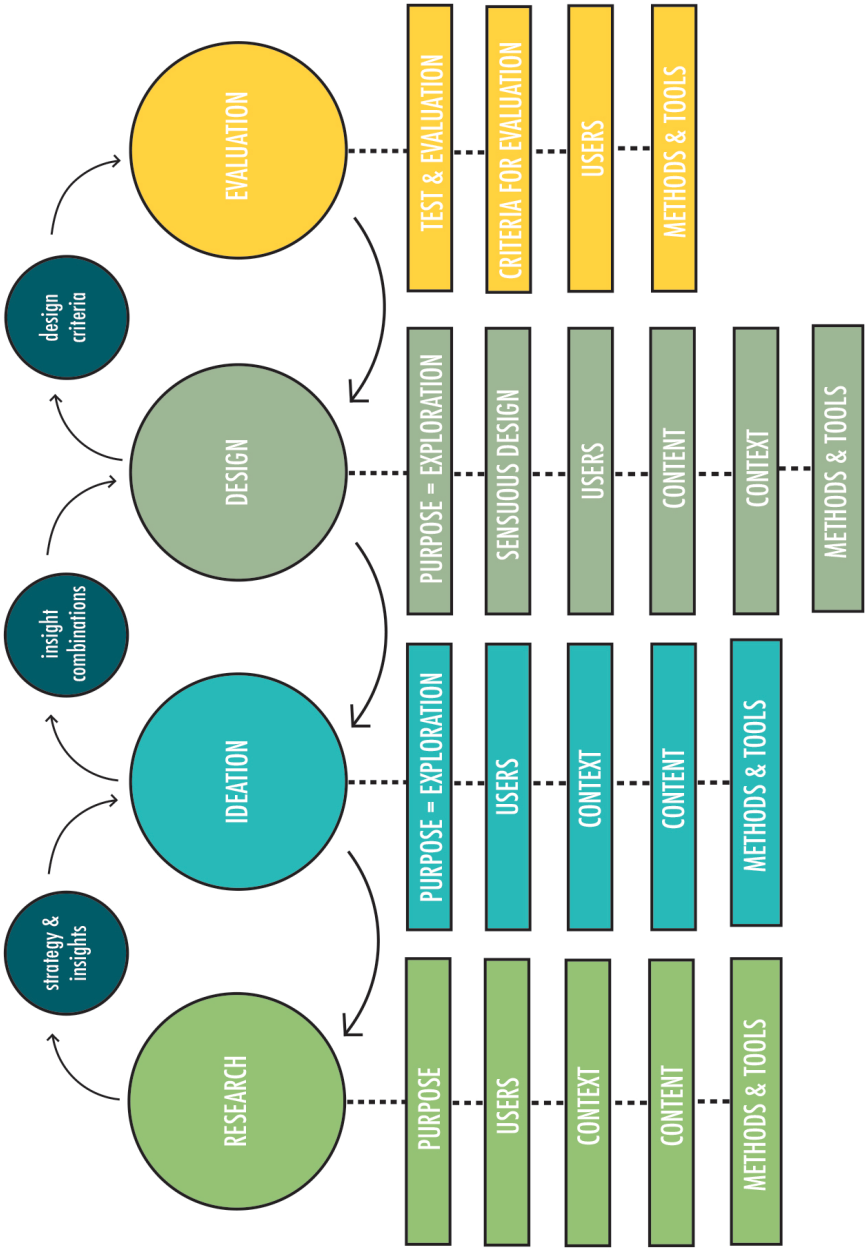

Figure 15:The ExD-framework as modified for relevance.

In the XD-framework, five iterative phases were presented: *Research, Strategy, Idea, Design* and *Production*. This was reduced to four phases (*Research, Ideation, Design* and *Evaluation*) in the ExD-framework, with an additional three connecting spheres (*strategy & insights, insight combinations* and *design criteria*). These modifications are based on [Ex_B], figure 6, and on the structure of the research design. Through the modifications *Production* has turned into *Evaluation*. In the XD-framework, *Test & Evaluation* is one of the categories beneath the design phase, which is connected to the continuous process of prototyping and testing design, evaluation and rethinking. Evaluation became more than that in this research project: it became an experiment in itself, one intended to understand the effect of explorative exhibitions and thus a concluding phase in the design process. Furthermore, since user studies are a rather common type of evaluation in museum practice, it seemed appropriate to include them as part of the design process in the museum sector. Production as a separate phase became redundant, since it was embedded in the design phase. This was an effect of the fact that we, design researcher and museum professionals, built the exhibition ourselves, thus becoming part of the design processes, since we could keep adjusting as we built. This would be different in a larger-scale exhibition, where the production would be handed over to other parties, and would thus be a separate phase in the design process. In between the design phases, there are three spheres which visualise the transition between the phases, to what is being transferred from one phase to the next, mainly based on the methodological approach to the research projects design process.

The first, between research and ideation, is *strategy & insights,* which is a combination of the removed design phase, *Strategy,* and insights collected in the research phase. Thus, the findings and framing defined by the research phase set the stage of the following phase: Ideation. Between ideation and design is *insight combinations*, which are essentially design ideas generated throughout the ideation phase that were transferred to the design phase. Insight combinations refer back to 2. *Research Design,* identifying this method as the way to combine design patterns and insights (Kolko, 2009). Lastly is the sphere between design and evaluation – design criteria. Whatever the purpose of the design, this purpose will define some of the criteria for the design. As for this project's exploration through emergent narratives (*user-mindset, agency, storification, narrative closure* and *simple thematic*), these criteria set the frame for the final evaluation – Did we accomplish what we intended?

