Fruitful Gaps in Digital Literacy

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Fruitful Gaps in Digital Literacy: Interpreting gaps in digital literacy among stakeholders in collaborative design research projects as an evolving innovative capacity

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Abstract: This paper discusses the problem of assessing shared value from collaborative design research projects through the lens of evolving digital literacy. Through mapping a seven-year co-design case study, based on multiple collaborative design research interventions in the same organisational practice at the Danish aqua zoo 'The North Sea Oceanarium'. The development of contextual literacy is identified as an important dimension when discussing co-design, but also an issue in which the stakeholders rarely will reach equal literacy. However, we argue this gap is not a fault of co-design, but rather an indicator of a gradual mutual increase in innovative capacity among project stakeholders. We argue that the gaps in digital literacy, which may initially be seen as an inhibitor, might evolve to one of the strongest value propositions of collaborative design research projects within the broader area of interest; design of digital media systems.

Keywords: Collaborative Design Research, Co-design, Digital Literacy, Organisation, Exhibition

1. Introduction

This paper discusses the problem of assessing shared value from collaborative design research (co-design) amongst an often-diverse set of stakeholders concerned with design of digital media systems. We discuss the divide as a gap in digital literacy among stakeholders when collaborating during the design process. That is the ability to reflect on opportunities and challenges with a given digital technology in a practice context. This ability is typically not equal among stakeholders of a design research project. A design researcher might have state of the art knowledge about a technology, and a technology provider might have state of art experience in practical issues of the technology. Furthermore, the organisation for which the digital technology might be aimed, might be constituted by both a staff and an organisation culture with little experience of said technology. Finally, the staff of the organisation, or in other cases the customers of the organisation, are also the users, often being spread across a spectrum of e.g. early adopters and late majorities (Rogers, 2003).

Thus, the diversity of stakeholders creates a challenging mix of different levels of digital literacy towards realisation of a digital technology. This is often seen as a weakness (e.g. Knobel 2008; van Dijk 2005), and as an incentive to focus the collaborative process on creating an equilibrium of literacy amongst stakeholders as soon as possible. However, we argue that difference in digital literacy is not a process of synchronisation, but a process of recognising dynamic gabs between how stakeholders develop digital literacy gradually throughout collaborative research at different reflection levels.

1.2 Challenges of Collaborative Digital Design Research

In design research, one of the oft-repeated challenges is the assessment of what constitutes a contribution (e.g. Cross 1999; Gaver 2012; Wensveen and Matthews 2015). Since Frayling's (1993) division of research on, for, and through design, especially the latter has evolved into an effective methodology of organising design research around active intervention into practice. Research through design reflects on Cross's (1999) suggestion that design knowledge actually resides in artefacts, induced from the process of realising said artefact. A core aspect of this is that it allows researchers to engage with wicked design problems (Buchanan, 1992), becoming active agents in the process, as they attempt creating 'the right thing' (Zimmerman, Forlizzi, & Evenson, 2007).

Later, research programs has arisen to show how multiple design interventions connect to the same general research problem (e.g. Binder and Redström 2006). This served to clarify the role of design experiments (Krogh, Markussen, & Bang, 2015), and how the motivational context of designers influence research practices (Bang, Krogh, Ludvigsen, & Markussen, 2012).

However, less focus has been on the role of literacy in the fast and ever-changing digital design research programs, and how participants evolve digital mindsets. We argue, this is an issue of building a shared literacy of the material design practice, which often divides the stakes between value for practice and value for the design research program (e.g. Vink, Imada, and Zink 2008). This is especially a challenge due to the significant complexity and multidisciplinary nature of digital media projects (Rosenstand, 2001). Thus, the challenge in a co-design research program is how the participating agents have different points of departure according to digital literacy - ranging from state of art research knowledge to novice level from stakeholders not literate as either digital users or producers. This diversity, of digital literacy, can further be seen as both concerning organisational infrastructure (Krishnan & Prahalad, 2008), organisational competency (van Dijk, 2005), and perceived user relevance of media technologies (e.g. Niehm et al. 2010).

1.3 Research Question

We are inspired by how Crossick & Kaszynska (2016) see research value as also being the ability to evolve an organisation's reflective practice, through own individualised learning process. We build on this, by tracing how a multitude of different involvements in the same design program, gradually changed the organisation's mindset, both towards the initiated design interventions, as well as broadening the proficiency in adopting and appreciating research insights.

