Perpetual Perspectives
On Designing for Aesthetic Engagement

Jeroen Peeters
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DOCTORAL DISSERTATION
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Department of Informatics, Research Reports, No. 17.02
ISBN 978-91-7601-625-1
ISSN 1401-4572
Electronic version available at http://umu.diva-portal.org

THIS PHD RESEARCH WAS MADE POSSIBLE BY
The Designing Engaging Information Technologies project funded by the Swedish Foundation for Strategic Research (SSF) within the Framtidens Forskningsledare program.
The Sketching Techniques for Interaction Designers in Industrial Environments project (Forskningsprojekt vid Konstnärligt campus) funded by Baltic Design AB.
The Designing Tools for Social Transformation project at the Umeå School of Architecture, partially funded by Baltic Design AB.
Hosted and supported by RISE Interactive.

LAYOUT AND TYPOGRAPHY Marlies Peeters www.marliespeeters.com
COVER DESIGN Marlies Peeters and Jeroen Peeters
IMAGES All images by Jeroen Peeters except: page 70 by Hummels and Frens.
Pages 142, 145, and 147 by Van AllesWat Ontwerp. Pages 148, 150, 152, 154, 155, and 158 by Sara Colombazzi. Page 164 by the University of Siena.

PRINTED BY Pantheon Drukkers www.pantheondrukkers.nl

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January 2017
Umeå, Sweden
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Abstract

This dissertation investigates aesthetics of engagement in interaction. Aesthetic refers to the aesthetic experience, based on a phenomenological and pragmatist understanding: dynamic and personal, appealing mutually to — and formed inseparably by — our bodily, emotional, as well as intellectual faculties. Engagement signifies this experience as forming a deeply involved relationship between people and an artefact in interaction.

The theoretical background upon which this work is based, asserts that we perceive the world in terms of how we can act in it. Action, through the body, is how we make sense of the world around us. To be congruent with these foundations and the topic at hand means that the research program was investigated through a constructive design research process. The research program anchors and outlines the goal of this investigation: to contribute shareable knowledge of how to design for aesthetic engagement in interaction by leveraging a first-person perspective. The findings of this research form two contributions to the overlapping fields of Human-Computer Interaction and (Interaction) Design Research.

The main contribution is methodological and is concerned with generating knowledge through design. The methodological structure of this dissertation builds on a programmatic approach that centres on the first-person perspective of the designer, who learns from experience by reflecting on design
Designing for aesthetics of engagement proposes ways to respect people’s skills in making sense of the complexity of the lived world. In respecting the uniqueness of their body and the subjectivity of their experiences, to design for aesthetic engagement is to support the expression of personal points of view in interaction. This points to ways in which designers can open up interactions with digital technologies to be more beautiful, respectful, and liveable, as it touches what makes us human: our personal being in the world.

Such an approach is fundamental to the design tradition, but its dependency on subjectivity is also a source of epistemological conflict since design, as mode of inquiry, matures and comes in contact with more established disciplines that have their own academic traditions. For design research, to develop its own intellectual culture, alternative and bidirectional relationships between theory and practice need to be further shaped, articulated, and debated in the field. This dissertation contributes to this discussion around designerly ways of knowing by exposing how skilful coping and intuition, through mechanisms of reflection-on-action, generate a multitude of perspectives on a complex design space. These perspectives reveal parts of the complexity of designing for aesthetic engagement, while leaving it intact. Exposing and consolidating the first-person (design) knowledge embedded in these perspectives allows this knowledge to be articulated as a shareable academic knowledge contribution.

This shareable knowledge forms the second contribution of this dissertation. Reflections on the process and results of eight constructive design research projects describe a design space around aesthetic engagement. Individual reflections are consolidated into themes that describe how a design may elicit aesthetic engagement in interaction. These themes are experiential qualities: conceptual values that can be leveraged for a design to appeal to both mind and body in ways that are rich, open-ended and ambiguous. The findings propose strategies for interactions with digital technologies to open up the complexity of relations in the world between artefacts and people.
PART I  GROUNDINGS
Design does not exist in a vacuum. The things that designers create are rapidly forming more and more of the world around us and these things co-shape our existence.
Technology mediates our relationship with the world, influencing our experience of that world and our behaviour in it \cite{Verbeek2005}.

Design thus has the power of transforming society, by guiding the ways in which these technologies mediate our relationship to the world and between one another \cite{Hummels2013}. This power of designers comes at a cost: it highlights the necessity to take responsibility and to use this influence to change our world into a better one, which leads to ethics.

Ethics and aesthetics are closely intertwined; aesthetics is a means with which to incorporate ethics into design \cite{Ross2008}. In interaction, aesthetics allow the way that we use technologies to embody other values than ease-of-use. Aesthetics call for interactions to appeal to all of our skills as humans \cite{Overbeeke2007}, to become playful, exhilarating, interesting, and more \cite{Locher2010}. To liberate from cognitive overload and appeal to our physical abilities \cite{Djajadiningrat2007}.

Aesthetics of interaction allow for a holistic perspective towards what we as human beings are: more than practical robots that carry out tasks. To create a world in which the personality and subjectivity of people is not reduced to uniformity, but celebrated for its uniqueness. To create things that elicit involvement and participation, to create a profound experience that has personal meaning and engages us.

This dissertation investigates aesthetics of interaction, and in particular how to design for aesthetics of engagement in interaction. Aesthetics here, refers to the aesthetic experience in the pragmatist philosophical tradition: dynamic and personal experience that appeals mutually and inseparably to our bodily and intellectual faculties, coloured by the socio-cultural context and our past experiences. Engagement emphasises the deeply personal and involved relationship between person(s) and artifact(s) that is aimed at through this aesthetic experience.

Berleant, in Art and Engagement, perhaps describes this best: “Most important for us as creators and appreciators of art is the contribution we ourselves make, a contribution that is active and constitutive. That is why I call this an aesthetics of engagement, a participatory aesthetics” \cite[1991, p.4]{Berleant1991}.

This introduction serves as a way to position the necessity and relevance of this topic. The way in which these themes are woven into this dissertation is elaborated on in the following sections.
1.1 AIMS

To create interactive artifacts that elicit aesthetics of engagement, designers need to know how to design them. The first aims of this dissertation is to contribute a actionable and pragmatic understanding of how qualities of an interactive artefact can be designed to elicit an aesthetic experience and through this foster a personal, involved and engaged relationship between a person and an artefact, or between persons through an artefact.

This dissertation aims at contributing knowledge towards a designerly understanding of how interactive artefacts can be designed to elicit aesthetic engagement. Designerly here signifies both what this understanding is directed towards, how to design, as well as the way this understanding is acquired, through design.

/ THROUGH DESIGN

A theoretical framework frames understanding of what an aesthetic experience is, where it comes from, and how it may be engaging. The theoretical background upon which this work is based includes ecological perception (Gibson 1979), phenomenology (Merleau-Ponty 1945), American Pragmatism (Dewey 1934), and embodied cognition (Clark 1997). Although not entirely compatible, these foundations share a notion of embodiment which asserts that we perceive the world in terms of how we can act in it. Action, through the body, is how we make sense of the world around us. Matthews, after Merleau-Ponty, explains what this means: we can perceive, by acting and interacting in the world, because we have bodies. Perception is born in action and precedes cognition. As a consequence, we thus always perceive the world from a particular point of view, our own. Matthews 2006, 34–35

In this research, these foundations point towards two important consequences: the complexity of the research topic, aesthetic engagement, and a way to deal with this complexity: through

Following a pragmatist and phenomenological notion of aesthetic experience means that an experience becomes highly subjective, ephemeral, and ungraspable. It emerges as a complex whole that cannot be pulled apart or accurately described in words. This highlights the complexity of the first aim: it is
precisely the unity of the elements that constitute an aesthetic experience that is the essence of this experience. To generate knowledge towards how to design for aesthetic engagement, thus becomes an investigation that needs to embrace this complexity, while trying to better understand what it is made of.

As Nelson and Stolterman describe, a scientific way of knowing is not equipped to understand the richness and complexity of our experience in the real world, at least in any holistic sense. An analytical perspective breaks complexity apart, while from a design perspective, the real is a whole. Nelson and Stolterman 2003, 45. This points to the value of design in this investigation.

Design is fundamentally a process of acting in the world to create the ultimate particular: a specific design. This creation of the ultimate particular is design will and design intention, guided by design judgment. Nelson and Stolterman 2003, 33–34. This ultimate particular, created by the skilled action of the designer, thus embodies his point of view. Trotto et al. 2011.

The research in this dissertation is based on this view of design and falls under Research through Design. Frayling 1993. To be more particular, the research presented here falls under constructive design research: a form of research where the design and construction of artifacts is central in the process of knowledge production. Koskinen et al. 2011. The methodological approach of this dissertation builds on the first-person perspective of the designer to investigate the complexity of aesthetic engagement. Learning from experience by reflecting on design action, while trusting intuition and skills, forms the basis of the way knowledge is generated: through design.

The subjectivity in this approach is fundamental to the design tradition, but also a source of epistemological conflict. As design, as mode of inquiry, is increasingly adopted by fields within the academic tradition that emphasise objectivity and often place theory over practice. For design research to develop its own intellectual culture, based on designerly ways of knowing, doing, and thinking. Cross 2001, alternative relationships between theory and practice need to be formed, articulated, and debated in the community.

This main aim of this dissertation is to articulate how a constructive design research approach may leverage first-person experiences to generate an academic knowledge contribution. This aim contributes to the development of designerly ways of knowing by articulating an alternative relationship between theory and practice.

The methodological structure presented in chapter 3, proposes a way to view this relationship as bidirectional and mutually informative. In this structure, the practice perspective is represented by an approach to design as a reflective practice. Schön 1983. The theoretical perspective is represented by a programmatic design research approach. Binder and Redström 2006.

1.2 RESEARCH PROGRAM

To contribute to a pragmatic and applicable understanding of how to design for an engaging aesthetic experience, this dissertation investigates the opportunities that exist in this design space. The inherent complexity of this research topic itself indicates that
In this dissertation, the research program is the main research interest: the goal of the overarching research trajectory. This goal is to generate shareable knowledge on how to design for aesthetic engagement and to articulate how this knowledge is generated by leveraging the first-person perspective.

These two fundamental components of this research program outlined in the sections above, provide handles to guide the overall research trajectory. The research program states a topic and is indicative of what knowledge it is aimed at generating. The topic of aesthetic engagement provides handles for this research because it allows building on existing theoretical and practical work. For example, existing research work into the aesthetic experience in interaction design (elaborated on in chapter 2); or, existing practical work in the form of others or my own design work that has explored how this aesthetic experience can be designed (the latter is elaborated on in chapter 5). Lastly, the research program points to what knowledge is to be generated, shareable knowledge, and how this knowledge is to be generated, through design experiments.

Programmatic design research is a particular way to deal with such an investigation, where experimental design is used to explore and illustrate opportunities, rather than to search for an optimal solution. Redström 2001, 26. In a programmatic approach, the program acts as a provisional knowledge regime, a starting point that frames the research interest and is realised through design experiments Binder and Redström 2006. Program and experiment mutually influence and sharpen one another as research unfolds Redström 2011. The way in which this programmatic approach is used in this dissertation is elaborated on in chapters 3 and 4. At this point however, it is relevant to make a distinction between a research program and a design program.