For the categories, as can be seen, there are fewer categories present under each phase than in the original XD-framework. Early in the design process it became clear that having to facilitate and incorporate all 12 categories made the design process too complicated, and therefore only the most relevant categories were picked. Through the first three phases, six categories were essential, as were four for the last phase. The three first categories are *purpose*, *user* and *context*. As mentioned earlier, purpose in this research project became synonymous with exploration following the first phase, and therefore, in Figure 15, they were named *purpose = exploration*. Thus,

under this category, the criteria for exploration are positioned. Purpose changes its name under the evaluation phase for clearance, *Criteria For Evaluation*, which entails the design criteria moving from design to evaluation through the sphere, *design criteria*. Furthermore, I have added a category called *content*. This is based on the previous reflection on the continuous balance between content and form. As argued in both [P4] and [P5] and with Figure 13, balance between content and form became the centre of attention throughout the collaboration, despite content not being explicitly present in the original XD-framework. I therefore added it as a category to the ExD-framework.

Lastly is the category *Methods & Tools*: In the XD-framework, there is a category called *Design Process*, within which are methods and tools for generating knowledge and design. But since the ExD-framework represents a collaborative design process, methods and tools are highly relevant and necessary to facilitate said process and to conduct research throughout the process. Consequently, this category is now also present, as reflected upon in *2. Research Design*, [Ex_B] and [P5] as steps in a collaborative design process. The sixth category under design is *Sensuous Design*, which is also one of the original categories from the XD-framework. This category is focused on the tactile and physical appearance of the design, which is highly connected to interaction between users and objects. An unfolded version of the ExD-framework with underlying questions, principles and criteria is available in appendix folder A8_Contributions (8.2_The_ExD_framework_Unfolded).

The ExD-framework (Figure 15) represents the redefined and modified XD-framework from [P2], based on the collaborative design process in [Ex_B], where the relevance of the different phases and categories was rearranged. But why is this relevant? The transformation from the XD-framework to the ExD-framework shows, as Buxton (2007) argued, that we should avoid standardisation and modify the process to be relevant for each design project. Even though the XD-framework was sufficiently extensive for experience design, not all of it nor its construction was relevant for the collaborative process of designing an exhibition that encourages exploration. The purpose of visualising the design process and categories is to create a framework, one which can be transferred onto another research project to design *for* exploration through a collaborative design process, thus contributing a more objective view on what to incorporate in this type of process. Both the XD-framework and the ExD-framework can be a starting point, but the latter is more specific than the former. Nevertheless, if either of these frameworks are applied in another research project, their relevance should still be considered and adjusted.

To summarise, the experience design principles and criteria for exploration have been implemented into an exhibition through continuous collaboration between the design researcher and the museum curator: a process whereby the XD-framework shaped and informed the design process so as to make the exhibition an experience design at its core. Furthermore, the criteria for exploration were set as the purpose for

the exhibition, and were therefore the goal when striving to create, discuss and balance content and form. 'How can we make this explorative?' was the most frequent question asked throughout the research process, as a collective goal and purpose for the exhibition. Nevertheless, all this points to the designer and curator and their activities and intentions with a design. But as shown and described in Figure 13, the users' interaction with the exhibition is what is required to create an emergent narrative or emergent interaction; it is the user who needs to explore, to achieve knowledge from the exhibition. Even though in 2. *Research Design* the research project is described as having a user-centred approach to the design process based on an expert mindset (Sanders, 2008), experiences are subjective and inherent in a user's interaction with a system/object in a given context (Jensen, 2013); thus, we cannot understand the extent of an experience, learning or explorability before letting the users interact within the exhibition. This leads us to the third and final sub-question. But before we get there, the collaborative design process and workshop approach of the research design let us design a workshop game, one which could be used in an exhibition design process to facilitate a user-centred perspective.

4.2.2. THE OUR MUSEUM GAME

Another outcome and contribution for implementation is *The Our Museum Game* (Figures 16 and 17), which was the result of knowledge generated through [Ex_B]. The game was developed in collaboration with one of the other PhD fellows from *Our Museum*, Rameshnath Krishnasamy. The game was intended as a user-centred exhibition design game in which the players, across professions, should each represent a user persona. The personas were defined by the player based on certain predefined criteria (appendix folder A8_3.4) and went through three stages of designing a user-centred exhibition: *Exploring, Designing* and *Researching the user dimension.*

The Our Museum Game was thus inspired by the facilitation of a user-centred design workshop in the collaborative design process from [Ex_B]. Insights from [Ex_B] show the importance of both creating a shared language between stakeholders in exhibition design processes and placing user experience at the core of the design. Furthermore, the workshop setting created throughout the collaborative design process was a valuable method for achieving a space for both shared language and user-centred design. Thus, these insights were transformed into *The Our Museum Game* through a game format, one which provided a workshop tool that facilitates shared language and user-centred design ideation for museum exhibitions. *The Our Museum Game* is a physical contribution to the *Our Museum* programme, focusing on understanding, designing and evaluating the user dimension, which is one of the three main dimensions in focus in the research programme: *User, Institution* and *Representation Dimensions* (appendix folder A1 – A1_2]). Thus, the user is placed at the core of designing and evaluating museum experiences instead of focusing either

on the institution or representation dimension, and participants are compelled to place themselves in the position of the user instead of the researcher or designer.