We examine this through the lens of how digital literacy of a diverse set of stakeholders evolve, and how this literacy is an asynchronous process, involving dynamic gabs between e.g. digital literacy of design researchers and organisational staff. Thus, to assess shared value, in both research and practice, we argue the process is highly dependent on the ability to intertwine the co-design research practice into a shared understanding of how digital literacy eventually catches up while new digital literacy gaps are continuously produced. This proposes an agile process that must be gradually unfolded over time. Such agility to the research practice becomes increasingly important, when the

design process oscillates between e.g. a tangible product focus and more systematic and strategic issues regarding the tangible products as seen in e.g. Nylén, Holmström & Lyytinen (2014).

As such, the research question is: How do collaborative design research projects establish a shared digital literacy over time?

2. Collaborative Design and Digital Literacy

A collaborative design research program contains a multitude of active agents like organisational stakeholders, users, designers, researchers, etc. that collaborate in one or several design projects to share ideas, resources, and capabilities to create interventions (Simonsen & Robertson, 2013). Today one of the crucial issues of collaborative design is supporting digital transformation (Perez, 2002; Brynjolfsson & McAfee, 2012). The digital revolution has not only changed many people's life but also the reality for organisations, as consumer products of today broadly contain digital technologies at their core. Therefore, it is necessary for organisations to adopt new digital technologies from the current economic environment (Brynjolfsson & McAfee, 2012).

Today digital literacy implies a certain set of skills to search, seek, and learn, which requires a cultivated mindset, where it is acknowledged that "*... the way in which disciplines are connected in relation to different challenges are infinite*." (Rosenstand, Rosenstand, & Øgaard, 2007).

The contemporary conceptualisation of digital literacy cannot be separated from technology in a society where rapid technological change is the norm (Brynjolfsson & McAfee, 2012). The size of the organisation, its culture, differentiation, and managerial attitudes to technology are some of the elements influencing the adoption of technologies. Today building digital literacy is necessary both at an individual- and organisational level in the digitalised society (Jenkins, 2009). Gilster (1997) formulates digital literacy as the ability to use and understand digitised information. Digital literacy is thus concerned with the knowledge possessed about digital technology, the skills necessary to use it and the ability to reflect on digital opportunities and challenges.

3. Case Study - The North Sea Oceanarium

Figure 1. Entrance of North Sea Oceanarium

The setting for the case study is a seven-year collaborative design research involvement with the Danish aqua zoo 'The North Sea Oceanarium' (NSO). The organisation has 35 full-time plus 35 seasonal employees and has 150.000 to 175.000 annual visitors. To qualify their 2020 strategy, with a focus upon becoming state of the art regarding digital exhibition technologies by, a collaborative design research cooperation was established with Aalborg University in 2012. The cooperation from 2012-present has been constituted by participating in the design and implementation of multiple digital projects and reflecting on the challenges of being first mover in providing experiences based on cutting edge technologies in an exhibition context. The projects have involved various

constellations of researchers and organisational stakeholders as leads, but with a core group being involved throughout all activities. The knowledge gained from prior individual collaborative projects in the organisation was taken in as a base for departure. Thus, we argue this case is exemplary to account for the temporal aspects of assessing shared digital literacy in collaborative design research among a broad spectrum of stakeholders of both research and practice - including users (zoo visitors) and digital suppliers.

Data Collection

The basis for the analysis is reflection-on-practice amongst stakeholders during the collaborative research. We see the totality of the collaborative practice as the portfolio of the sum of decisions, constructive activities, and social interactions throughout more than seven years, in an often interwoven and oscillating mix of research and practice activities.

Figure 2. Workshop at North Sea Oceanarium

To outline the co-design, we created a timeline from 2012 to 2018, detailing activities and their relations (Figure 3). This timeline was the basis for hosting a retrospective workshop with key stakeholders, some having been involved in the period from 2012-present.