Programmatic design research is a particular way to deal with such an investigation, where experimental design is used to explore and illustrate opportunities, rather than to search for an optimal solution. \textsuperscript{3} Redström 2001, 26. In a programmatic approach, the program acts as a provisional knowledge regime, a starting point that frames the research interest and is realised through design experiments \textsuperscript{4} Binder and Redström 2006. Program and experiment mutually influence and sharpen one another as research unfolds \textsuperscript{5} Redström 2011. The way in which this programmatic approach is used in this dissertation is elaborated on in chapters 3 and 4. At this point however, it is relevant to make a distinction between a research program and a design program.
The main contribution of this research is to expose and articulate this process of cycling through a multitude of perspectives on the complex whole that an engaging aesthetic experience is. This dissertation articulates these perspectives and places them in relation to each other, in order to show what knowledge of the subject matter they expose together.

1.3 STRUCTURE OF THIS DISSERTATION

This dissertation is structured into three Parts:

Part I, Groundings, presents the foundations for this research project by introducing the research program that integrates the intentions for the dissertation. Chapter 1 outlines the aim and programmatic approach of the overall research trajectory. The following chapters position this research program within the field of informatics and design research. Chapter 2 discusses how the field of informatics evolved to adopt a notion of embodiment towards the design of digital technologies. This chapter concludes by discussing earlier frameworks and approaches around the aesthetic experience in interaction design that informed this research program. Chapter 3 proposes and elaborates on the methodological structure of this dissertation. In this structure, the artifacts that are created in design research exist in the meeting points of two perspectives: practice and theory. Unpacking this methodological structure demonstrates a way to generate shareable knowledge by positioning reflective practice within constructive design research.

Part II, The Real, presents the actions undertaken as part of this approach: the design and construction of artifacts. This part presents the body of work, a series of artifacts, formed by the constructive research approach. Chapter 4 elaborates on the notion of a design space and the way in which this design space is communicated using an annotated portfolio. The second section of this chapter presents a model to structure this work into three cycles. Each cycle involves formulating, realising, and reflecting on design programs. The following chapters discuss these three cycles in more detail, as they successively explored, dimensioned, and articulated the design space. The second section of these chapters present the artifacts that were designed and individual reflections on this work from the perspective of aesthetic engagement. The reflections start to expose the knowledge these projects embody on experiential qualities of aesthetic engagement.

Part III, Perspectives, consolidates and reflects on the knowledge generated in response to the research program. The first section of chapter 8 responds to the main aim by elaborating on the reflective methodology that was used to leverage the first-person perspective in generating shareable knowledge on how to design of aesthetic engagement. The second section of this chapter presents the shareable knowledge generated in this process, by describing the design space around aesthetic engagement. This section consolidates perspectives on the design space to describe particular experiential qualities that emerged from reflections on the design work. These experiential qualities are highlighted and related to existing work.
in the field of interaction design research. Chapter 9 presents additional perspectives on this research as a whole in the form of methodological reflections. These reflections highlight consequences of the perspectives taken in this research, pointing towards related insights and opportunities for further research. The conclusions in chapter 10 discuss the implications and recommendations of these findings for researchers and practitioners in interaction design.
The relatively young field of informatics studies the relationship between people and digital technologies. Due to the pervasiveness of Information Technologies, informatics is a field that is complex, multi-faceted, and far-reaching.
The academic field of informatics covers a wide range of perspectives, contexts, and specialisations. These range from the micro (e.g. specific usability issues and design guidelines) to the macro (e.g. organisational, political, and ethical dimensions of digital technologies). One way of engaging with such issues is design. Design is a particular way of looking at, engaging with, and especially doing in digital technologies that has become increasingly pervasive and influential in the field.

This chapter will examine this particular perspective of design within the context of informatics by focusing on the overlapping fields of Human-Computer Interaction (HCI) and Interaction Design. An overview of influential scholarly works and their adoption within the field sketches how our understanding of the role of digital technologies has changed. These changes opened up towards new theoretical foundations that form the basis for this dissertation.


2.1 STRUCTURE

The main focus of this chapter will be on the slow but steady depart from an engineering perspective dominated by a rationalistic approach, towards a socially constructed perspective that has created a stable space for design. Design here is a mode of inquiry, a way of understanding by working with technology to create that-which-does-not-yet-exist. Nelson and Stolterman 2003, 39.

The first section discusses the expansion of an originally narrow, technologically deterministic field to one that came to expose the complex entanglements that form the relationship between humans and technologies. To unravel these entanglements exposes the importance and necessity of societal and contextual factors in this relationship. Of particular interest here are the key points made by Pelle Ehn in Work-Oriented Design of Computer Artifacts 1988. This work would foreshadow major developments within the field and aided in forming philosophical and methodological foundations for design in informatics.

The second section on embodiment discusses how this expanded scope grew further, as digital technologies started to become pervasive throughout all aspects of daily life. Turning towards phenomenological foundations, the notion of embodiment allowed the integration of different perspectives in the field. Embodiment connects social, contextual, and tangible perspectives on digital technologies. Moreover, it provides a fertile ground for hands-on dealings with the difficult question of how to design for experiences.

These opportunities and caveats that a position based on embodiment presents for the design of experiences with digital technologies, is more thoroughly discussed in the third section. In particular this section highlights approaches and frameworks that leverage different theoretical notions of embodiment to gain a grip on the design of aesthetic experiences in interaction. These handles provided by this related work form a starting point for this dissertation’s investigation into aesthetics of engagement. Moreover, as theoretically informed frameworks, this related work also sketches the relevance of a constructive design research approach: an approach that articulates an alternative relationship between theory and practice to contribute to an understanding of aesthetic experiences.

2.2 ENTANGLED IN THE SOCIAL

Early computers were developed by (electrical) engineers, mathematicians, and computer scientists. These computers were intended to be used in the workplace. Designing, measuring, and evaluating the relationship between these technologies and their users focused on the automation of work tasks. To deal with the human component of this relationship, early methods and approaches were heavily influenced by cognitive psychology.

Examples of this are the GOMS model Card, Moran, and Newell 1983 or Donald Norman’s 1988 7 Steps of Action. In these models, the role of the human largely resembles that of a cognitive information processor. This perspective fit well with the state of computers of the time as it provided clear ways to create and assess the way single computers were able to deal with single users in a work-oriented context.
As computer technologies became more widespread, accessible, powerful, and accepted, the limitations of such models started to show and other approaches and methodologies were called for. Social and contextual aspects of computer technologies became new dimensions along which the design and effect of these artifacts could be studied. This can be seen as the birth of informatics, as it became clear that the use of computer artifacts depended on contextual, social, and personal factors. These factors extend beyond the “one man – one machine” paradigm on which the initial rationalistic computer science perspective was based.

A good starting point for this discussion is Pelle Ehn’s *Work-Oriented Design of Computer Artifacts* (1988). His contribution to the field is impressive in its breadth and presents three main points that would foreshadow major developments and lasting approaches in the field.

Firstly, Ehn, among others (Winograd and Flores 1986; Dreyfus 1972), pointed towards the shortcomings of Cartesian dualism in computer science. He stressed the need for an alternative philosophy of technology based on existential phenomenology.

Secondly, in continuation of this philosophical argument, Ehn proposed transdisciplinarity as an imperative step to take in humanising the design of computer artifacts. He argued for the expansion of the existing methodological foundations of computer design to include the rich traditions found in the humanities and arts (1988, 210). In particular, Ehn emphasised a need for practical knowledge – the fundamental component of design – in addition to theoretical knowledge, the hallmark of Cartesian dualism (1988, 77).

Thirdly, Ehn actualises these positions by proposing and dissecting an approach where user-participation in the design process is key: building on the skills of both users and designers to develop digital technologies that promote democratisation of the workplace.

This pioneering work in what has been developed as Participatory Design is perhaps most well known. However, of particular interest here are the other two contributions. Ehn’s positioning of a phenomenological approach to the design of computers and his sketches of the consequences of this paradigmatic shift on many different levels (epistemologically, methodologically, and practically) could be regarded as fundamental to the position of design in Informatics today.

In discussing the judgment of the designer, Ehn points out the need for a practical understanding when designing things, in addition to detached reflection (1988, 124). In particular he discusses the necessity for designers to engage with what they are designing, practically, in order to understand it (1988, 78).

Suchman’s *Plans and Situated Actions: The Problem of Human-Machine Communication* (1987) is another example of an early critique of the rationalistic approach and a call to open the study of digital technologies far beyond an engineering perspective. Suchman argues that difficulties in using digital technologies arise as a result of cognitive models that insist actions are a result of plans that are made on the basis of general knowledge, irrespective of the context in which these actions are required.

Based on a case study, Suchman stresses actions as situated, meaning they arise from a particular context and emerge in a
social dimension. In other words, the disconnected and objective plan of actions envisioned by the designer in a cognitive model, often does not correspond with the improvised and subjective nature of the plans and actions executed by users, together, in the real world.

In addition, her critique of then-current approaches and the alternative she proposed, the empirical research that Suchman 1987 used to develop her arguments is also of relevance here. Her analysis of users and their interactions with a copying machine was based on ethnomethodology, an approach borrowed from sociology. This is worth noting as a clear example of the field broadening its scope to look beyond disciplinary boundaries. Borrowing methods from (primarily) the social sciences, meant not only recognizing the need for a social perspective on digital artifacts and society, but also the need for workable approaches within this social perspective.

In Computers and Context, Dahlbom and Mathiassen 1993 highlighted the influential external factors that affect the organisations, workplaces, and social settings in places where computers were used. Their extensive and accessible book lifts the design of digital technologies from a clear engineering perspective to a more holistic point of view that more accurately portrays the complexities of developing technologies and their influence on our social behavior. Written largely towards a practitioner’s audience, it makes explicit how the design decisions, processes, and goals of software development relate to their potentially far-reaching consequences.

A similar perspective relating to the political and ethical dimensions of digital technologies is discussed more theoretically and extensively in Computerization and Controversy Klein 1996. In this collection of essays, a multitude of perspectives on the ethics of computers are put forward. These range from the technologically deterministic to the economic, cultural, organisational, and privacy concerns that may arise. The many perspectives presented are sometimes conflicting or even polemic in regards to their counterparts in the same book. However, they highlight the inherent complexity of these rising ethical concerns and the need for a more humane approach in the development and research of digital technologies.

To conclude: the developments set in motion by among others, the seminal works of Ehn 1988 and Suchman 1987, signify an important change in scope for the field of Informatics. Not only did new perspectives emerge that approach the relationship between computers and society more holistically. The resulting openness towards academic fields other than computing science, primarily the social sciences, also exposed researchers and practitioners to other methodologies for studying this relationship. Moreover, this openness towards other ways of understanding digital technologies starts to sketch the opportunity and necessity for practical ways of understanding and engaging with such technologies. This starts to open the field towards the domain of design as of critical importance in developing the relationship between computers and people.
defined embodied interaction as “the creation, manipulation, and sharing of meaning through engaged interaction with artifacts” \textsuperscript{2001, 126}.