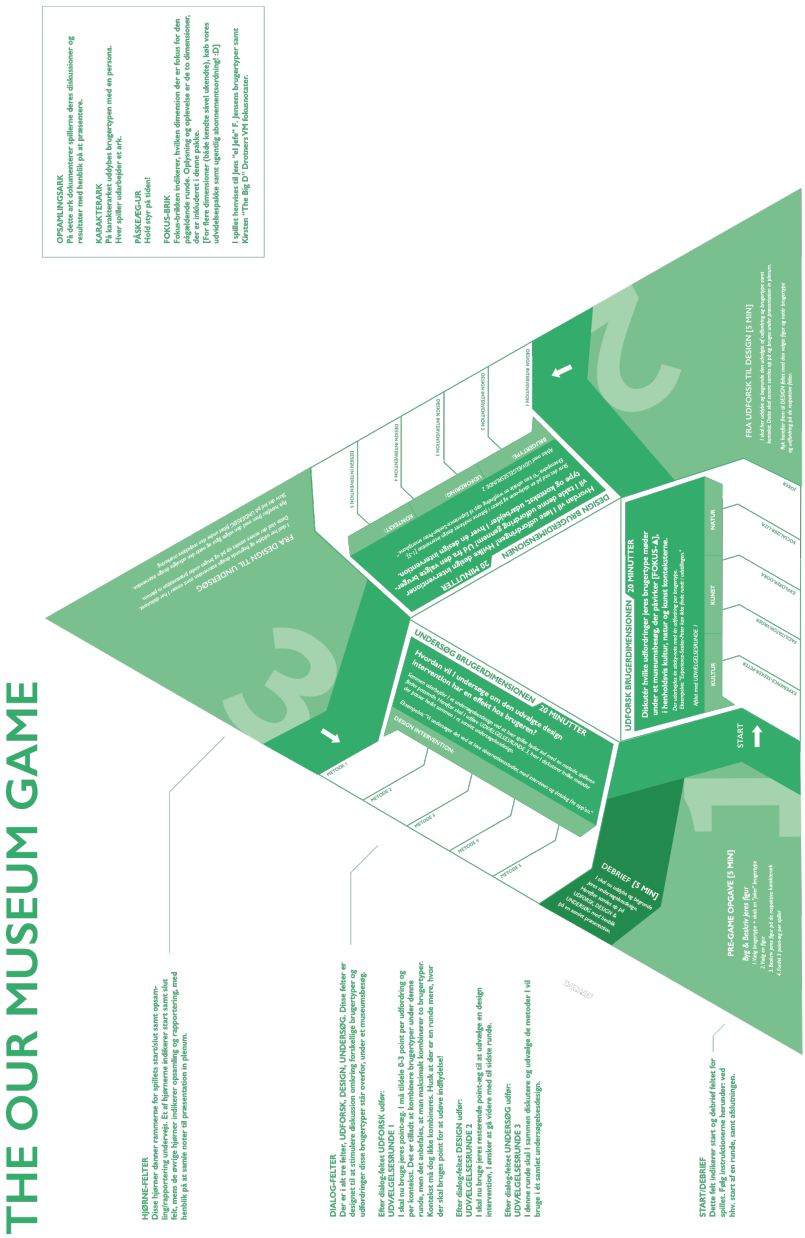

Figure 16: The Our Museum Game's gameboard. To see a larger version and for the different game elements, go to appendix folder A8_Contributions (8.3.1_The Our Museum Gameboard).

Furthermore, *The Our Museum Game* also represents a potentially valuable workshop tool for practitioners when initiating new museum exhibition, suggesting that this design game creates a toolbox for the museum to sustain a design-in-use practice when designing future exhibitions. A first iteration and pilot test of the design game has been made at an *Our Museum* seminar, as mentioned in [Ex_B]. However, a second iteration of the game would be interesting to test with a group of museum practitioners at a museum, with and without actual museum users and/or with exhibition design teams.

Figure 17: The Our Museum Game as played at an Our Museum Seminar on 3rd April, 2018. (Permission was granted by the players to use this image).

There are many ways to conduct workshops, as discussed in this research project and as based on Sanders and Stappers' (2014) concept of the convivial toolbox; nevertheless, this game provides a format with game constraints and mechanics as well as content specified for the museum sector. The intention of the game is not to have a final exhibition design at the end of the workshop, but rather to inspire new perspectives and ideas with the users at the core. The game might also be valuable as a recurring workshop throughout a design process.

4.3. EVALUATING LEARNING THROUGH EXPLORATION

The final sub-question takes us back to Chapter 1. *Introduction*, where exploration was observed as users' behaviour in outdoor activities at the Limfjord Museum – behaviour which demands higher engagement from the user than the indoor exhibitions. Thus, the difference between the outdoor activities, which encourage a more free-form, exploratory and inquisitive user interaction, and the more structured and passive exhibitions was highlighted. This framed the research project and brought users back in focus in the third sub-question, in which the learning potential of an experience-based exhibition design that encourages explorative user interaction was explored. Consequently, focus was placed on what users take away from these types of exhibitions and how these experience-based exhibitions affected their enlightenment. This sub-question was mainly addressed in [P6] *Learning through exploration at museum exhibitions*, which detailed the user study experiment [Ex_F]. The criteria for evaluating user experiences in an exploratory exhibition were based on the criteria of design, thus mainly the contributions from [P4] and [P5]. The third sub-question was formulated as follows:

[SQ3] How can exploration support informal learning?