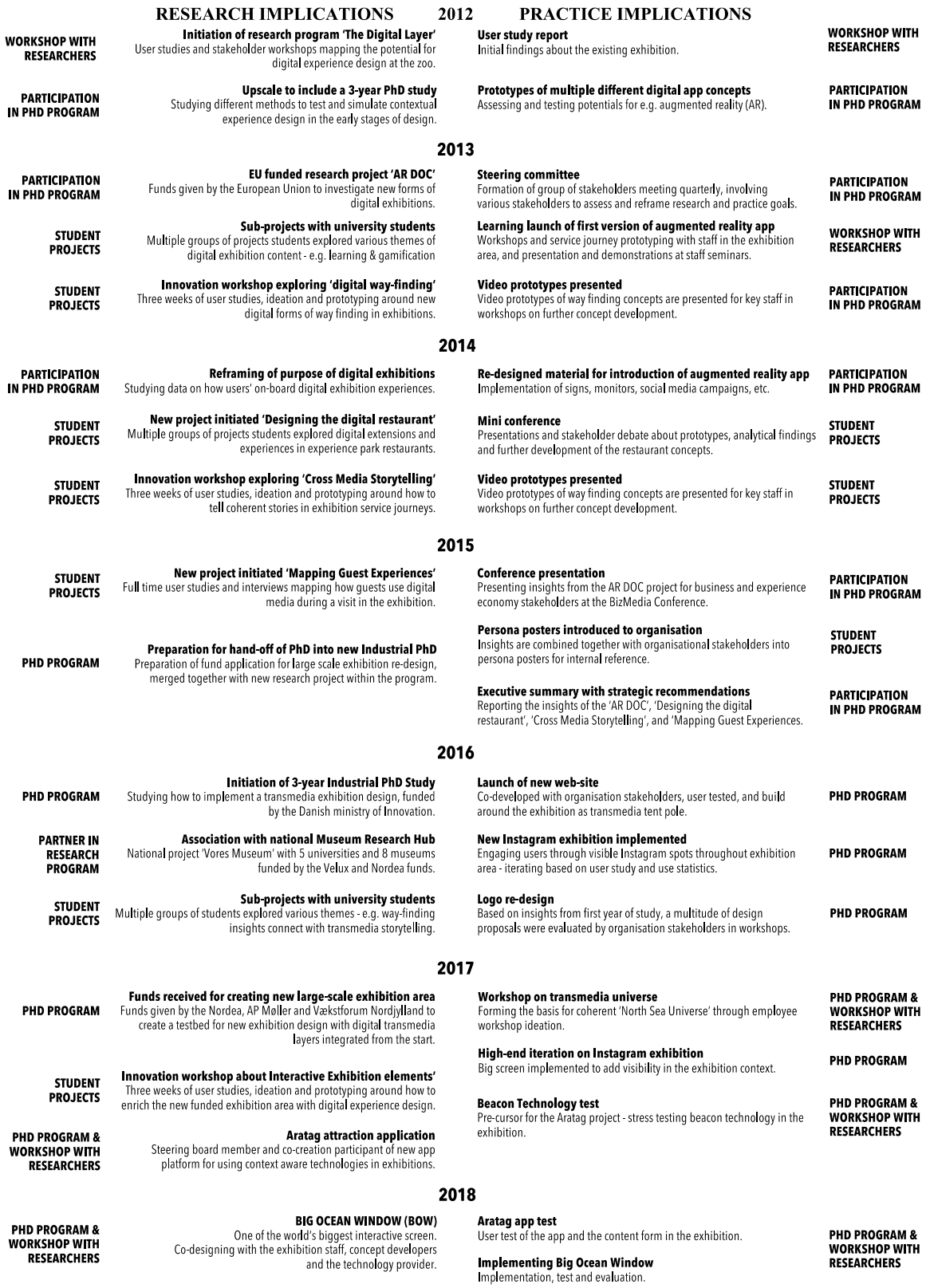

Figure 3. Timeline with activities from 2012 to 2018

The workshop was explorative and semi structured with prepared themes, while also being open to new themes. The workshop resulted in a mapping of how the NSO CEO, the chief of marketing, the chief of exhibition, and various researchers (PhD-student, assistant professor, and associate professor) reflected upon common activities, and assessed value of contributions (Selvadurai & Rosenstand, 2017; Vistisen, 2016; Vistisen, Østergaard, & Krishnasamy, 2017; Vistisen, Selvadurai, & Krishnasamy, In Press; Vistisen & Rosenstand, 2016).

3.2 Analysis

In this section, we analyse insights from the workshop into a series of themes. The themes were codified by the authors by clustering data with similar arguments or topics. Below, we present the processed themes in a descriptive analysis, and pair these with the gradual realisation of how assessment of value was very much connected to the evolvement of digital literacy amongst the multitude stakeholders.

Motivation for becoming digitally literate

> "What I think has happened is, over the last 5-6 years, is a growing realisation of our visitors' preferences, their lives and the way their lives change. This is where we have had the need to get increased [digital] knowledge into our exhibition. Here we are talking about the digital layer and it is a process of recognition with us, that we need to know something more about what is going to happen and how we can impart extra value to our visitors." – NSO CEO (Laursen, 2017).