This phenomenological perspective on embodiment asserts that we live in a world that is inherently meaningful and we make sense of it by acting in it by using our bodies in a way that is fundamentally physical and social. \textsuperscript{Dourish 2001, 127}.

Dourish's work stably cemented the validity of a phenomenological approach among the possible approaches in HCI research. An embodied experience born from our physical actions in the world stresses the importance of the body and thereby corrects the Cartesian mind/body split. This split was discussed in earlier sections of this chapter, but here it becomes important to note why embodiment is particularly useful for design. The concept of embodiment is functional to design as it readdresses the balance between cognitive and physical abilities of people. This shifts attention from logically structuring information to the expressivity of that information in the physical world, entering the domain of design.

Dourish's Embodied Interaction has received increased attention and traction within the research community. The notion of embodiment has been developed based on various strands of phenomenology, for example by Fällman \textsuperscript{2003}, and has also aided in the integration of other approaches founded on ecological psychology or embodied cognition.

In Ecological Psychology \textsuperscript{1979}, Gibson describes how we perceive the world in terms of the possibilities we have to act in it using our bodies. Coining the term affordances, his work has been fundamental in early interaction design frameworks.
ease-of-use and consider meaningful or emotional dimensions of experience in the use of digital technologies e.g. Norman 2005.

Many different theories, approaches, methodologies and frameworks have been introduced to deal with the design of experiences. This section of this dissertation aims at introducing the topic of aesthetics of interaction as emergent from these developments. More complete and historic overviews of such research work have been done extensively and can be found elsewhere e.g. Forlizzi and Battarbee 2004; Desmet and Hekkert 2007. The following paragraphs focus on establishing a particular view of a product’s function in relation to aesthetic experience, in order to set the stage for aesthetics of interaction discussed in more detail thereafter.

Within this broadening, the fundamental notion of a digital technology’s function is challenged as its sole or main requirement. A design’s use becomes more than its instrumental functionality, it becomes important to consider how it can have a meaningful presence in someone’s life Hallnäs and Redström 2002. Ross 2008 points out after Verbeek 2005 that especially when we consider technology to mediate our experience of the world, the term functionality needs to be broadened to accommodate for a design’s intended social transformation.

A design’s function in this dissertation is considered along this line, as more than its mere ability to carry out the task for which it was created. Rather, as a beautiful and meaningful part of our world. Particular attention is given to how this task can be carried out: how the design may exhibit aesthetics in use Dunne 1999. This dissertation builds upon existing work around this topic. Aesthetics of interaction is a particular way...
of valuing the design of experiences, where designers and researchers explore how the way in which we use things might provide an aesthetic experience.

American Pragmatist philosopher John Dewey’s book *Art as Experience* (1934) is often used as a source of philosophical reflection to get a grip on what an aesthetic experience is. In his view, the aesthetic experience is a fluid product of inseparable parts bodily, emotional, and intellectual that comes from action (1934, 56). Dewey also points out his dissatisfaction with the increasing separation between the worlds of art and daily life (1934, 8). Shusterman (2000) builds on Dewey’s work and discusses daily aesthetic experience from a deeply embodied perspective, coining somaesthetics as a field that studies aesthetics of experience through action using the living body.

The emphasis, or even ideal, found in connecting aesthetics and daily life has seen pragmatist aesthetics being used extensively as the basis for the formation of approaches and principles in designing aesthetic experiences. Moreover, it is important to point out here that pragmatist aesthetics are fundamentally different from analytical aesthetics. In analytical aesthetics, aesthetics are properties of an object, e.g. as a designer uses a specific quality of coloured glass in the design of a lamp, and therefore that lamp gains an aesthetic property. This is a property of the lamp and exists disconnected from the world around it or the person experiencing the lamp. In pragmatist aesthetics, the aesthetic is a process of appreciation, a dialogue between the person and artefact, where the aesthetic cannot be disconnected from its socio-cultural context.

Graves Petersen et al. (2004) build on Shusterman’s articulation of Dewey’s pragmatist aesthetics to propose a theoretical foundation for aesthetics of interaction. Describing the aesthetic experience as inseparably part bodily, and part intellectual, Graves Petersen et al. highlight how interaction design might leverage both of these parts to create a profound experience. Moreover, they stress the opportunity such an approach presents to regard the aesthetic, as is the case in the pragmatist tradition, as an integrated – rather than superficial – part of interactive systems.

Along a similar line, McCarthy and Wright (2004) draw upon the pragmatist discourse, in particular John Dewey and Mikhail Bakhtin, to propose a theoretical framework for interaction design to provide aesthetic experiences with the technologies deeply embedded in our daily lives. In *Technology as Experience* they employ perspectives derived from theory and applied in analysis of everyday technologies to propose four strands of the aesthetic experience as a way to understand and work with it in design: the sensual thread emphasizing sensory engagement in a situation; the emotional thread highlighting the way in which our personal perspectives and feelings colour our experience; the compositional thread that synthesises the different parts of an experience into one whole, and finally the spatio-temporal thread asserting all experiences as existing in space and time (2004, 79).

Ross and Wensveen (2010) build on Shusterman’s articulation of Dewey and the research of Graves Petersen et al. to propose a framework for aesthetic interaction that more explicitly emphasises form as an essential component. They identify the four components of aesthetic interaction as: having a practical use
next to being rewarding in itself, considering social and ethical dimensions of its existence, having a satisfying dynamic form, and respecting and involving all of a person’s capabilities.

It is worth noting that the authors of the above-mentioned frameworks based on pragmatist aesthetics all point out the inherent shortcomings of their propositions. In line with their philosophical groundings their descriptions are inescapably incomplete, as the aesthetic experience is ephemeral, fluid, and released in dialogue. As such, the aesthetic experience cannot be described accurately in words. Nonetheless, these frameworks have proven to be crucial in advancing the understanding of the aesthetic experience in interaction and are still used in interaction design research and education.

However, the research community still struggles to be consistent and decisive in applying these frameworks. The clarity of how to design for aesthetics of interaction is often still muffled by the inherent complexity and ephemeral nature of what this experience is, despite the clarification offered by different frameworks.

In contributing a designerly understanding of how to design for aesthetic engagement, this dissertation does not aim at being complete or definitive. Rather, the intention is at adding to existing knowledge of how aesthetics of interaction, particularly focused at engagement, can be designed. The constructive design research process <Koskinen et al. 2011> through which this knowledge is generated, aims at exposing a multiplicity of perspectives in and on this topic, both during and after the research process. Together, these perspectives articulate a living relationship between practice and theory. The following chapter will more closely look at this relationship and propose how design can be used to move between theory and practice in alternate ways, in order to better understand the inherent complexity and ephemeral nature of the aesthetic experience.
This chapter articulates a relationship between theory and practice from the notion of design as a mode of inquiry.
In particular this is done by positioning this relationship within the wider discourse of design research; a way of generating knowledge within the context of academic research. This discussion of perspectives on design research sets the stage for the particular methodological structure formed for the constructive design research work presented in this dissertation.

Design, as a specific mode of inquiry, is particularly suited to engage with complex matters.

As discussed in the previous chapter, to design for engagement through aesthetics of interaction is complex, as the notion of experience on which this work is founded stresses the interdependency of many factors and forces involved in our perception of the world. This sketches an opportunity for a constructive design research investigation to form a contribution towards existing theoretical understandings of these factors and forces.

Section 2.3 in the previous chapter elaborated on an embodied perspective towards initiating and carrying out design tasks. From an embodied perspective, acting in the world is our source of experience and therefore knowledge of that world. It then makes sense to start this design investigation from design action.

The first section of this chapter discussed design as a mode of inquiry, by establishing how, as a particular way of looking - and especially making - design is a valuable way to generate knowledge. The emphasis is on making here, as design is fundamentally about creating something new: a concrete manifestation that did not exist prior to the act of designing. The action of making in design elicits and enables the process of making sense of the world and allows the generation of new meaning (Trotto 2011).

Firstly, this section establishes perspectives on how the knowledge created by design is valuable, but also inherently difficult within an academic context. Secondly, this section discusses different types of design research to position the particular type of design research of interest here: constructive design research.

The methodological structure that forms a mechanism for the investigation in this dissertation is presented and illustrated in the second section. Here, the focus is on establishing the different levels of the design research process that explored aesthetic engagement. This establishes the methodological structure formed to expose the knowledge this process produces.

This chapter concludes with a description of the particular contexts where the constructive design research work presented in the next chapter were created.
3.1 **DESIGN AS A MODE OF INQUIRY**

In *Work-Oriented Design of Computer Artefacts*, Pelle Ehn discusses the need for a practical understanding when developing technologies, pointing out the shortcomings of working solely from detached reflection <Ehn 1988, 124>. In particular, Ehn discusses the necessity for those that create technologies to engage with what they are designing, practically, in order to understand it <1988, 78>. He places this need in contrast to the dominance of theoretical understandings in our Western society. To support this position, Ehn points out examples from the rich traditions of the arts, architecture, and design, where skilled practical work has always gone hand in hand with the practice of generating knowledge: research.

What these traditions share, Ehn points out, is that they create temporary or finite proposals that synthesise advancing understandings and multiple concerns. As such, design has proven to be a pragmatic and actionable course to take in dealing with complex and difficult issues. Design has been argued to be particularly well suited to deal with so-called “wicked” problems <Rittel and Webber 1973>, problems without a clear-cut solution as they are characterised by complex and multi-faceted perspectives of many stakeholders.

Within the field of Human–Computer Interaction, approaches influenced by design became increasingly adopted when the field started to explore the question of how to design experiences <Bødker 2006>. Faced with a holistic view on its intended user, one consisting of a whole person – a human being with a body, a personality, past experiences, hopes, dreams, and desires, Overbeeke 2007 – the field required approaches to deal with this new found complexity.

Although to consider design as a particular mode of inquiry certainly establishes its ability in generating knowledge by engaging directly with complex matters, design in essence involves subjective choices. This exposes a fundamental difficulty in its relationship to academic traditions that are mainly concerned with scientific methodologies to reveal objective truths. As the field of design research matures, scholarly debate has sought to more clearly articulate these essential differences.

Fundamentally, as Gregory states, design is not concerned with analysing what already exists: design is concerned with creating that which does not yet exist <Gregory 1966, 6>. Similarly, Gaver 2012 argues design is generative, concerned with proposing what might be, rather than describing what is. Another way to highlight this perspective is articulated by Seago and Dunne 1999, who state that replicability, the hallmark of the scientific method, is very much the opposite of design, where replicability does not, even should not, apply. Cross 2001 argues that design should be considered as a way of knowing in its own right: designerly ways of knowing with own values and praxis.

The analysis of Nelson and Stolterman 2003 on the value of design as a powerful and unique, but systematically undervalued mode of inquiry brings this discussion closer to the source of knowledge in design: the act of designing. In contrasting three domains of inquiry, they state that design is fundamentally different from scientific or artistic modes of inquiry: scientific
inquiry is concerned with creating knowledge that is *true*; knowledge that centers on universal facts and descriptive knowing of what *is*. Artistic modes of inquiry are concerned with the *ideal*, investigating norms and values to transcend what exists, to focus on what *ought to be*. Design, then is fundamentally different because it engages with and focuses specifically on what is *real*. It forms a compound mode of inquiry that certainly engages with the *true* and *ideal*, but explicitly focusses on the *real* by creating the *not-yet-existing* (2003, 38–41).