The two previous sub-questions had a user-centred focus in order to answer the 'what' and 'how' of design for explorative museum experiences, defining criteria and shaping experience design processes and designing for user experiences. In this final sub-question, the design comes to the test of the users' actual experience and enlightenment from explorative exhibitions. The assumption that exploration can support enlightenment through experiences in informal or free-form learning spaces (Falk & Dierking, 2013/2016) is grounded in experiential learning (Kolb, 2015), i.e., the notion that we should not provide a set experience, but instead create space for free exploration, demanding, or at least encouraging, users to create their own storification. Thus, experiential learning is based on users own interest, curiosity and willingness to understand – e.g., active participation for their own enlightenment. Furthermore, this also reflects back on the wish to balance and dissolve the tension between enlightenment and experience rather than to design for 'disneyfication' or formal learning.

The empirical experiment for [P6] evaluated and discussed the experiential learning potentials of exploration-driven museum experiences based on two case studies of exhibitions designed for exploration: *The Amazing Eel* and *Anguish & Fire*, as also presented in section 2.4.6: [Ex_F]. This study provides a perspective and insights on how exhibition designed for exploration offers the potential to balance enlightenment and experience by not just providing a set experience or curriculum, but by creating a

space for uses to explore and create their own learning experience (i.e., storification), even though this challenges the way that users usually visit and use museums.

The four criteria of emergent narratives for exploration – *user-mindset*, *agency*, *storification* and *narrative closure* – provide a framing for both identifying an exhibition's potential for exploration and for understanding a user's explorative experience and storification. When approaching the idea of exploration from both a design and user perspective through the four criteria of emergent narratives, this experiment indicated that the free-form museum experience provides the potential for users to become enlightened on their own terms and their own storification of their experience. Thus, this is an indication that exploration can potentially balance and dissolve the tension between enlightenment and experience by giving users multiple options of choice in content and communication approaches, thus leaving users to define and create their own learning and experience style based on interest.

Nevertheless, there is an obstacle with types of user experiences, since the museum is not explicit about what they expect of users and what is provided for the users; therefore, exploration might not occur. Thus, an important contribution for this research question is that the user-mindset must align with the museum's intentions to successfully encourage exploration. Another interesting contribution from this experiment is that storification provided a way to understand the assimilation of information and experience based on the users' informal learning experience. With storification, the individual user can reflect on the narrative they have created, based on what they chose to explore.

In answering and reflecting on the contribution of this sub-question, it becomes clear that exploration is a way to both talk about a user's interaction potential in exhibitions and a constraint in design to keep opening up the experience and learning potential for the users to let them freely explore and create their own narrative. Nevertheless, it could be argued that it is redundant to discuss exploration, because free-form learning and informal learning spaces should by default provide the potential to create one's own learning experience. But by talking about exploration and emergent narratives as a structure for creating a space for exploration, we demand more of the exhibition design and experience potential in the context as well as providing the users with multiple levels and types of interactions – with interaction potential being the keyword. Thus, encouraging option of choice for user experiences through exploration. Consequently, straying away from the purely passive communication means as text and displays in the pursuit of enlightenment and the pre-coordinated interactions in a tight planned experience.

Last but not least, through [Ex_F] and [P6], the users' perspective of the previously discussed balance between content and form became evident. One of the main themes in the user study was *simple thematic*, which refers to the user's experience of

having a clear understanding of the theme of the exhibits and therefore pointing out how this provided them with a context in which they felt they could explore multiple perspectives of this particular theme or narrative in depth, thus supporting the potential for exploration. Evidently, I argue that a *simple thematic* is added to the criteria for exploration in exhibitions, since the study indicates that it can further the potential for exploration by creating depth and multiple perspectives on a specific area of interest, thus maintaining the users' curiosity and focus.

4.4. SUMMARISING CONTRIBUTIONS

This chapter provided a summary and reflection on the majority of findings from the papers published throughout the research project, based on the three sub-questions. Each of the contributions portrays different endeavours into expanding the body of knowledge about museum experience design, endeavours that have not been a straight line nor a solely serial set of experiments, but rather an expanding set of experiments (Krogh et al., 2015), as also defined in the research design of the research project. To visualise this complexity of both different levels and goals for the experiments, I have drawn the following figure (18) to create an overview of the papers and their research foci.

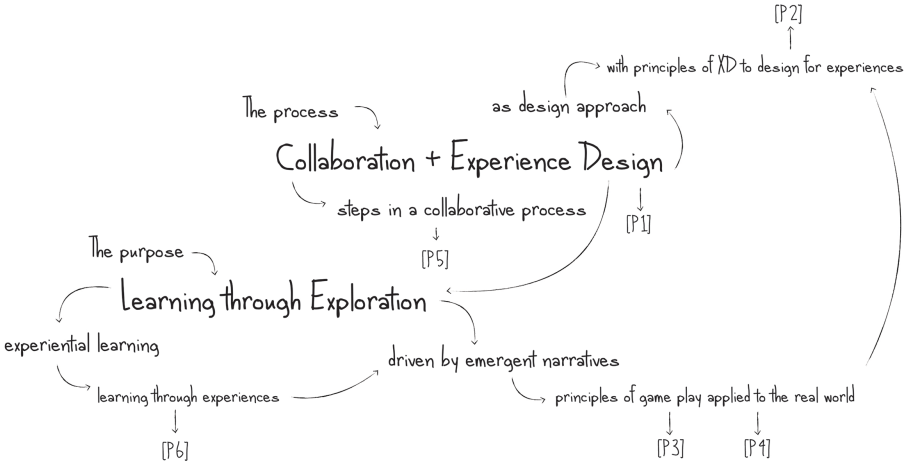

Figure 18: Findings and contributions (appendix folder A8_Contributions - 8_4_Figure_18).