NSO sensed that analogue technologies converted increasingly to digital technologies from 2000 and realised that digital technologies were becoming a need to have. They also witnessed the change in their visitors' preferences accordingly and also their digital literacy. This was a primary factor that motivated NSO to increase digital value proposition as well as their digital literacy within the organisation. Even though they had engaged in digital projects since 2010, the relevance of becoming more digitally literate arose when they saw the behaviour of their visitors to surpass their current digital state of art. In other words, the organisation began to fall behind the rapid adoption of e.g. mobile and social media.

The strategy from NSO was an attempt to increase in-house knowledge through cooperation with researchers, and thus increase the competitive advantage. This initiated the cooperation with Aalborg University by 2012. By reflecting back on the cooperation period, the organisation acknowledges that it has also gradually evolved the organisation, where the culture and attitude of the organisation of today are significantly more receptive to digital design interventions (Ydesen, 2017).

Not only technology, but just as much about process

Another theme showed how digital literacy is highly determined by the process of digitalisation, and not just the technology itself. The research institution has to share ownership with the organisation through e.g. applying for funding both for research projects like a PhD, as well as for smaller design experiments not only to realise, but also to anchor the co-design in the organisation. Thus, the employees must be involved to understand the value of research projects to reach a shared ownership, which is paramount to achieve a proper anchoring. Without employees' involvement, the products will be something strange forced into the exhibition and which distance employees to engage in and promote it (Laursen & Berglund, 2017).

However, the shared ownership also indicated one of the core challenges of collaborative research effort in terms of negotiating what was the core value to pursue. For instance, there was continuous discussion about the relationship between the enlightenment and entertainment of visitors, and the compromises the organisation was willing to make. The design researchers argued for dissolving this discectomy into a more experience-oriented strategy in which education arose from the experience and interaction with staff. This negotiation was mediated through gradual introduction of different research initiatives like user studies, prototypes being developed and tested, and workshops being held with employees. Thus, a search for a shared value in a research project was articulated as an organisational experiment.

> "The augmented reality app (AR-app) project is a very exciting organisational experiment in relation to which types of compromises one is willing to make when talking about relationship between experience and enlightenment, and where I am the representative for content quality." – Chief of exhibition (Ydesen, 2017).

During the period of the cooperation, the value of co-design evolved understanding for NSO – from being focused on developing a digital layer to actually becoming more digitally literate in working with co-design as a method for gaining better digital literacy. Even though the different projects were product oriented, the processes were just as valuable.

> "In the beginning, the PhD collaboration and the AR-app were not the final result for the PhD project or for us, but it gave a lot of knowledge about implementation and organisational challenges." – Chief of marketing (Berglund, 2017).

> "Had the digitally literate designer not been here, our cooperation could have ended after the first PhD collaboration." – NSO CEO (Laursen, 2017).

The experience acquired from the cooperation with academics from the research institution had its impact on the organisation when employing a digitally literate designer. This was a difference from earlier employees, as their secondary intention was to improve their in-house digital knowledge. This employee can be seen as the digital manager with the responsibility for minimising gap in digital literacy when co-designing with other stakeholders and research institutions.

Suppliers as co-design stakeholders

When assessing the potential value of new technology, it is important that suppliers are selected, not only based on state of the art, but also by assuring that they understand the contextual needs of the organisation and its digital pre-conditions. It defines how well a digital product can be integrated and received by employees with responsibility for creating and sustaining interest. It is not just a question of technology, but also of synchronising the expectations of what value technology can and should realise in the organisation. In co-design projects like these, the supplier becomes a stakeholder whose digital literacy is mutually evolved with the research institution and the organisation. The role of the supplier is more like an advisor who contributes with practice knowledge on the realisation of ideas that are being jointly developed. In other words, the stakeholders' ability to use, understand and reflect on digital opportunities and challenges are on different levels in co-design (Laursen & Berglund, 2017).

NSO acknowledges that the research collaboration has made them better able to differentiate between what the value can and cannot add in terms of actual technology and knowledge (Laursen & Berglund, 2017). This is an important organisational recognition, that digital literacy of the organisation is developed through the process, where the organisation now contains ability to assess what value technology might add, and following that, when to say yes and no to adding technology.

The experience of the organisation has furthermore enlightened the value that design research can infuse into their practice. The in-depth state of the knowledge combined with a broad understanding of practice assisted comprehensive communication with suppliers that spanned the foundation for constructive co-design. The involvement and engagement of a research institution assured better product quality. The positive experience has caused the organisation to enter a new state of the art digital project as a pilot partner, where the involvement of the research institution is the primary reason for engagement. NSO would not have engaged with the state-of-the art knowledge without the research institution as a stakeholder (Laursen & Berglund, 2017). The engagement of the research institution here is perceived as a guarantee for valuable results. This positions the research institution to take part in quality assurance for the organisation, in terms of evolving ability to develop contextual digital potential. This indicates that the organisation is starting to acquire a technology-creating ability with support from a research institution.