As designers shape the *real*, the question becomes where the knowledge produced by this shaping resides. In his oft-cited work, Christopher Frayling coined the term Research through Design (1993). He defines Research through Design as “research where the end product is an artifact – where the thinking is, so to speak – embodied in the artefact, where the goal is not primarily communicable knowledge in the sense of verbal communication, but in the sense of visual or iconic communication”. Frayling’s definition does not tackle how one might actually do this. However, it brings this discussion closer to understanding what makes this way of doing research different: design makes things.

Zimmerman et al. (2007) further articulate Frayling’s notion of Research through Design and in particular, how it relates to research on interactions with digital technologies. They assert the importance of making-centred approaches in the field of Human–Computer Interaction, to create prototypes that reveal insights into complex problems by embodying possible futures. Both Frayling and Zimmerman et al. here point towards the act of making as a way of generating knowledge. Other forms of design research exist, but approaches leveraging design’s ability to make things have increased in relevance, not in the least within the Human–Computer Interaction and Interaction Design communities. Koskinen et al. (2011) provide an overview of different approaches in design research that center on the construction of artefacts: constructive design research. This is “…research that imagines and builds new things and describes and explains these constructions” (2011, 6).

Koskinen et al. (2011) present a topology of three different approaches to constructive design research. The *Lab* approach, where prototypes become physical hypotheses that are evaluated in controlled-environment experiments. The *Showroom* approach, where prototypes or design proposals take a provocative role, intended to evoke discussion and elicit thought or dialogue about potential futures. And finally, the *Field* approach, where prototypes are used as design interventions, deployed in real-life settings and observed in use. This broad topology encompasses different specific methodologies, but Lab, Field, and Showroom all emphasise the importance of the artefacts created by design action.

Having established the possibility for *things* to embody knowledge, it then becomes important to consider how this knowledge is embodied. The next section will elaborate on the mechanisms of design action in creating the *things* that embody an advanced understanding of a particular situation and that generate new knowledge.
3.2 INTUITION, SKILL, AND THE FIRST-PERSON PERSPECTIVE

Returning to Nelson and Stolterman’s analysis of design 2003: in creating the not-yet-existing, designers produce the ultimate particular. The ultimate particular is a concrete proposal that balances the resistance of the real world with the desiderata that inform its making. Desiderata is a concept that gives direction to the actions of a designer in creating the ultimate particular, the desiderata encompass and balance concerns from the domains of ethics, aesthetics, and reason into a unified whole 2003, 135. Desiderata give direction to how we want to world to be, as we transform it by making something that brings us closer to that world. Desire here, “can be understood as the ‘force’ that provides us with intrinsic guidance and energy” 2003, 142.

Desiderata here resonates with Sennett’s explanation of intuition in The Craftsman: “intuition begins with the sense that what is not yet could be” Sennett 2008, 201. Sennett goes on to describe intuition as necessary to make leaps: “an imaginative experience … that guides us towards what we sense is an unknown reality latent with possibility” 2008, 213. Desire is where we want to be, intuition is what brings us there.

Like design itself Nelson and Stolterman 2003, 41, constructive design research, from this perspective becomes both a journey and a destination. The knowledge that this form of inquiry generates exists both in the dynamic understanding of the design situation directed through intention, the process, as well as the in the ultimate particular, the result that embodies the decisions based on this understanding. The understanding consists of the complexities of a design situation, directed by desiderata to make decisions to give form through intuition. This understanding positions judgment as the means of design. Nelson and Stolterman describe this judgment as a way of making decisions that does not depend on strict rules of reasoning but more likely depends on a person’s accumulated experiences 2003, 181.

Ehn 1988, 228 in establishing the need for this practical understanding, builds on Schön’s Reflective Practice 1983 to assert the importance of judgment as essentially to what designers do: to make decisions in a dialogue with the design material in a way that is neither completely absorbed action nor completely detached theoretical reflection.

What it is exactly that happens in this judgment and when, at what point, decision making is suspended between acting and thinking, is difficult to grasp and describe. A perspective offered by Sennett is prehension: physical action anticipating mental understanding 2008, 154. Prehension, i.e., grasping - here is not moving after having received and weighed all information, it is moving and allowing meaning to unfold under anticipation.

After Tallis, Sennett describes prehension as having four dimensions: anticipation, the shaping of the body before contact. Contact: the moment of touch. Language cognition: naming what is held and finally: reflection, to understand what one has done. Sennett adds a fifth dimension: the values of skilled hands and the development of technique 2008, 155.

Trotto 2011 transfers these steps in the concept of prehension into the field of design: Anticipation is to prepare before designing, to collect materials and create the necessary conditions in
which to make. Contact is to engage with the design assignment, to perceive and conceive opportunities as one starts to act in designing. Language cognition is to find direction and give physical form to what has been revealed by intuition. Reflection on this form elicits understanding of what has been created. Finally, the values embedded in the design are a result of the skilled hands of the designer that created it: it embodies his point of view.

This resonates with Merleau-Ponty’s Phenomenology of Perception 1945, who argues for an embodied perspective on our being in the world: we experience the world subjectively by using our bodies and this subjective experience is such because of the uniqueness of our bodies – Matthews 2006, 52. It is because we have bodies that we can perceive, by acting and interacting. Perception is a direct contact with the world, it is born in action and precedes cognition 2006, 35. We thus always perceive the world from a particular perspective, a point of view 2006, 34. Moreover, the skills we develop to cope in the world are inextricably linked to our perception.

For design, such an emphasis on the personal point of view from which we perceive the world by acting in it, has numerous implications. For the way in which people experience a design when they use it: each person will have his or her own point of view shaped by their being in the world. For the act of designing: a designer sees his designs from his or her own point of view: what I design will have a different meaning for me than for someone else Trotto et al. 2011. How I perceive it, is shaped by my skilled action, just as the thing I am making. The subjectivity of the designer, his experience of the world, can thus not be separated from the design itself.

/ MY POINT OF VIEW

It follows that the subjectivity of the constructive design researcher cannot be separated from his design research. This means that the designs presented in this dissertation embody my point of view, materialised through my sensitivity and my judgment. My sensitivity and judgment are based on my skills: my perceptual–motor, cognitive, emotional, and social skills. The making of these designs depended on my subjective decisions and those of the others in the design team. My subjective decisions were based on my body, my skills, my past experience, my cultural background and my desires, in a resistive dialogue with the circumstances where the design was shaped: my being and acting in the world. This is an inescapable part of designing and I believe it is important here to be honest about it. This constitutes an explanation of the partiality and incompleteness of the description of my designs and design processes: I can offer only my own point of view.

To leverage the richness in this point of view to generate shareable knowledge, it needs to be substantiated and articulated. This chapter exposes why I have my own point of view and how I use it to design. Moreover, it positions the first-person perspective within the discourse on what design and design research. I can articulate how my point of view has changed throughout this process, as I became more skilled and my understanding of the research program grew. By making explicit what perspectives I have taken in this research process and by carefully articulating what I see in them, I can expose my own point of view.

Articulating my own point of view therefore means that I take responsibility for it as a designer and as a researcher. The
remainder of this chapter illustrates and positions the methodological structure of this dissertation. This structure exposes how I continuously change perspectives on the artifact I am designing in order to act and perceive, generating shareable knowledge from my personal point of view. In Part II of this dissertation, this is made clearer by presenting the concrete design work that I engaged in. In this section, the perspectives I take on the research interest are made explicit, to frame and articulate how my point of view changed as the research unfolded.

Expressing my subjectivity by making a multiplicity of perspectives explicit, increases the probability that their content will resonate with your point of view, as the reader. Through this, I aim at contributing to the development of understanding and applicability of this perspective on aesthetic engagement in interaction design research.

### 3.3 SHAREABLE KNOWLEDGE

The next section of this chapter proposes the artifact created in constructive design research as existing at the meeting point of two perspectives, practice and theory. Consistently changing perspectives on the artifact generates knowledge. The structure proposed and elaborated on here focuses on exposing how this process generates knowledge, it is less concerned with what this type of knowledge this is. The reasoning is that with the increased acceptance of design practice as a way to do research, the community has sought to articulate what forms of knowledge exist between theory and practice. Often labeled intermediate-level knowledge, this knowledge exists in between general, abstract knowledge and concrete, practical knowledge. This intermediate-level knowledge has been articulated as able to be articulated from both a theory perspective e.g. Stolterman and Wiberg 2010 or from a practice perspective e.g. Höök and Löwgren 2012.

In the model presented here, the perspectives of theory and practice are not separate in the sense that the research process moves from one to arrive at the other. Rather, it is consistently changing perspectives that generates knowledge. As such, the knowledge the process generates is in itself bidirectional, connecting both theory and practice. One could consider the shareable knowledge this methodological structure creates as akin to the proposal of bridging concepts Dalsgaard and Dindler 2014. Because it is accountable from both perspectives, theory and practice, and intends to bridge the gap between the two. Moreover, as Dalsgaard and Dindler argue, the value of bridging concepts is not only in the “finalised” knowledge it generates. As inherently unstable structures, the value of bridging concepts also lies in their constant rearticulation.

This chapter, in particular the next section, is mainly concerned with describing the process with which shareable knowledge is generated. Part II of this dissertation focuses on articulating and exposing how this knowledge evolves through a programmatic design research approach, at it is formulated, realised and reflected on.
3.4 METHODOLOGICAL STRUCTURE

The design research approach for this dissertation builds on this necessity and logic of taking a first-person perspective in designing for aesthetics of engagement. The Reflective Transformative Design Process <Hummels and Frens 2008; 2011> allows integration of this perspective with those of others and makes them operational.

The Reflective Transformative Design (RTD) Process forms the basis of the design approach in this dissertation because it consistently leverages the designer’s personal point of view as a way of dealing with a design situation and provides mechanisms to connect this personal point of view towards the alterity.

The RTD Process asserts that the task of designing intelligent and highly interactive systems with a societal impact is too complex to be clearly defined, following Rittel and Webber’s 1973 notion of wicked problems. It follows that the design process that supports this task is not necessarily a linear and rational process: it requires flexibility and subjectivity to deal with these complexities. The process needs to balance making and thinking as ways to gain understanding of a situation.

To promote such a balance, the theoretical foundations for the RTD Process integrate Schön’s notion of Reflective Practice 1983, to learn by reflecting on actions, with Merleau-Ponty’s Phenomenology of Perception 1945, who states that our understanding of the world is born in acting in the world. The RTD Process builds upon the former to actualise and make explicit reflections as points of learning and development in order to achieve understanding. It builds upon the latter to, more than Schön, emphasise skillful engagement and personal intuition as vital to designer’s practice.

Having established the importance of intuition and the workings of reflection-on-action as a mechanism to expose first-person tacit knowledge, the question becomes how to expose this knowledge. By transposing insights gained from design action in a first-person perspective into a domain that is understandable for others, from their point of view, this knowledge becomes valuable beyond the ultimate particulars that were created in the constructive design research process. This knowledge becomes shareable and can be articulated as research results.