Before moving on to the conclusion and further perspectives, I want to follow up on *1.5. Expanding the Field* after presenting this rather complex figure. In summary, the findings in this research project have expanded the field with the following: With this dissertation, I wanted to contribute and expand the research area of museum experience design by applying experience design to the design process of exhibition making in collaboration with a small Danish museum. Thus, in summary, the following contributions can be identified:

The ExD-framework: This contribution was the development of the ExD-framework, which takes advantage of the scientific literature around experience design (XD) and introduces my collaborative museum to experience design as a design approach through our collaborative design process. Thus, this framework takes advantage of Samis' (2018) notion of museums having much to learn from Human-Computer Interaction (HCI) and supports both collaboration and design in smaller museums (Calvi & Vermeeren, 2015; Vermeeren & Calvi, 2018). The ExD-framework therefore expands the field of museum experience design by adding a framework focusing on integrating XD into the core of the exhibition design, apart from optimising user experiences by manipulating communication and interaction design through technology.

Exploration for informal learning: Furthermore, one of the implications that I set out to research by applying experience design as a design approach was handling the balance of enlightenment and experience, which refers to a struggle between the museum's role as protector of objects and facts about our cultural and natural history and its role as a site of experiences. This is an approach that thus seemed relevant – not to design for disneyfied exhibitions and museum experiences, but rather as an approach to balance the continuum and dissolve the tension between enlightenment and experience, to design purposeful exhibitions that provide the potential for learning and meaning making through experiences (Bedford, 2014; Kolb, 2015) – setting learning and meaning making as the purpose for the experience design, a purpose that turned into exploration: the active participation of the user in creating their own experiences and storifications. Thus, this approach makes designs for exploring a new perspective in museums, one which offers opportunities for users to gain knowledge through interactive museum experiences. Consequently, exploration is not a third perspective in the enlightenment–experience dichotomy, but it is an approach to dissolve the conflict and balance enlightenment and experience to avoid disneyfication and formal learning.

Incorporated experience design – not as an add-on: Additionally, this balance is further supported through collaboration in the design process in the continuous balance of content and form, represented by the museum curator and the design researcher. Thus, exhibition development with an IT-based experience design approach is a process of designing for exploration embedded in the exhibition design and not as an add-on or separate layer of technology and communication, as described for gamification in [P3]. Nevertheless, I must recognise that this collaborative process and balance might only have succeeded because of the small constellation of the case study, which also means that this cannot be a final truth but rather an indication of a possible solution to balancing enlightenment and experience.

In summary, I expanded the field of museum experience design by defining a theoretically based and empirically tested ExD-framework. A best practice example

of an exhibition, *The Amazing Eel*, designed with an experience design approach encouraging exploration, was used. A design game, *The Our Museum Game*, was employed as a tool to discuss the process of designing user-entered exhibitions across multidisciplinary teams. And lastly, light was shed on the importance of balancing content and form in the design process in the pursuit of balancing enlightenment and experience, which can be achieved through collaboration between museum practitioners and design researchers. This is a condensed summary of three years of research as well as a reflection on the contributions and expansions of the museum experience design field. The purpose of this chapter was to give an overview and reflective understanding of how the different contributions ([P1]–[P6]) have contributed to answering the three sub-questions ([SQ_1]–[SQ_3]) before moving on to the conclusion.

As a final note in this chapter, the only paper that is not mentioned as having a contribution to any of the sub-questions is [P1] *REDOing the museum exhibition*. The reason for this is that it was a position paper, one which framed the problem area and the initial research question for this research project as a whole. This paper set the stage for my research by outlining the hypotheses, which were grounded in the initial stages of experiments A and B. In the paper, I pointed to the potentials of using IT-based experience design in creating exhibition designs that support learning. Even though it was a short paper, it was the stepping stone for discussing the subject with other design researchers and for reaching new understandings and asking new questions about the subject. Furthermore, it also shows the development of the research project's RQ: *How can principles of IT-based experience design guide the design, implementation and evaluation of an explorative museum exhibition?* Closing this contribution chapter with a paper framing the initial research question leads us to the final conclusion of this dissertation and research project in the following chapter, Chapter 5. *Conclusion.* But one last reflection is required to tie the contributions from this research project and dissertation to the *Our Museum* research programme.

4.4.1. A REFLECTION ON THE RESEARCH PROGRAMME: OUR MUSEUM

The final remark on the contributions summery is how they contributed to the research project and to the *Our Museum* programme, presented in section 1.2. This PhD project was conceptualised as part of the national research and development programme, *Our Museum*, as one of 13 projects. Through the *Our Museum* programme, we were keen to understand how museums' innovative practices of public interaction handle the concepts of enlightenment and experience, since these concepts operate as key dimensions of museums' societal engagement in the past as well as today. *Our Museum's* research and development goal is to contribute to the theoretical, empirical and practical development of Danish and international museums' knowledge dissemination with a focus on three dimensions of analysis: *Institutional Dimension, Representational Dimension* and *User Dimension.*