Research Complexity

Following the theme of how stakeholders also have co-design stakes in the project, a theme formed around the challenge of merging research perspectives with the practical context of non-design and non-research stakeholders. It was discussed whether the seven years of increase in research activities could be seen a co-evolving reflection on practice, where the increased experience of the organisation with collaborating design processes, enabled their further engagement from e.g. hosting small research experiments, to hiring an in-house industrial PhD student. However, NSO CEO did not see it as an issue of organisational maturity – in which the organisation had to go through interdependent steps (Laursen & Berglund, 2017). Instead, it was articulated as an issue of becoming literate in terms, processes and methods of design research, and thus being able to see ways to implement them in practice.

A core challenge is alignment of language, from the often-academic discourse of design researchers to the day-to-day practical language of the organisation. This alignment does not happen in an instant and has to be co-developed alongside the collaborative design research activities. But even though the establishment of a common discourse is important, it is also articulated as something that cannot rely solely on ‘getting everyone onboard’ one by one throughout the process. Integration of research perspectives and involvement of research discourses should not be person-dependent, but rather be part of a management initiative to ensure that both practical and academic experiences are anchored in the organisation. As such, the organisational capability to adopt and implement research contributions, are seen as a co-evolving part of increasing organisational literacy in adopting digital technologies. In other words, research knowledge is adopted through a gradual increase in literacy towards the area of research interest. This was visualised during the workshop as how the activities had evolved in complexity (figure 4).

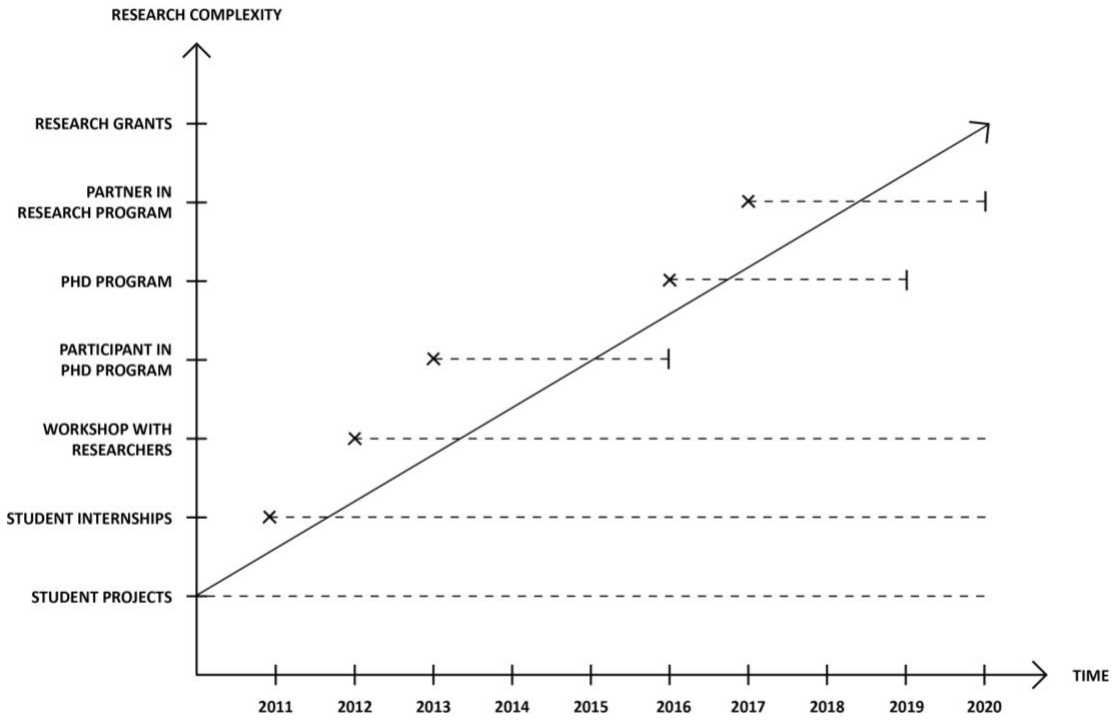

Figure 4. Re-drawn version of hand drawn diagram with duration of different activities from 2011 to 2020

This pattern was further evident in how NSO now operates with digital development project, in which they see co-design as a type of 'quality assurance'; not only for getting new digital exhibition elements, but also for gaining knowledge of how to build digital literacy needed to effectively utilise new digital elements. In fact, many of current digital projects being planned within the organisation, can be traced back conceptually to as early as 2012, from early master-student projects and short research workshops. This shows that building digital literacy is not necessarily 1:1 aligned with current collaborative research efforts, but utilised with a certain gap between research activities and organisational implementation. To this point, digital literacy is accumulated.