A particular approach to constructive design research is offered by Binder and Redström 2006 in the form of programmatic design research. In this approach, a program is a brief statement to frame the research process and its intention to provide a context for the inquiry. The program in this instance is not an overly formalised and static notion, rather it is a starting point from which to explore by means of design experiments. These experiments are the result of design action – construction – and are concrete proposals that mutually inform the program.

In this manner, Redström 2011 discusses how the program can be considered to be abstract and the experiments concrete. Drift, the dynamic repositioning as a result of the dialectic process between the two, reveals how we may interpret and report on results, as well as adjust both the program and our future experiments. Establishing the mechanism of knowledge generation in programmatic design research as a dialectic conversation, where continuous repositioning between two opposites, abstract
and concrete, leads to a richer understanding of the subject at hand, resonates strongly with the nature of design as discussed in section 3.2.

The act of designing is to move from abstract desires and intentions to a concrete synthesis governed by the resistance of the real world the designer works in. In dialectics, an exchange between two opposites allows us to examine their relation and to come eventually to a shared agreement. In dialogical conversation a mutual exchange between opposites sharpens each point of view in an open-ended way which may not have a result. As a mechanism in theory, dialectics are inherently oppositional, involving the exchange of views from two positions: the thesis and antithesis.

To consider the act of designing as a form of dialectics requires some nuance. The dialectic process in design may be less oppositional in the sense that it is of a different nature. What is abstract and what is concrete in the design process may only be oppositional in terms of the domain in which these elements reside: the abstract desiderata may be closely aligned with the concrete thing synthesised by making.

In such a case it might be relatively easy to reach a shared understanding or agreement between the two, where the real and ideal are in an acceptable and useful balance. They might however, also be spread far apart, inherently oppositional after all. In such a case it will be more difficult to synthesise a shared understanding between the two that is acceptable, but some agreement can always be reached.

3.5 UNPACKING THE METHODOLOGICAL STRUCTURE

The methodological structure of this dissertation (See Figure 3.1) builds on this continuous repositioning in between abstract and concrete. The dialectic between abstract and concrete happens between two different perspectives: from practice and from theory. The two perspectives meet in the design that is created, a concrete thing.

The perspective of practice encompasses creating the design: contextualising practical engagement by relating how we are designing to what we are designing: where, for whom and why. Here, reflection in and on action involves moving in between the abstract intentions in the design situation and the concrete prototypes that are created. Moving away from practice and closer to the thing, makes that these concrete results of design action are increasingly contextualised within the requirements of the design situation.

FIGURE 3.1: Schematic of the two perspectives, practice and theory, in the methodological structure.
The perspective of theory encompasses framing the concrete design as research. The perspective of practice results in a finished thing. To look at this thing from the theoretical perspective is to frame it as a design research experiment. The design research experiment engages in a dialectic conversation with the design program (Binder and Redström 2006). The design program contextualises the work by relating what is designed to what can be learned from it, placing it in a wider societal and theoretical framework prescribed by the research program, as introduced in chapter 1.

As we move in between these two perspectives, away and towards the thing, the activities, knowledge, and results that are produced change. It is the consistency of the dialectic mechanism, the continuous and active repositioning between elements in the perspectives that ensures a rigor and relevance between the activities, results, and knowledge that are produced. This process transposes first-person knowledge embodied in (making) the ultimate particular towards shareable knowledge, the research contribution.

The next section unpacks and unravels the layers in these two perspectives, to expose the dialectic mechanism that transposes knowledge from one element and perspective to another. Examining each layer closely exposes what the dialectic mechanism both theoretically and practically entails and how this mechanism produces knowledge. This section concludes with a description of how this knowledge develops by moving across layers and in between perspectives: the process of transposing insights from the first-person perspective into the third person perspective as shareable knowledge and vice versa.

Unpacking and unraveling this methodological structure starts from the perspective of practice, as design activity forms its foundation. Moving through the layers shows how the thing is created. The theoretical perspective moves from the thing and shows how first personal knowledge is contextualised and becomes shareable.

/ THE PRACTICE PERSPECTIVE: REFLECTION-IN-ACTION

Reflection-in-action is the process of “thinking about doing while doing it, in such a way as to influence further doing it” (Reymen 2003). This process describes a dialogue between the designer’s intentions and his material through his skills. In engaging with the material the designer reflects on the concrete results of his actions in relation to his abstract intentions in order to further explore what an agreement between the two might be. This is a process that is intuitive. The knowledge it produces is tacit but shapes both the abstract intentions and the concrete results.

The material in this case is not necessarily physical, it might also be a technology. It might mean shaping a foam model with a piece of sandpaper to achieve a satisfactory form. It might also mean adjusting the position of LED lights to influence reflection off a surface or the fine-tuning of software parameters to adjust the behaviour of artificial intelligence. Often, it may even be a process of acting on all three of these design materials simultaneously in an unsystematic and explorative way to reveal the opportunities their particular constellation may hold.
What is important here from a methodological perspective is the process of meaning arising through action. The creation of tacit knowledge that may become explicit upon reflection in the next level. This process does not build exclusively on cognition and it does not result in analytical knowledge. Rather, it is a direct result of the designer engaging with the real world using his skills to respond to the situation at hand in a form of embodied knowing.

/ THE PRACTICE PERSPECTIVE:
REFLECTION-ON-ACTION

Reflection-on-action takes place after doing, with the aim of influencing further action [Reymen 2003]. One step removed from the messiness and resistance of dealing with the real thing in making, reflection-on-action provides the designer with a stance from which he can reflect on what he has just done to gain insights as to what might be his next actions.

This might be after his actions have led to a satisfactory result or it may provide refuge after unsatisfactory results, where it was too difficult to reach an acceptable agreement between the abstract intentions and the concrete resistance of the real world. In either case, reflection-on-action adds a temporal dimension to the process. The designer has a moment to relate actions to each other outside of actually doing those actions.

This moment of reflection is more explicit than reflection-in-action. It is formed by relating the concrete insights and results gained from a reflection-in-action process to abstract factors external to that particular situation, but directly in its vicinity. These abstract factors could be the particular design direction that is being explored, the design intention itself that is under investigation or even a vague sense of the designer wanting to explore something for his own sake.

The concrete results here are likely to be other explorative prototypes created in the same line of the design investigation. For example, in this layer a designer may reflect on a series of explorative prototypes of LED lights to identify suitable and unsuitable patterns for the next prototype. It might also be a reflection on the experiences elicited by a finished series of explorative prototypes, to judge how they resonate with the original intention that sparked the process of creating them.

Within the methodological framework the key difference between reflection in and on action is of importance here: When reflecting in action, the designer is directly engaged in the making. His actions are intuitive and the knowledge that his reflections generate is largely tacit. In reflection-on-action the designer is one step removed from actually making and reflects on completed actions. This is a more cognitive and explicit moment of reflection that forms the first step of dredging out tacit knowledge from the making. Reflection-on-action makes this knowledge explicit and articulates it, so that it can be shared or documented. This knowledge then becomes concrete. In terms of research this is where insights first start to appear in the first-person perspective. The challenge is to develop and consolidate these insights to move towards the theoretical perspective.

/ THE PRACTICE PERSPECTIVE:
REFLECTIVE TRANSFORMATIVE DESIGN PROCESS

The Reflective Transformative Design Process (RTD Process)
Hummels and Frens 2008; 2011 is “a design process, particularly aimed to support the design of disruptive innovative and/or intelligent systems, products and services, that emphasises values like openness, context- and person dependency, envisioning a new society, intuition, craftsmanship and development through reflection” Hummels and Frens 2011.

The strategies are mutually informative and present two ways to gather information: making (left) is the skillful engagement of the designer with materials. This strategy provides experiential knowledge. Thinking (right) is the analysis of results and insights. This strategy provides more formal knowledge.

The RTD Process provides the designer with a framework in which to place his actions in relation to the overall design process and his competency development. The process actualises reflection in and on action, by eliciting the designer to move in between making (concretising) and thinking (analysing) and by approaching the outcome of the design process from different directions (societal and contextual).

Concretely this could for example mean that a lighting design project starts with the exploration of LED lighting patterns and the experience they elicit when reflecting off various materials. Reflection on this action may provide insights as to what other types of lighting the designer can explore. At some point in the design process these designed outcomes are also contextualised within the framework offered by the RTD Process. The designer might visit the site for which this lighting installation is being designed and reflect on how it may impact the landscape or social behaviour once deployed. Reflection in – and on – action may thus be exploratory, but the mechanisms of the RTD Process connect the understanding gained from reflections outwards, towards a methodological necessity of evaluating what is desirable.
In terms of the methodological structure the *RTD process* provides a framework to connect the personal perspective of the designer (design action and the insights gained from reflecting on that action) to the desiderata that guide the process (the wider societal and contextual scope of the design situation). It explicitly affords actions that are not necessarily focussed internally – on making the thing – but on relating the thing that we are making reciprocally to external factors. The explicit points of reflection that are built into the process are intended to support the development of new designers in their education. These reflections also tease out insights that transcend the particular design process in relating the development of the overall research.

In terms of design research, this is where a design experiment is created. The result of the *RTD process* is a finished thing. This could be an installation, a product or a temporary intervention. The process of creating it involves many substeps of reflection in and on action and places these in dialogue with external factors that define the project space (e.g. contextual, clients, stakeholders, economical, societal, etc.). These factors may be fixed or co-shaped by the process. In any case the *RTD Process* produces a finished thing that is contextualised within a wider frame of reference. It is this thing that becomes a design research experiment by transposing it to the next level and examining it from a theoretical perspective.

// THE THEORETICAL PERSPECTIVE:
 // DESIGN RESEARCH EXPERIMENT

The *RTD Process* allows the designer to frame his actions and elicits and activates reflections leading to a finished design. This finished design contextualises the combined decisions as a design project. As a finished thing, the design project can be positioned as a design research experiment within the overall arch of the research process (Binder and Redström 2006; Redström 2011).

The research process as a whole may have different points of interest than the design project that has been completed. For example, the design project may have been executed within a commercial context leading to the inclusion of practical or otherwise necessary elements that may or may not be of interest to the research question. Or, the project may have been explicitly framed as a design research experiment from the start. In any case, taking some distance from the design process of creating the project affords a new, theoretical perspective. This elicits reflections to gain insights towards the research question of a research process.

Taking one step away from the designed thing at the end of the *RTD Process* allows the thing to be examined from the theoretical perspective. By framing it as an experiment the relation between the thing that has been created, a subjective assembly within a certain set of boundaries, and the overall research intention becomes clear. As an experiment it offers exclusion of certain elements that are not of interest. For example the ones that are part of the regulatory (safety) requirements imposed by the environment in which the design is placed. The experiment offers focus on salient elements. For example those interactive qualities the design elicits (or does not elicit) that correspond to our research intentions. As a finished thing reflections might also emerge from unexpected outcomes. For example seeing the...
design in use by visitors to an exhibition or event where it is on display. Or a critical discussion of the finished thing among colleagues. Another example might be that the work is presented in an academic publication. As a particular platform with its own ethos and praxis, this forces an articulation of the relevance of the work towards the intention, background, and related work. Moreover, a publication makes explicit what the experiment has provided in terms of new insights that are of interest beyond the particular thing itself.