In this current project, I have approached the research question by aiming to explore the museum practices around exhibition making through collaboration. Thus, the institutional dimension was touched on by actively collaborating and engaging with the museum in the design process, instead of using the museum as a place to study or manipulate through design interventions. Consequently, the *incorporation of experience design – not an add-on* is a question of how to practically and methodologically approach the institutional dimension of the *Our Museum* programme. The collaborative aspect of the institutional dimension, within this dissertation, also became a discussion of balance between content and form, or rather enlightenment and experience. Second, with the ExD-framework ‚principles of experience design and criteria for exploration can be applied to a design process and consequently to an exhibition design. These principles and criteria provide a tool for shaping the construction and combination of communication approaches for exhibition design to encourage exploration, and thus for contributing to the representational dimension. Consequently, representation is a dimension that is present in the creation of an exhibition as a whole as well as in its effect on users more so than on specific technologies and objects. Lastly is the user dimension, which this project contributed to through *exploration for informal learning*, i.e., meaning making through explorative experiences, which also argues for exploration being a user-oriented perspective on balancing and dissolving the tension between enlightenment and experience. This demonstrates that the contributions and findings identified in this dissertation both touch upon and contribute to all three dimensions of analysis in the *Our Museum* programme and provide insights into how museums can take advantage of experience design practices for handling concepts of enlightenment and experience.

“Tell me and I forget, teach me and I may remember, involve me and I learn.”

- Benjamin Franklin

5

conclusion

5. CONCLUSION

As indicated by the title, this chapter will conclude the research project based on both the research question posed in Chapter 1 and a reflection on the two working hypotheses. In the previous chapter, the three sub-questions for the main research question were addressed with the contributions created by each. Thus, this chapter summarises these contributions to create a collective answer to the main research question, framed by a reflection on how this positions the initial hypotheses.

This dissertation's research project was initiated three years ago with two working hypotheses under the following assumptions: [Working Hypothesis 1] IT-based experience design can be a useful design approach to design for explorative interaction in exhibition design due to its characteristics for approaching design holistically and borrowing criteria of design from other fields of design. [Working Hypothesis 2] By designing for explorative user interactions in exhibition design, enlightenment and experience can be balanced.

The working hypotheses were inspired by experience design, as an HCI design approach, due to the rise in its application in the context of museums, in both supporting collaborative processes and developing the exhibition and communication design by taking advantage of methods from the HCI field (Samis, 2018). The hypotheses were grounded in the collaborative case partner for the project, demonstrating a contrast in user interaction, i.e., activities versus exhibitions. These working hypotheses provided the foundation for exploring the abductive 'what if?' question. Thus, what if we use IT-based experience design to guide the collaborative design process to balance enlightenment and experience through exploration? The 'what if?' question was based on the assumption that IT-based experience design as a design approach can support a purposeful and collaborative exhibition design process due to its holistic, multidisciplinary quality to balance enlightenment and experience in a final exhibition. The hypotheses further claim that if we use the experience design process for explorative interactions as the purpose for the exhibition, then there is a greater potential for learning. The working hypotheses and the interest in exploring the 'what if?' question generated the research question, as defined in the introductory chapter:

How can principles of IT-based experience design guide the design, implementation and evaluation of an explorative museum exhibition?

The research question was examined through constructive design research with six serial and expansive experiments, each exploring different perspectives of designing for exploration through experience design in collaboration with the Limfjord

Museum. The research question entailed three main perspectives – *design, implementation* and *evaluation* – which were reflected in the three sub-questions, discussed in the previous chapter.

Designing explorative exhibition: One of the main contributions in this research project was the identification and clarification of both principles of experience design and criteria of exploration to be implemented in a design process in order to design for explorative museum experience. Initially, 12 categories for experience design were defined based on the quality of experience. These identified principles of IT-based experience design should be considered when designing for experiences. But according to the hypotheses of this research project, the 'what if?' question pointed to explorative museum experiences. Thus, emergent narratives and interaction were identified as a game-based, open-world approach to creating space for exploration. Within this theory, four criteria of designing for exploration were identified: *user-mindset, agency, storification* and *narrative closure*. These principles and criteria have been utilised in the ExD-framework based on a four-phase design process. For each phase in the design process, different categories were defined based on the principles of experience design and criteria for exploration, thereby producing a framework for guiding *Explorative Experience Design* (ExD). Designing for exploration continued to reinforce the user-centred focus of experience design, since we in the design process had to create space for the users to participate and create their own experiences and storification through exploration. This also forced us to think through the design decisions and criteria for creating a space that allows users to satisfy their curiosity and keep them engaged.

Implementing explorative experience design: With the framework and its principles and criteria, collaboration around the design process was invaluable in the continuous balance of content and form, avoiding both formal learning and disneyfied exhibitions. Thus, design and implementation became highly dependent on collaboration between museum practitioners and the design researcher. Thus, the implementation of exhibition development with an IT-based experience design became a process of designing for exploration embedded in the exhibition design, not as an add-on or separate layer of technology and communication. Nevertheless, I recognise that this collaborative process and balance might only have succeeded because of the small constellation of the case study, which also means that this cannot be the final truth but rather an indication of a possible solution to balancing enlightenment and experience.

Evaluating learning through exploration: The criteria for exploration, based on emergent narratives defined in the dissertation, both created the foundation for designing for exploration and identified and evaluated explorative user interactions through four strategies for emergent user interactions: two being design-driven, *by Design* and *by Redesign;* and two being design user-driven, *Creative Play* and *by Hacking*. The experiments have shown how, when designing explorative exhibitions, we can

provide users with the potential for meaning making through their active participation in the museum experience. Thus, enlightenment and experience can be balanced or the tension between the two can be dissolved by having the users accumulate their own *storification* through active exploration. Nevertheless, exploration opposes the expectations of what it means to interact in an exhibition, thus making the shaping and briefing for *user-mindset* in exploration experiences of the highest importance. The evaluation also indicated the importance of a *simple thematic* when seeking to encourage exploration, providing a fifth criteria to *by Design* for exploration.

