



# Design as a Knowledge Constructing Activity

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**Abstract.** In this chapter, contributions from DLI 2019 show that a design process is not given to its form, structure, or qualities. Rather, design work is given form by designers' and technology developers' own considerations and actions inspired and guided by people's voices, desires, habits, and practices.

**Keywords:** Interactive space · Smart toy · Electrochromic ambient display · Digital libraries · Games and theatre · Participatory design

## 1 Introduction

### 1.1 Scope

The field of design has connections to a number of established academic fields concerned with digital technologies, including user experience design, human-computer interaction, and information systems. There are differences between these fields, in particular when it comes to the understanding of design and design practices. In this section of the proceedings the papers are united around a use-oriented practice of design, where the question about how to think about design, users' experience and artefacts (something made by humans) comes to the fore. While Winnograd [1] described design as “designing spaces for human communication and interaction”, Saffer [2] emphasised its artistic dimensions underlining that it is an art to facilitate interactions between humans through artefacts. Considering that all design work results in a product of some kind, Löwgren and Storlterman [3] points to the thoughtful designer who is part of a larger culture, which they call “design as knowledge construction” (p. 2). In other words, the way of ‘doing’ design can be said to have an eclectic character, being *use-oriented*, *context-and culture-dependent* and a *knowledge constructing* activity, targeting shaping of and knowledge about artefacts that can change the way users think and act. In this way, such designs become *mediators* and essential *action and experience shapers* [4].

The first contribution in this section addresses the question of how designs and integration of hotspots in book apps for children can facilitate mediated reading of digital books. The second contribution focuses on the introduction of a smart and robotic toy to explore its use qualities to support emerging storytelling skills in children. The third

contribution presents a practice-based study of people living remotely from their partner. Here, an unobtrusive display technique was prototyped with an interactive picture frame, which was used as a probe to chart the use possibilities of this technique. The fourth contribution addresses the complex issue of designing a meaningful interface where a library could provide and enhance reading experiences and acquisition of knowledge. The fifth and final contribution reports on initial findings from engaging in participatory and speculative design methods with rural women in Bihar, India. The above-mentioned contributions show that a design process is not given to its form, structure, or qualities. Rather, design work is given form by designers' and technology developers' own considerations and actions inspired and guided by people's voices, desires, habits, and practices (c.f. Löwgren and Stolterman, 2004).

The following text snippets elaborate from each contribution to further assist readership.

## **2 Touch to Read: Investigating the Readers' Interaction Experience in Mediated Reading with Story Apps**

In this contribution, *Douglas Menegazzi and Cristina Sylla*, addresses the question of learning to read in a digital book context. For a child, this is considered as a complex and challenging activity. However, when guided by a more experienced reader, the child can become encouraged to stay focused and becomes engaged to develop reading skills. The paper focuses on how hotspots – interactive areas – in story apps can mediate a child's reading and interaction experience when accompanied by a carer. The carer is also described as a mediator of the child's reading experience. Such hotspots are most often designed to entertain children rather than providing a learning experience. Moreover, the hotspots are scarcely contributing to the story in question, which makes it hard for more experienced readers to interact and guide children to deal with hotspots and mediate reading in this kind of digital books. The authors argue that there is a lack of validated knowledge in digital publishing targeting children, to design for meaningfully mediated reading experiences. Thus, framed by a user-centred design approach, six carer-child couples (children aged 6–9) were engaged in a study investigating positive and negative aspects of the couples' reading experience with different types of interactive areas on apps (i.e. hotspots) when engaged in mediated reading. The results indicated that children's reading flow can be improved and that the engagement between child and carer (or mediator) became more intense when the app allowed a clear space for the child to invite the carer to help by, for example, explaining unknown words. Based on the outcomes of the study, the paper contributes with input to improving design and integration of hotspots in book apps for children and to facilitate mediated reading of digital books. Here, the process of mediation offered potentials for carers and children to shape actions, on the one hand, and the use of interactive spaces (or hotspots), on the other hand.

### 3 Designing a Smart Toy Interactive Setting for Creating Stories

This contribution is authored by *Silke ter Staal, Alejandro Catala, Mariët Theune, and Dennis Reidsma*. To produce products that users experience as beneficial for their purposes refers to the concept of *use experience* commonly applied in the field of design and often applied with an agile *iterative* approach to a design process including prototype development. This can be seen in this second contribution where a smart and robotic toy was introduced to explore its use qualities to support emerging storytelling skills in children. In this field of research, previous studies mostly have focused on technical implementation issues or included specialised hardware, which may limit their potentials to be studied outside a laboratory environment. To contribute to this lack of applications including off-the-shelf affordable components, the paper investigates how to combine a tablet application with an existing smart robotic toy to foster children's creation of stories and their reflection on them. To do so, the authors adopted a user-centred approach based on iterative design processes, empirically evaluating various prototypes involving a total of 73 children. Overall, the results showed that the designed prototype can be used as a starting point for an interactive storytelling system. Beside this, the outcomes raised several new questions, for example about the relationship between play, creativity, and storytelling and how to measure the quality of stories produced in an interactive way. The authors suggest that future research should include teachers, parents, and caregivers to gain knowledge about how the technology best can be applied in practice.