The importance of framing the finished thing as an experiment is that it allows a look at what has been designed from an explicit and informed vantage point taken as a designer. This is a lens through which to focus on what is important about the design from a research perspective, moving some of the messiness and complexity of actually designing the thing towards the periphery.

In a sense, it is similar to the reflection-on-action that was part of the design process. However, reflections on the experiment happen on a higher level of abstraction than the one referred to earlier. The action in this sense is the combined and complete set of design actions that have been undertaken to design the experiment. The reflection is still focused on understanding what has been done, to see the opportunities and caveats for further action.

In the research process, there are two further actions that require guidance. Firstly, reflections reveal insights that give a direction for the next experiment. Secondly, reflections reveal insights that help to redefine, sharpen, or adjust the program that drives the overall research intention.

In programmatic design research, the program is a provisional knowledge regime. The design program acts as the foundation for experiments carried out within a constructive design research investigation. As such, the design program is not an overly formalised and static notion. Rather, it is a statement that provides pragmatic guidance for the experiments and a point of reference from which the knowledge the design research process produces may be communicated. It is the dialectic process between the abstract design program and the concrete experiments that generate knowledge. In this sense, the program provides a way of opening up a design space around a topic and thereby proposing opportunities for changing our understanding of the world.

Binder and Redström go on to articulate how such a design program may be evaluated from the inside and outside. From the inside the design program can be evaluated as to how it measures up to the task it states for itself. From the outside the design program can be evaluated as to how well it contributes relevant knowledge to the outside world. At that point, the knowledge that passes through the methodological structure becomes contextualised within the
wider frame of reference of existing discourse.

As an essentially dynamic statement, the design program within the research presented in this dissertation has also changed often. Its focus has been sharpened, blurred and often shifted along the overall research process. In retrospect, there are three distinct formulations of the design program that have been explored along the overall research trajectory. All three of these design programs are more specific instances of the research program presented in chapter 1. These three formulations can be used as a lens to describe a starting point for three distinct loops of program/experiment dialectics. Part II of this dissertation further elaborates on this mechanism, positioning the intent and outcome of these three loops substantiated by design work.

/ NOTES ON MOVING IN BETWEEN PERSPECTIVES AND LAYERS

Having unpacked the different layers that form the methodological structure of our research process highlights how the results of our skillful engagement can be transposed and become contextualised as academic research. It is important to emphasise that this process of moving in between layers and switching perspectives is often not linear or systematic in a prescribed way.

It is not necessarily the case of starting in one end of either perspective, for example the design program in the theoretical perspective, and moving systematically through all the layers and through the other perspective until one is engaged in a material dialogue. Nor is it automatically the case that one simply start making and find ways for these doings to become research insights. Although both directions are possible the reality of reflective practice in constructive design research is far more complex. Two examples may be useful to illuminate this complexity.

One example of the work in this dissertation is the Interactive Dissertation project. The design brief for this project was to explore how the design of this dissertation may embody the content it presents. This contextualised the design process; the goal was to create artefacts that explore ways of bridging the incongruence between medium and message. This was achieved by making, where reflection in and on action directed further action, and concluded with a contextualisation of the design proposals in a public discussion.

Only later, as this design process was underway, that it became clear that translating the qualities that had started to emerge from the research process into a new medium, actually provided insights into the qualities themselves. This realisation of the design program had a direct effect on the formulation of the design program. The project gained an additional goal in relation to the overall trajectory of the research, as this research unfolded.

Another example is the Implied by Light project. The project was undertaken in an educational (MSc course) context, where students were encouraged to develop and apply a personal vision on design in their projects. In retrospect, this vision document could be considered as an early version of the program used for this dissertation’s research process. This “program” sought to investigate the potential for a personal intellectual
experience as an equal addition to the bodily experience, following the pragmatist notion of aesthetic experience. The design brief and context, to communicate with light in a train station, immediately contextualised this program into a design process. A making-centred approach then resulted in the prototype. In this manner, the overall research process travels through the methodological structure in the opposite direction compared to the previous example.

These two examples are but two possible ways in which the activities, knowledge, and results travel through layers and one switches perspectives in the methodological structure. Its real complexity lies in the many connections on all levels, between one another in one project and between one another across multiple projects. As stated by Hummels and Frens 2011 the design process is not entirely rational and inherently unpredictable and thus, neither was the constructive design research process that lead to the work presented in this dissertation. For the dialectic process to work effectively the design process needs to be flexible and responsive to needs and insights as they emerge.

This dialectic process is consistent throughout the layers and also relates to the structure as a whole. A sudden or accidental realisation that occurs in dialogue with the design material may be as revealing towards the design program as a deeply contemplated evaluation of a finished design experiment. The layers as presented here are therefore simply a structure to clarify how different contextualisation of the activities generate knowledge.
As discussed in chapter 3 after Nelson and Stolterman (2003), design is a mode of inquiry that is different from scientific or artistic modes of inquiry, because design is primarily concerned with the real. Design inquiry is explicitly directed towards action: the production of a thing that is manifested in the real world. This focus on the real is essential to give form to the not-yet-existing (2003, 39). Part II of this dissertation structures and presents the manifestations in the real world created for this research.

Chapter 4, Introducing the Design Space, establishes the concept of the design space and the notion of an annotated portfolio as a way to expose the values embodied in a collection of design works. Moreover, this chapter discusses the two ways in which the notion of an annotated portfolio has been appropriated in this dissertation to present this design space: firstly, as a way to curate and communicate research results through a body of work; secondly, as a way to dredge out research results from the complex interrelations existing in that body of work. The second section of chapter 4 introduces the three research loops that together form the total body of work presented in this dissertation. These loops successively explored, dimensioned, and articulated the design space around aesthetic engagement.
Part III of this dissertation focuses on the knowledge generated by these three loops in relation to the program that guided the overall research trajectory. This is achieved by reflecting on the three loops through taking different perspectives on the work created in the loops.

Chapters 5, 6, and 7 present the loops in more detail by establishing the intention and the body of work for each loop, together with individual reflections on the work.

The first loop explored the design space and is discussed in chapter 5. This chapter presents six constructive design research projects and the individual reflections on these projects to establish positions in the design space around aesthetic engagement.

The second loop is discussed in chapter 6. This loop was directed by the knowledge generated in the first loop. This chapter presents one constructive design research project that explicitly investigated the boundaries around the positions established in the first loop, in order to explore the dimensions of the design space.

The third and final loop is discussed in chapter 7. This loop built on the combined results of the first and second loop. Design action here was directed towards articulating the knowledge of the design space. The aim was at finding ways to communicate abstract knowledge of the qualities of aesthetic engagement in balance with the concrete manifestations of the different projects that generated this knowledge.
4 Introducing the Design Space

The design space is a metaphor for the potential of possible designs. Following Gaver and Bowers (2012), a single design project establishes a position in the design space.
It follows that a group of projects that together form a body of work, then establish an area within that space. Part II of this dissertation presents a body of work and individual reflections on these projects that expose the qualities of aesthetic engagement as well as how these qualities may be properly articulated.

The projects presented in this dissertation have been developed over a timeframe spanning six years. Some were created as course projects for the MSc program at the Department of Industrial Design at Eindhoven University of Technology. Some were created during this PhD research at RISE Interactive and the Department of Informatics, Umeå University. As such, they were created for a range of briefs, in various contexts, and by different design teams.

However, despite being different in many ways, all of these projects are connected: they can all be considered to form part of the same line of investigation into the design space around aesthetic engagement in interaction. The differences between the projects allow for a multiplicity of perspectives to investigate how one might design for such aesthetic engagement.

/ ANNOTATED PORTFOLIOS

Together, these projects form a body of work that is presented in the following chapters in the form of an annotated portfolio. The concept of an annotated portfolio follows the logic that a design embodies knowledge that is characterised by the myriad of different choices that formed the design. It is impossible to describe all of these considerations accurately, or the artefact itself in all of its details. Descriptions in text thus always become partial views of the artefact and should therefore be considered annotations <Gaver and Bowers 2012>.

An annotated portfolio proposes a specific way to expose the values embodied in a collection of artefacts while respecting the particular qualities of the individual designs. This can be done in different forms, for different purposes and for different audiences, dependent on the intention of the author <Bowers 2012>.

This dissertation appropriates this concept of an annotated portfolio in two ways. Firstly, as a way to structure and communicate eight constructive design research projects, as well as individual reflections on these projects, to the reader: an outward looking annotated portfolio. Secondly, as a way to elicit and structure reflections on these projects as a body of work to expose the knowledge these projects generate towards the research program: an inward looking annotated portfolio. These two ways of using an annotated portfolio are described in more detail below.
the outward looking annotated portfolio is directed towards the reader and is presented in sections 5.1 to 6, 6.1 and 7.1. These chapters present the three main loops of action and reflection over the course of the overall research trajectory. The loops successively explore, dimension, and articulate the design space around aesthetic engagement. The notion of an annotated portfolio is appropriated to structure and curate the descriptions and reflections of individual design projects in order to establish their positions in the design space. The form of an annotated portfolio balances the presentation of the designed artefacts, the ultimate particulars [Nelson and Stolterman 2003, 33], with the knowledge that starts to emerge from these artefacts.

To position this knowledge, it is necessary to expose how it was generated: through reflection on the body of work by the designer. The inward looking annotated portfolio formed a tool to structure and document reflections on the body of work. The creation of this inward looking annotated portfolio involved reflecting through annotations made to audio-visual material of the different projects with the intention of exposing the knowledge these projects embody. Reflecting on the projects makes implicit values and intuitive decisions embodied in both the design process and final artefacts explicit.

Highlighting this tacit knowledge gives value to the body of work outside particular examples. This provides insight into the qualities they leverage and how these qualities may elicit aesthetic engagement. Creating an annotated portfolio is thus not only a way to communicate knowledge, it can also support the generation of knowledge.

The inward looking annotated portfolio created to generate knowledge, even more so than the outward looking annotated portfolio, builds on my own point of view. This point of view was shaped by being part of the design processes that created the designs and it is difficult to fully expose or communicate its richness. Rather, than to show large parts of this inward looking annotated portfolio, chapter 8 exposes the reflective methodology to demonstrate how this inward looking annotated portfolio was created. Section 8.1 elaborates on how this process supports knowledge generation by affording multiple perspectives on and within the same body of work.
4.1 LOOPING THROUGH PERSPECTIVES FROM PRACTICE AND THEORY

Chapter 3 introduced the methodological structure that forms the basis of the constructive design research approach in this dissertation. This structure presents the artefacts created in this approach as existing at the meeting point of two perspectives: practice and theory.

The artefacts and knowledge generated through this methodology are a result of the dialectic process of continuous repositioning within the perspectives of practice and theory, at different distances from the artefact. This repositioning is constant, dynamic, and often not systematic or structured. It is the flexibility in changing perspectives that allows one to understand what can or should be done next, or what has been done and can be learned.

There are however, points in time along the overall research trajectory that afford a more structured view with the possibility of making this repositioning and the knowledge it generates explicit. These points in time can be considered research cycles or loops: stages in programmatic research where it becomes possible to reflect on a design program and reformulate it in order to direct further experiments in a new loop. Structuring the work into distinct research loops aids in exposing how the knowledge that is generated in experiments is used to readjust the program and vice versa.