In the end, it is relevant to ask to what extent this research project has answered the primary research question about the guiding qualities of IT-based experience design in designing, implementing and evaluating exploration to encourage museum experiences. The examples from the experiments, and the accumulation of data, serve to at least give exemplary evidence towards claiming that the hypotheses are in part confirmed, and that the answer to the research question was found through its examples. Nevertheless, there is no one way to approach exhibition design, as it depends on the thematics, the design team and the purpose of the exhibition. In this research project, I have tried to challenge the collaborative design process through experience design and the boundaries of user experiences through exploration by applying the ideas of emergent narratives. I have also sought to add to a research field of narrative approaches to exhibition design within museum design research by adding criteria of narrative models from open-world games to encourage user exploration. Furthermore, I have attempted to condense my contributions into a theoretical framework, providing practice- and design-oriented guidelines which are grounded in the design experiments conducted throughout the research project. Altogether, this dissertation has expanded the body of knowledge of museum experience design, which I am not claiming to have discovered, but in which potentials remain to be discovered – as in general within the newer branch of context-oriented experience design approaches.

In summary, by defining principles of IT-based experience design and criteria for exploration, based on emergent narratives, it is possible to guide the design process for and the evaluation of an explorative museum exhibition. The implementation of these criteria for exploration is highly dependent on collaboration between museum practitioners and design researchers in order to balance content and form. Thus, I allow myself to finally conclude that this research has expanded, but not completed, this area of research. Further experiments could provide value by further expanding on the experiments conducted in this research project or by focusing on some of the areas not included in this research design. Thus, in the next chapter, I will point to what I see as obvious extensions of my research, some of which may challenge my findings, whilst others may expand upon them.

“We shall not cease from exploration, and the end of all our exploring will be to arrive where we started and know the place for the first time.”

- T. S. Eliot

6

further perspectives

6. FURTHER PERSPECTIVES

Closing in on the finish line, it is evident that some areas have been covered and expanded upon in this dissertation, whilst some remain to be explored, as hinted at throughout the dissertation. Thus, before typing the final period of the dissertation, I will briefly outline five research topics and experiments which I argue could represent next steps in further research and create more in-depth knowledge on museum experience design for exploration.

Evaluating Organisational Learning: As described in [Ex_B], even though the empirical knowledge generated throughout this research project has been highly dependent on the collaborative process, the learning effects on museum practice and the efficiency of the facilitating methods have not been expanded upon further within the scope of the research project. Thus, this can be further explored and perhaps developed into a comparative study, with multiple cases going through a similar collaborative experience design process for explorative museum exhibitions.

Different Collaborative Constructions: The Venn diagram presented in section 4.2 presents different intersections based on the collaborative participants of the design process in this research project. It would be interesting to further explore different collaborative constructions, as described by Knudsen and Olesen (2018), and how they can morph and change depending on the design approach a project takes: research- or design-led, with an expert- or participatory-mindset (Sanders, 2008).

From Framework to Toolbox: While discussing the collaborative process and organisational learning, another perspective that would be interesting to further explore is whether the ExD-framework combined with the facilitation methods and tools from the collaborative design process and the *Our Museum Game* can be transformed into a toolbox for museum practitioners to support their design processes or for facilitating collaborative design processes. The creation of a such toolbox would be followed by a study on its use and implementation, as well as its potentials and limitations.

From Mapping to Design Patterns: The mapping of communication approaches in museum exhibitions from experiment [Ex_D] could also be further developed and transformed into an identification of design patterns for explorative museum communication. Thus, the construction of communication approaches that encourage explorative interactions among users could be explored, mainly focusing on how these design patterns might affect user mindset to encourage exploration despite preconceptions of exhibitions as a space for 'hands on back', unless explicitly told otherwise.

Longitudinal Study of Learning through Exploration: Another perspective on users in explorative museum experiences that could be further explored is learning over time. Thus, a longitudinal study of the informal learning effect of exploration could be performed by interviewing users from the two exhibitions, *The Amazing Eel* and *Anguish & Fire*, 6, 12 and 24 months after their initial visit. This approach to understanding users' learning experiences could be based on Falk and Dierking's (2013/2016) user research, in which they contacted users over time to understand how informal learning experiences settle in and become new knowledge.

These five further perspectives are all connected to the idea of using IT-based experience design as an approach to design for explorative museum experiences. Thus, they could each expand and create more in-depth knowledge about the exploration perspective on museum experience design and how learning affects users. Other perspectives can be added and discussed, because it is evident by the above that the area of interest and research is far from exhausted.

Finished, but not done… As the above perspectives outline, there are still many perspectives to further explore when using IT-based experience design as an approach for designing explorative museum experiences, perspectives which I look forward to further exploring in future research and collaborations. As for now and for this dissertation, I hope that the lessons learned, the principles and criteria defined, and the experiments conducted contribute at least a small set of insights into understanding and approaching museum experiences with IT-based experience design for encouraging explorative user interactions.

Thank you, readers, for taking the time to read through this dissertation and for sticking with me to its end.

Kristina Maria Madsen, 2019

B

bibliography

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A

appendix

APPENDIX OVERVIEW

All appendix material for this dissertation has been appended digitally for the assessment committee. I others want insight into the any appendix, please contact author.