### 4 Our Little Secret: Design and User Study on an Electrochromic Ambient Display for Supporting Long-Distance Relationships

Next DLI 2019 paper by *Hong Li, Heiko Müller, and Jonna Häkkinä*, presents a practice-based study of people living remotely from their partner. Here, the unobtrusive display technique was prototyped with an interactive picture frame, which was used as a probe to chart the use possibilities of this technique. The study was interview-based as well as in-the-wild deployment of one week to evaluate the concept and the design. The use study showed that a non-light-emitting electrochromic display was well received in terms of use qualities such as calmness and pleasantness. Moreover, the technology allowed for easy and cost-efficient manufacturing of customised displays, which could be placed on different shaped surfaces. In particular, the findings from the in-the-wild study highlighted that the prototype, Our Little Secret, added a new communication channel between the remote couple, which supported their communication and relationship at a distance through the form of a pair of private, meaningful, and always-on yet calm displays. Although promising outcomes, the authors acknowledge that their work is limited by a small sample size and a rather short duration of the in-the-wild study. The latter is aligned with challenges of organising in-the-wild user studies in the field of ubiquitous computing. However, the results indicate that a non-light-emitting display may have potential to support long-distance-relationships by offering meaningful and private forms of communication. This paper shows that designers, nowadays, have a wide range of opportunities for designing meaningful user experiences. The range of technological developments has encouraged different ways of thinking about design, for example, by combining physical and digital interfaces in novel ways.

## 5 Keeping Digital Libraries Alive: Designing an Interactive Scientific Publication to Drive Demands of Scholars Based on Participatory Design

Next paper by *Camilla Wohlmuth da Silva and Nuno Correia*, addresses the complex issue of designing a meaningful interface where a library could provide and enhance reading experiences and acquisition of knowledge. The study applied a participatory design approach to discuss and find opportunities for the design of a user interface for sharing scientific knowledge in digital libraries. The authors present the initial steps of a participatory design study where three consecutive steps were carried out, namely a participatory design workshop, a follow-up exercise, and the development of a prototype to demonstrate the applied design solutions. The authors argue that even though existing digital libraries has addressed future actions for improving their interface designs in terms of, for example, functionality, content expansion, and content organisation, they most often do not incorporate stakeholders into the design process. The authors further argue the importance of actively involve stakeholders when creating new and improved design solutions as this can increase the designer's awareness of a problem space. Thus, the authors state, participation can be seen as a researcher's shared decision space to determine quality and direction of, in the case of this paper, scientific publication utilisation. The outcomes of the study showed that working with scholars as participants in a co-design process posed a richness and variety of possible solutions to improve scientific communication by means of digital and interactive designs. The paper points to improvements related to characteristics of the interface to provide increased engagement and accessibility of scientific information to scholars as well as how interaction and functionalities would improve by having meaningful icons as input. In this way, the paper acknowledge the necessity of a participatory design approach to transform an existing digital tool to a meaningful communication medium.

## 6 Enabling Rural Women in India to Speculate Futures Through Games and Theatre: A Participatory Approach

The last paper in this section of the DLI 2019 proceedings by *Arjun Harish, Mahima Chandak, and Shreya Mukta*, reports on initial findings from engaging in participatory and speculative design methods with rural women in Bihar, India. The study outlines a contextualised workshop including participants as equal partners to the design of their future. The authors emphasise that other cultures like India are not naturally democratic and are comprised of politics and power structures within their setting. Based on this, the paper highlights that in such contexts, participatory and speculative design methods can help in giving voice to marginalised groups of people and uncover these complexities to gain a nuanced understanding of their situation. The findings of the paper contribute to researchers, designers, and technologists who aim to uncover key factors that affect the functioning of complex systems to design sustainable interventions.

A design process begins when initial ideas concerning a possible future take shape and, furthermore, this process is always carried out in a culture-base context. In this regard, Löwgren and Stolterman [3] use the concept of *design situation* referring to a

situation that is both the reason for the design process and the context within which the design work is carried out. In this way, the situation is the starting point for a design and evolves along with the design process. Involving stakeholders in such design situations involves considerations of, among others, emotional dimensions to construct knowledge about their desires and expectations. This can, in other words, be expressed as giving voice to the stakeholders as participants in the design process.

## 7 Epilogue and Acknowledgements

This fifth section introduces five contributions to promote readership of each full paper that are presented in the following chapters. In doing so, the authors of this chapter acknowledge the contribution to this section/volume by each author whose original work was presented in the ArtsIT/DLI 2019 events in Aalborg, Denmark November 7–8, 2019.

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