Dynamic gaps in Digital Literacy among Stakeholders in Co-Design

Co-design requires multiple stakeholders to actively collaborate to create and improve. Collaboration is more than tapping into individual knowledge of internal and external stakeholders. It's also discovering collective perspectives to span the foundation for innovation (Rosenstand, 2012).

> "Organisational learning and readiness are important. It is also about language usage in relation to whether employees understand when you speak. If you come with an academic language different from the language that prevails here. How we can then create common language, should also be considered." - NSO CEO (Laursen, 2017)

The cooperation with the research institution was initiated by some internal advocates of digital transformation in the organisation in 2012. At the start-up, some of the internal managers were reluctant to cooperate with the research institution, since value of digital transformation was not evident at that time - the digital literacy divide between stakeholders was too wide. This was an obstacle to establishing a constructive co-design. The AR-app project started in 2012 is a good example, as the biggest challenge was organisational anchoring, as many employees were reluctant to take ownership because of missing focus on involving staff in the process. Ideally It would have been optimal to anchor the project from the beginning, to reinforce the foundation for co-design

without organisational obstacles. Because of the organisation being the first mover in its field, there were several digital transformation challenges. The organisation had no prior experience or state of art knowledge and only some users were ready for the AR technology in 2012, which made it hard to create broad user interest. Therefore, it was potentially valuable to work with researchers to gain knowledge and collaborate to become a state of art example.

Another digital transformation challenge was not to focus solely on what technology can do, but what the purpose of the technology should be. It is about balancing literacy between researchers, NSO employees, suppliers, and users. During the workshop, the NSO CEO drew two learning curves regarding digital literacy between NSO and research institution, which illustrated a dynamic gap (Figure 5). The gap between organisation and research institution was debated as a measure of digital innovation capacity. If the gap of digital literacy between researcher and organisation is constant over time, it was a consensus that the gap represents an increase in innovation capacity. The research value is assessed from post-reflections; even though the dynamic literacy gap can be a challenge, it is essential to continuously increase the innovative capacity and the common denominator of shared digital literacy in co-design.

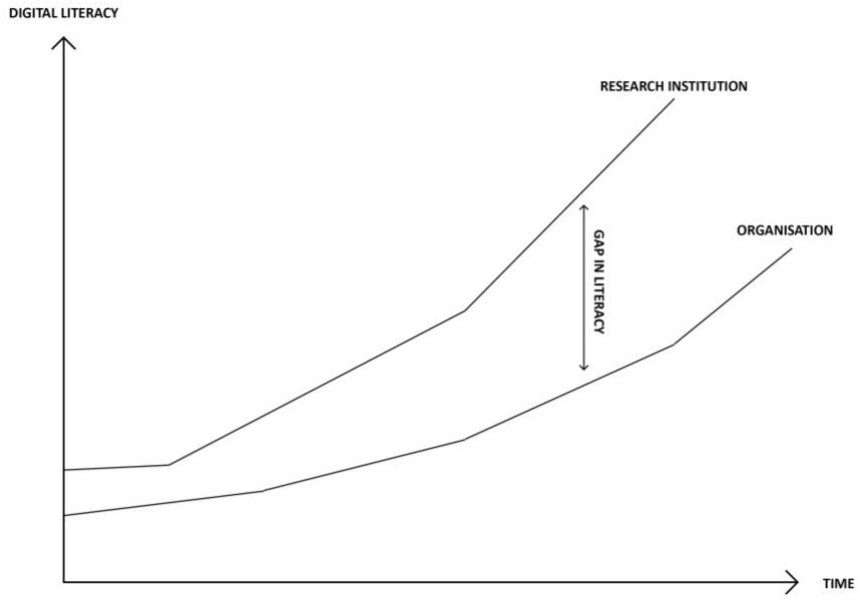

Figure 5. Learning curves drawn during the workshop by the director of the North Sea Oceanarium

The time delay in utilising gathered knowledge from research projects in practice led to a debate about whether it is natural, that it takes time to get different levels of digital literacy to catch up with each other. Many good research results are stored in the organisation and then used *later when* results can be utilised in a practical context. In NSO examples, a two-year gap was mentioned (Laursen & Berglund, 2017). However, it depends on continuous co-creation across different research projects to realise, which apparently also picks up unapplied knowledge. A project, concerning mapping of visitor experiences in 2015 (Figure 3), is a good example as the generated knowledge was not applied when introduced, but was incorporated in a new digital experience guideline in 2018. However, it requires an active effort to gather generated knowledge when the organisation is ready. A precondition is, that generated knowledge can be accessed through formats saved as co-creation design results. An example is how earlier, smaller student projects and design workshops have addressed potentials for digital wayfinding, while the problem is not yet solved, but is a recurring issue in focus, and is now being picked up through active development in 2018.