[A1] APPENDIX 1 - General

1.1: Vores Museum Projektansøgning (2014)

1.2: Vores Museum Fokusnotat (2018)

[A2] APPENDIX 2 - [Ex_A] Reviewing, defining and clarifying problem area

2.1: Structured literature review (SQLR) from P3

[A3] APPENDIX 3 - [Ex_B] Collaborative design process

3.1: W1: Workshop 1 Material + Data

3.2: W2: Workshop 2 Material + Data

3.3: W3: Workshop 3 Material + Data

3.4: Design Process

[A4] APPENDIX 4 - [Ex_C] Design Insights

4.1: Field notes from observation and conversations at LFM in 2016

4.2: Infographic

4.3: Poster

4.4: Thoughts Document

4.5: Research-phase Document

[A5] APPENDIX 5 - [Ex_D] Mapping Communication Approaches

5.1: Exhibition visits as autoethnographies and field notes

5.2: Analysis

5.3: Mapping of Communication Approaches

[A6] APPENDIX 6 - [Ex_E] Exhibition Design: 'The Amazing Eel'

6.1: Floor plan + Moodboard

6.2: Exhibition prototype - Audio, sensor and personal tale experiment 2017

6.3: Observation + analysis

[A7] APPENDIX 7 - [Ex_F] User study 2018

7.1: Group Interviews from The Amazing Eel - Transcription 1-6

7.2: Interview Guide from The Amazing Eel

7.3: Observation Guide from The Amazing Eel

7.4: Observations from The Amazing Eel

7.5: Group Interviews from Anguish & Fire - Transcription 1-4

7.6: Interview Guide from Anguish & Fire

7.7: Thematic Analysis

[A8] APPENDIX 8 - Contribution

8.1: The XD-framework Unfolded

8.2: The ExD-framework Unfolded

8.3: The Our Museum Game

8.4: Figure 15

[PAPERS]

Author Statements

[P1] REDOing the Museum Exhibition Design

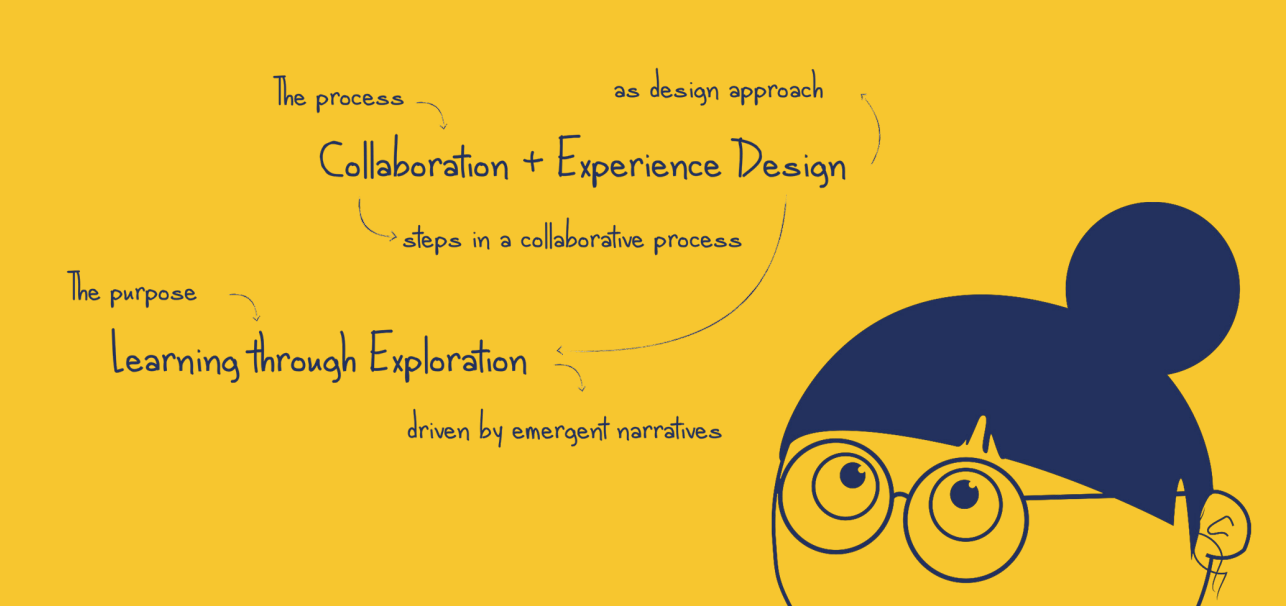
[P2] Retningslinjer for Udviklingen af IT-baseret Oplevelsesdesign

[P3] The Gamified Museum

[P4] Designing for Emergent Interactions

[P5] How to Design for Exploration through Emergent Narratives

[P6] Learning Through Exploration at Museum Exhibitions



SUMMARY

This disseration is based on the results of a three-year long PhD study at the Department of Communication and Psychology at Aalborg University. The dissertation consists of six original papers as well as a framing text with the dissertation's research question, research design, theoretical foundation and summary of contributions. In the produced work, I expand upon 'Museum Exhibitions as Exploration Spaces'. Through this research project, I have approached the challenges posed to museum institutions by the experience economy from an experience design perspective in collaboration with a smaller Danish museum. I explore potentials of learning through explorative experiences by asking the question: How can principles of IT-based experience design guide design, implementation and evaluation of an explorative museum exhibition? Through this research, I have applied principles of emergent narratives to the exhibition design in order to create a space for exploration, making the users active participants in creating their own experiences and narratives to encourage informal learning instead of passively receiving predefined and structured narratives.

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