The overall research trajectory of this dissertation exhibits three loops of what Redström calls program/experiment dialectics. These three loops are used here as a tool to structure and communicate this research trajectory. Each loop has three stages. The first stage is the formulation of the research program as an initial view on the design space. The second stage is the realisation of the design program by design experiments that actively investigate the design space. The third stage is the reformulation of the design program based on reflections on the results.

The previous section of this chapter introduced the concept of a design space around aesthetic engagement. The next chapters present the work created in these three loops that successively explored, dimensioned, and articulated this design space in order to generate knowledge towards the research program formulated in part I of this dissertation.

Each of the following three chapters exposes one particular loop. The introduction to each of these chapters briefly describes the three stages of formulating, realising, and reflecting on the design program for each loop, in order to illuminate how each loop builds on knowledge generated in the former loop. The second section of each chapter presents the design work created to realise the loop in more detail, including individual reflections on the work.

The model used to illustrate the three stages in program/experiment dialectics...
that occur in each of the loops is explained below in order to set the stage for the presentation of the three particular loops in the next chapters.

Nelson and Stolterman create a distinction between design as concerned with the real and science as concerned with the true. Abstracted scientific knowledge is true: it is universal or general. Design on the other hand, is concerned with what is real: it creates particular and unique instances. Science aims at concluding the universal from specific particulars, while design moves in a different way. Design deals with the real and in doings so, transforms the abstractness of relevant scientific knowledge into an ultimate particular that is manifested in the world. The real is overwhelmingly complex and impossible to grasp fully through abstracted truths. However, engagements with the real, through design, do depend on truths (and are guided by the ideal). Nelson and Stolterman point out the necessity for these two modes of inquiry to exist in unity and symmetry, as both are essential in dealing with the real. [2003, 32–45]

Following this reasoning, the model presented here to illustrate the three stages of loops in constructive design research builds on this tension between complexity and abstraction (See Figure 4.1). The real, in its overwhelming complexity and richness, exists in the center of the model. Moving away from this centre is to abstract this complexity in order to grasp (parts of) it. The design space exists on a certain level between the two. As a metaphor for the potential of possible designs it is infinitely complex. As the subject of a research investigation it is limited by the particular design domain that is of interest in this investigation.
Both the design space and the perspective offered by the design program are rigid and static in this model for illustrative purposes. In reality, they are both dynamic and more ambiguous: the design space as a whole is too complex to fully grasp, the perspective offered by the design program is continuously readjusted within a loop.

The first stage of each loop is the starting point: taking a perspective on the complex design space from a certain level of abstraction through the \textit{formulation} of a design program (See Figure 4.2). The design program is a particular point of view on these complexities. The design program directs the design inquiry as an emergent compound: it prepares to deal with \textit{the real} by building on what is already \textit{real} and \textit{true}, influenced by \textit{the ideal} \cite{Nelson_and_Stolterman_2003}. The design program provides a perspective on the design space: it identifies tensions or unexplored areas and suggests where to start designing.

Both the design space and the perspective offered by the design program are rigid and static in this model for illustrative purposes. In reality, they are both dynamic and more ambiguous: the design space as a whole is too complex to fully grasp, the perspective offered by the design program is continuously readjusted within a loop.

The first stage provides handles to start the design of artefacts in order to \textit{realise} the design program, the second stage of the loop. These artefacts are concrete
manifestations and engage directly with the complexities of the real world at the centre of the model (See Figure 4.3). To consider these artefacts as experiments extends them from the center outwards. This is where the experiments gain value in an abstract sense. To look at a finished artefact as an experiment allows exclusion of elements not of interest in favour of those elements that are, in relation to the design program. This process is facilitated and documented through individual reflections that abstract insights from the experiments. These individual reflections may exist on different levels of abstraction, depending on the insights that they bring forward and possible connections to existing bodies of research. However, as individual reflections they stay connected to the ultimate particulars - Nelson and Stolterman 2003, 33 - that they belong to.

The third and final stage of each loop is to reflect on the formulation and realisation of the design program. To reflect on a body of work exposes further insights into the design space because it teases out insights beyond the ultimate particulars. For example, it may sketch what is missing between experiments, or what can be explored outside of their collective boundaries. The reflective methodology used in this process is elaborated on in chapter 8.1.

Reflection on the body of work affords drifting - Binder and Redström 2006 - from the original design program towards a new formulation. This is a shift in
perspective, from the initial position to a new one informed by newly generated knowledge (See Figure 4.4). From this new perspective, new or latent opportunities for investigation within the design space can come into view. This informs the perspective that is taken at the start of the new loop in the formulation of a new design program.

/ INTRODUCING THE NEXT CHAPTERS

The next three chapters illustrate the three successive loops of this research. Each chapter starts with a brief introduction that explains the program/experiment dialectics according to the three stage model explained above. This discussion of the formulation, realisation, and reflection on the design program for each distinct loop should not be read as an illustration of a pre-described and systematic approach. Rather, it is a structure to make progression in the research clear: as a way to illustrate and frame the intention and results of the loop within the overall trajectory of this research.

This brief introduction of each particular loop is followed by an outward looking annotated portfolio presenting the individual projects and reflections. In this annotated portfolio, the particularities of each project are presented in the colophon. The colophon also references previous publications associated with these projects. The colophon is followed by a description, presenting the design intention, concept, and result of each project, supported by images and a link to a video registration of the project. To gain more insight into the particular details and dynamics of each project, the reader is recommended to view these videos. The section on each project is concluded with an individual reflection that discusses insights towards the program that emerged from each project.
The first loop formulates, realises and reflects on a design program aimed at exploring the design space.
FORMULATING THE DESIGN RESEARCH PROGRAM

The design program for the first loop can be formulated as: exploring the experiential qualities that elicit engagement in aesthetic interaction with intelligent artefacts. This formulation highlights a few key aspects of the design program that specify the overall research program formulated in Part I of this dissertation, for this particular loop. Firstly, this design program describes that this first loop is concerned with exploring the experiential qualities of aesthetic engagement, i.e. investigating uncharted territory. Secondly, engagement highlights the research interest: interactions that foster a personal and involved relationship. Thirdly, aesthetic interaction suggests an existing body of research, a pragmatist’s notion of the aesthetic experience in interaction design, on which this design program is founded. Lastly, intelligent artefacts suggests a design domain where these explorations take place.

REALISING THE DESIGN PROGRAM

It is of relevance here to briefly describe the origins of these four key aspects in the design program, as they relate directly to the realisation of the program. As previously discussed, the body of work presented in this dissertation was created in different environments with different design teams. Some of these projects were designed before the start of this PhD project. These first projects were guided by a personal fascination in aesthetics of interaction and my identity as a designer. Moreover, these projects were also heavily influenced by the educational environment where they were created: the MSc course in Industrial Design at Eindhoven University of Technology, placing an emphasis on embodied interaction design for intelligent products and systems. In retrospect, these two factors formed part of the design program before it was formulated as such. However, these factors form the origin of the key aspects aesthetic interaction and intelligent artefacts in the design program stated above. My identity as a designer gained a more explicit dimension as a researcher with the start of this PhD project. Familiarisation
with the design space, existing research work and design research methodologies, resulted in the specification of the investigation. This is evident in this design program through the topic, engagement, and the research intention: to explore the design space.

/REFLECTING ON THE DESIGN RESEARCH PROGRAM/

Reflecting on the drift <Binder and Redström 2006> caused by the program/experiment dialectics allows for new perspectives on the intention and results of the loop. Two perspectives from the overall research trajectory are of relevance here.

Firstly, comparing and contrasting the six constructive design research projects establishes their positions in the design space relative to each other, exposing the space between them and in their direct vicinity. Taking a perspective on these positions brings to light what is similar and different between these projects in the way that their experiential qualities elicit aesthetic engagement. This perspective offered an opportunity to start describing an understanding of the qualities, which was formalised in the publication “Reflections on Designing for Aesthetic Engagement” <Peeters and Trotto 2015>. The publication elaborated on three themes of aesthetic engagement that emerged from reflecting on a body of work: physical qualities and the body, complexity and ambiguity and finally, balance and personal perspectives. This first understanding was functional, but also highlighted the necessity to further specify the qualities of aesthetic engagement.

This understanding establishes the body of work as an area relative to the wider design space and sketches the boundaries of this area. These boundaries are inherent limitations prescribed by similarities within the body of work that are a result of the design program and other, external, influences. The second perspective on the first loop focuses on these boundaries and exposes the domains shared by the six projects: many are interactive installations, relatively large scale, complex assemblies of digital and analogue components, and in some cases publicly displayed as what could be considered artistic works.

The reflection on the design program at the end of the first loop presents opportunities for the formulation of a new design program for the second loop. Having explored the design space allowed for a first formal discussion of the qualities of aesthetic engagement, published as three themes <Peeters and Trotto 2015>. These themes needed to be further examined in order to be described more clearly. Moreover, the themes were extracted from a body of work that operates in certain design domains. To better understand these themes it is also necessary to push these boundaries in order to find the dimensions of the design space.
5.1 IMPLIED BY LIGHT

2011
Department of Industrial Design,
Eindhoven University of Technology

DESIGNED BY Jeroen Peeters

SUPPORTED BY Harm van Essen

VIDEO https://vimeo.com/rightsthroughmaking/
impliedbylight

PREVIOUSLY PUBLISHED IN Peeters, Jeroen, and
Ambra Trotto. 2015. “Reflections on Designing for
Aesthetic Engagement.” In Proceedings of the 2nd
Biennial Research Through Design Conference.
The *Implied by Light* project aimed at exploring alternative approaches to the design of a visual communication system in the context of railway stations. Analogue visual communication systems in this context are typically dense timetables saturated with an abundance of explicit and specific information. Digital visual communication systems are dynamic and capitalise on this by showing only parts of this complexity, reducing available information to what is deemed relevant in the short term. A typical commuter is aware of most of the static information surrounding their trip. To access information on changes, a commuter is required to scan through an abundance of explicit information and determine whether this information is relevant to his trip.

The design intention for the *Implied by Light* installation was to explore an alternative approach to the presentation of this information based on implicit communication. Implication opens up a possibility to rebalance the relationship between accuracy of information and aesthetics of presentation. The design is intended as an addition to existing communication systems rather than a replacement. *Implied by Light* builds on knowledge of the railway network that commuters acquired from past experiences with, among others, existing systems in the train station.

A prototype of the lighting installation explored what such an alternative system might be like. The installation would be placed in the departure hall of a train station, positioned as to be accessible for a quick glimpse upon making one’s way from the entrance to the platforms. The prototype features an abstracted and reshaped map of the Netherlands in the form of a cluster of hexagons (See Figure 5.1, 5.2). Based on the official railway diagrams each hexagon is a sector of the railway network, a place where at least one track or station exists. There is no difference in representation between places that feature one track or station and those places that feature many tracks or stations in proximity to one another.

A continuous light pulse starts every few seconds, briefly lighting the hexagon placed at the central hub of the network: Utrecht Central Station (See video referenced in colophon). The lighting effect radiates outwards and travels from the central hub to the extremities of the map in an expanding circular pattern. Sectors where railway service is functioning normally all light up and fade with the same tempo and intensity. Local disruptions in the service are displayed through delays in the tempo with which the lighting pulse fades in affected sectors. The corresponding hexagons fade slower than unaffected hexagons.
leaving a lingering visual trace of the pulse that disappears only just before a new pulse emerges from the central hub.