Gaps in Literacy as Innovation Potential?

From analysing the workshops, we have induced how development of digital design maturation of different stakeholders is an important dimension of co-design; we argue that the maturity discussed can be described as a measure of digital literacy.

Four key stakeholder categories of digital co-design have been identified through the workshop: visitor, organisation, supplier, and researcher. Normally and generally digital literacy of researchers is highest, then supplier, then organisation, and finally the visitor. The four key stakeholders represent different steps on what we, inspired by (Schön, 1990), term the *co-design ladder of reflection*. With the following main functions of the key stakeholders on the four steps of the ladder:

Table 1: The co-design ladder of reflection inspired from Schön's ladder of reflection

Schön's ladder of reflection		The co-design ladder of reflection
4	Reflection on reflection on description of designing	The researcher is reflecting on reflection on description of design
3	Reflection on description of designing	The organisation is reflecting on description of design
2	Description of design	The supplier is describing design
1	Designing	Visitors express design needs

Ultimately for developing the co-design ladder of reflection, researchers must, as we do in this discussion, reflect on the whole system of design, description, and reflection. In conclusion, we have a normal and general digital literacy hierarchy as follow: Researcher > organisation > supplier > visitor.

An anomalous situation will make a key stakeholder with less than normally expected digital literacy temporarily obsolete to the co-design. This is not necessarily a bad situation. However, key stakeholders are excluded from the co-design. As an example, we have as researchers designed and described design, and reflected on the description of design, which temporarily excluded respectively visitors, suppliers, and organisation. However, they are again included in the project later - often to learn that we had estimated digital literacy of other key stakeholders incorrectly. Another example is when the organisation is less digitally literate than the supplier (of course in the specific organisational context - not in the specific technical solution) and does not involve researchers such as employed PhD. Then supplier must fill out the three top steps of the co-design ladder of reflection; in best case reducing the co-design to two parties - the supplier and the visitor. This might have been tempting from the organisational point of view, because involving researchers and themselves in co-design is expensive and time consuming. However, it involves a big risk for the implementation in the organisation, because employees might simply not take ownership of the design in the exhibition - e.g. as experienced in the AR-app case not providing necessary technical advice and support to the visitors. The risk of not involving researchers is loss of knowledge and learning, including a big risk of repeating unsuccessful design behaviour.

Another illuminating factor of the co-design ladder of reflection is that dynamic gaps in digital literacy are not a bad thing; actually, it is a precondition for a fruitful co-design project. As how the NSO CEO expressed, that a constant gap in digital literacy is a sign of increasing innovation capacity. If there is no digital literacy gap there is no literacy-difference to constitute the ladder, and thus no push towards furthering a state-of-art. The co-design ladder of reflection also stresses the point, that

researcher, organisation, and supplier are obliged to constantly develop their digital literacy not to become obsolete to co-design and ultimately users; in this case visitors.

The four steps in the ladder of reflection can be aligned with four levels of learning termed by Qvortrup (2003) as (1) qualifications, (2) competencies, (3) creativity, and (4) culture on the digital literacy dimension. Visitors expect digital (enriched) experiences that increase their digital literacy. Therefore, suppliers must have digital literacy competencies to describe and implement state of the art digital solutions in exhibitions. To engage successfully in this as a co-design project, the organisation must have creativity to reflect on the state-of-the-art digital solutions in the specific organisational context, which they e.g. get through visiting other digital exhibition solutions. Finally, the researchers must provide new knowledge to all stakeholders to be cultivated to reflect on the relation between visitor qualifications, supplier competences, and organisational creativity.

In figure 6, the time dimension is x-axis and digital literacy dimension is y-axis. In this frame, the ladder of digital co-design is inserted with key stakeholders. In total, the ladder with stakeholders is on a trajectory towards higher digital literacy. As time goes by, digital potential results in a digital strategy, which results in digital changes that then result in new digital experiences. We argue that figure 6 represent a general and healthy situation for a co-design situation with fruitful dynamic gaps in digital literacy. As argued, anomalies appear and there can be practical or uncontrolled reasons for this. However, it results in exclusion of relevant knowledge and learning, which increases risk of wrong assumptions about digital literacy of excluded parties. To this point, we term the area over the ladder in figure 6 as 'over-reflective', and the area under as 'under-reflective'. If the situation is over-reflective, the visitor and supplier are excluded from the co-design, and if the situation is under-reflective the organisation and researcher are excluded from the co-design.

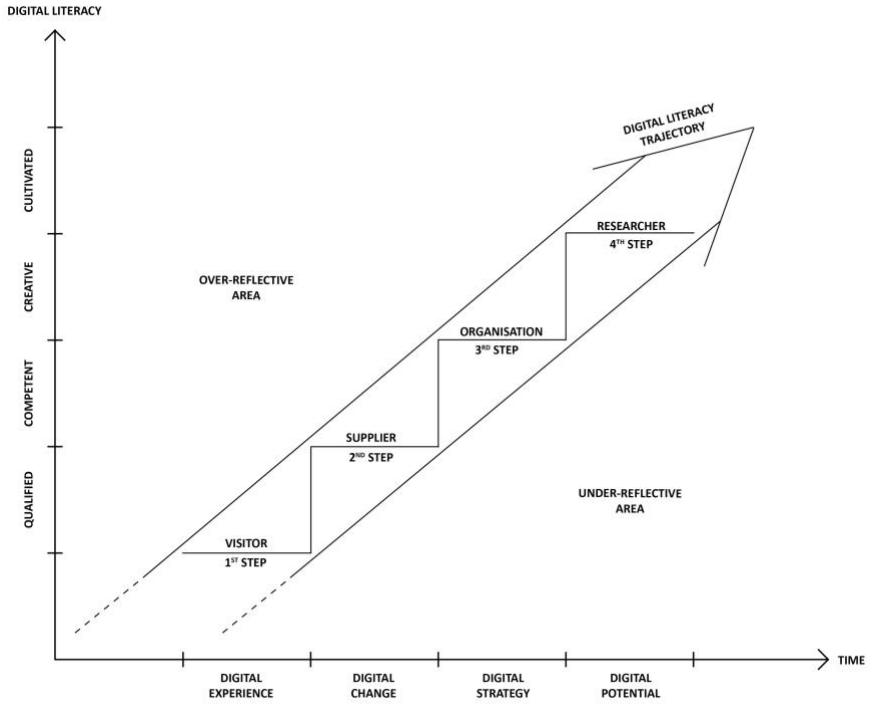

Figure 6. Co-design ladder of reflection

Figure 6 is not considered as a theory describing the actual dynamic reality, and thus we make no general attempts to predict e.g. the time period between each reflective step or how the movement up and down the ladder might look in various edge cases. Rather, the model is outlining a

methodology for optimising digital co-design practice, where the main insight from this seven-year study is how the value of persistent collaborative design research effort has been significantly larger than the sum of the individual collaborative design projects, due to the identified co-evolving digital literacies.

Conclusions and Further Perspectives

From treatment of reflections-on-practice from the seven-year involvement with NSO, we unfold the issues regarding how collaborative design research projects establish digital literacy among stakeholders. From the analysis of workshops, we argue how development of project specific literacy is an important dimension for collaborative design in general, but also how it is important to accept how stakeholders will rarely reach equal literacy – gaps will constantly emerge from exploring new aspects of digital technologies. We argue these dynamic gaps are not a fault of collaborative design, but rather an indicator of a gradual increase of innovation potential. Furthermore, gaps foster a culture of being ready to step outside the comfort zone of one's current literacy to further the state-of-art of practice. Seen through this lens, the need to acknowledge how gradual catch-up between e.g. design researchers and a participating organisation is not a process of uncertainty, but a process of gradual increase in organisational innovation capacity, which might first reveal itself a significant amount of time after the design intervention. As argued, this is a beneficial situation for co-design – even though from a non-dynamic perspective it might be interpreted as the direct opposite; especially in early phases of a collaborative design research. The gaps are thus not to be avoided through e.g. enforcing doctrines or strategies to equalise digital literacy between stakeholders. Instead, it is a precondition to a mutual long-term cultivation and growth of digital literacy. Of course, too big digital literacy differences are a threat to coherence of digital co-creation practice.

The co-design ladder of reflection is our synthesised outline of a methodology for optimising digital co-design practice, by providing an argument for why dynamic gaps in digital literacy, which may initially be seen as an inhibitor, might actually evolve to become one of the strongest value propositions of co-design concerning digital technology.

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