The hexagonal map resembles the outlines of the Netherlands’ mainland that is serviced by the railway network. However, it is not entirely clear — especially at first sight — what hexagon represents what part of the country or even railway system. The same resolution is used for both places that are densely as well as sparsely populated with railway tracks. This makes every hexagon an ambiguous representation of parts of the network. This elicits commuters to form their own interpretation of how the train lines, stations, and tracks are shown.

In the event of disruptions it is also often not entirely clear which location or which line is not functioning properly, especially in sectors where one hexagon represents multiple independent train lines. To understand whether disruptions are relevant a commuter is triggered to reflect on personal past experiences of earlier travels, or to relate the delay to peripheral information provided by the traditional communication systems.

/ REFLECTION

*Implied by Light* presents ambiguous real-time information of a complex railway network. It elicits people to relate the visual cues provided by the system. Based on their knowledge of the network formed by past experiences as well as their present travel intentions, a person can interpret the information’s relevance and
place the meaning that arise.

The installation elicits participation by triggering people to become involved in allowing personal meaning to arise in interpretation. The meaning is personal as the presented information is useless without each person’s interpretation influenced by their individual knowledge and experiences. Largely, these personal points of view remain personal and are not shared or expressed in interaction with the system itself although travellers may discuss their interpretations in an effort to reach a more common understanding.

The installation elicits less engagement on a sensory level, it is limited to visual communication and is not interactive in the sense that the connection between commuter and installation is not reciprocal. The lighting pulse is continuous and can easily become repetitive and predictable. This richness that is found in the amount of information the installation presents is not fully reflected in the richness of the sensory experience.

The installation has a clear function. Furthermore, it appeals to an integration of people’s perceptual–motor and cognitive skills to make sense of the information. However, it is important to note here that the perception in this case depends only minimally on motor skill involvement. Moreover, social and emotional skills are not called upon in this design. The interaction is intended as a existing between one person and one installation to convey a practical piece of information.

The main difficulty in the design process for *Implied by Light* relates to ambiguity.

To present complex information in a deliberately ambiguous way that remains potentially understandable is a difficult task. When is a design ambiguous enough, so that it strikes a balance between triggering curiosity and communicating in a meaningful way? This is a similar problem as the one that occurs when designing for clarity: as a designer’s understanding of his own design ideas advances, he loses more and more of the ability to attempt taking a fresh perspective.

/KEYWORDS

ambiguous, visual, past experiences, existing knowledge, relevance, involved, personal, repetitive, predictable, interpretation, cognitive skills.


2011
Department of Industrial Design, Eindhoven University of Technology

DESIGNED BY
Jeroen Peeters

SUPPORTED BY Jun Hu, Bram van der Vlist and Gerrit Niezen

VIDEO https://vimeo.com/rightsthroughmaking/nodes

PREVIOUSLY PUBLISHED IN
Nodes is an interface designed to enable the managing of wireless connections between devices in a smart home environment. This design project was part of a wider investigation into ontologies and semantics of connections between smart devices by Bram van der Vlist in 2011 and Gerrit Niezen in 2012 in their PhD projects.

The design intention for Nodes was influenced by the earlier designs and the context sketched within this wider investigation. Nodes aimed at exploring an embodied and distributed approach to the tangible and centralised explorations explored in earlier work. The design is based on the Gestalt Laws of Grouping that describe human tendencies to order visual information (Rock and Palmer 1990).

/ PROTOTYPE

The Nodes design revolves around physical objects that represent nodes within the virtual network. The physical nodes are small circular platforms that are distributed in the environment, meaning they are placed close to or onto the actual devices a user wants to connect. Placing the nodes near devices does not yet establish the connections between the devices. To establish connections, users need to determine the start and end points of connections between the nodes. These are determined by placing flat shapes that resemble an arrow (start point) or negative arrow (end point) vertically onto the nodes. By aiming a start point on one node directly at the end point of another node, the connection between two nodes is established.
Nodes allows for a network of connections with a particular functionality to take different forms. The system adapts to a certain extent to a person’s mental model of this network. For example, to watch a DVD on a television screen while playing the audio through a stereo set requires a network with three nodes. However, there are two alternatives for the directionality of connections in this network that result in the same functionality. One alternative is to make a connection from the DVD player to the television screen for the video feed. A second connection is then made from the TV-screen to the stereo set to relay the audio signal. Another alternative is to make a connection from the DVD player to the television screen for the video feed. A second connection is then added from the DVD player to the stereo set for the audio feed.

The multiplicity of options to establish a network with the same function in different ways expands with the inclusion of additional devices. These different options allow a greater flexibility for people using the system to project their individual mental models of the network onto the system. This is in contrast to many other systems that require a person to interact following a strictly prescribed protocol.
The Nodes design was evaluated in a comparative user-study involving 15 participants. The user-study used a mixed-methods approach that included video prototypes, a schematic smart home environment, questionnaires, and a teach-back session. Using video prototypes and schematic versions rather than functional prototypes means that many of the important design decisions that would detail the design and interaction were not taken into account. However, the setup of the evaluation was sufficient to indicate that people interacting with Nodes formed different mental models of the necessary connections. The evaluation also showed that they were able to establish these mental models using the design. For more details on the methodology and insights produced by the comparative user-study, please see Peeters et al. (2012).

**Reflection**

“The Nodes design is distributed and localised, and elicits physical engagement: it requires people to move around the living room and to place the different nodes and signers. While doing this, it evokes people to physically project their mental model into the environment, in the way that they construct the nodes of the network and the directionality of connections. The Nodes system does not reduce the complexity of wireless networks between devices to a single solution. Rather, it allows people to decide themselves in what order and directions they think they require the necessary connections” (Peeters and Trotto 2015).

The system adapts to the perception of the person using it, as opposed to demanding the person using the system to adapt their perception to how the system works. This elicits a personal point of view and the system elicits an expression of that point of view in use. Sharing different personal points of view is possible with the system, but such sharing is not an intention of the design or part of its interaction.

It should be noted that although the system does provide several ways to establish a network of three or more devices, this complexity is still fairly limited and not completely open-ended. There are usually at most a handful of functional alternatives to choose from.

“Evaluation and reflections also suggested displeasure of participants in using the Nodes system. Although the design requires effort on behalf of the user, it does not reward these efforts with a seductive sensual experience. Nodes also does not lighten the work required to fulfill the task. As such, it becomes an embodied puzzle that does not elicit lasting and meaningful engagement” (Peeters and Trotto 2015).

The initial open-endedness and complexity are also replaced by routine as one becomes used to forming personal mental models and develop the ability to express them. This is also a result of the form and video prototypes that were
focussed on embodying the central concept of the design: eliciting the projection of mental models of networks using tangible objects. These objects did not achieve a level of detailing and fidelity necessary for a complete experience in interaction. This shifts the focus of the project towards intellectual qualities at the cost of sensorial ones.

Although Nodes opens up functionality to several different points of view, this domain remains rather limited. Coupled with a lack of sensual richness means that the design is limited in eliciting lasting and meaningful engagement.

/KEYWORDS

physical, project mental models, express personal point of view, complexity, ambiguity, effort, lack of sensual richness, embodied puzzle.
2012
2nd Installment of the Light through Culture
International Design School
Department of Industrial Design,
Eindhoven University of Technology
Department of Social, Political and Cognitive
Sciences, University of Siena
DESIGNED BY Jeroen Peeters, Teun Vinken,
Sara Giosa, Francesco Laezza, Daniele Interni-cola, Matteo Sirizzotti and Marta Vitolo

ADDITIONAL CONTENT PROVIDED BY Rachel Ellis,
Nairi Kazazian and Tünde Pál of the International
Master of Arts in Human Rights and Genocide Studies
SUPPORTED BY Patrizia Marti, Ambra Trotto, Philip
Ross, Rombout Frieling, Pierre Lévy, Marcello Flores
and Iolanda Iacono
PARTNERS Comune di Siena, Santa Maria della Scala
Museum and RISE Interactive
Exhibited to the public in June 2012 at the Santa
Maria della Scala Museum in Siena, Italy
VIDEO https://vimeo.com/rightsthroughmaking/
experiencinghumanrights
PREVIOUSLY PUBLISHED IN
Marti, Patrizia, Ambra Trotto, Jeroen Peeters, and
Caroline Hummels. 2013. “Instilling Cultural Values
through Bodily Engagement with Human Rights.” In
Proceedings of the Biannual Conference of the Ital-
ian Chapter of SIGCHI. A. CHItaly ’13. ACM.
Experiencing Human Rights was the second installment of *Light through Culture*, an international design school founded by Patrizia Marti and Kees Overbeeke. The school aims to use the power of design to synthesise cultural heritage and innovative technologies to expose new ways of making and thinking. Design here is intended to contribute to and boost a cultural shift, where designers and those engaging with the products of design are imbued with an ethical sensitivity by working with the embodiment of socio-cultural values (Marti and Overbeeke 2011). Two other projects presented in this dissertation, *Ballade of Women* and *Aesthetics of Politics* were further installments of *Light through Culture*.

**DESIGN INTENTION**

The project *Experiencing Human Rights* focussed specifically on the use of design to give an experiential form to the Universal Declaration of Human Rights. Through this, the aim was to convey the meaning and relevance of the values it expresses in a personal way. The intention to give this theoretical topic an experiential form leverages concepts of embodiment and active perception: visitors are not passive consumers of intellectual instruction on difficult issues. Rather, they are trigger to engage in a dialogue with an installation and to reflect on the issues by taking a personal and involved stance.
“Initial design work focused on discovering the content and design opportunities by means of physical explorations. This process involved gaining a grip on the complexity of the topic and the identification of promising conceptual directions. The students researched the social, cultural, and historical grounding of Human Rights and in parallel, developed physical implementations of their findings” <Marti et al. 2013>.

“By reflecting on the qualities of the experiences that these implementations provided, the students were able to align the theoretical content offered by the theme of Human Rights, with their skills of producing physical hypotheses (experienceable prototypes)” <Marti et al. 2013>.

“The initial design directions established in the scoping phase of the project were developed into depth by several iterations of reflection-on-action cycles. The process was concerned with moving away from symbolic representations of Human Rights. It aimed at working towards making Human Rights experienceable, having their values materialised into artefacts and therefore being able to be sensed, perceived and conceived through a bodily engagement” <Marti et al. 2013>.

“The final part of the design process revolved around the production of the installation on site in the Santa Maria della Scala Museum in Siena. This involved the synthesis and integration of the conceptual development work with technologies into fully functional and durable installations” <Marti et al. 2013>.

/ EXHIBITION

In total, the exhibition featured seven interactive installations (See video referenced in the colophon) that focussed on expressing the values of two articles from the Universal Declaration of Human Rights. Firstly, Article 13: Everyone has the right to freedom of movement and residence within the borders of each state. Everyone has the right to leave any country, including his own, and to return to his country. The second is Article 19: Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive, and impart information and ideas through any media and regardless of frontiers. The exhibition was produced in the Museum Santa Maria della Scala in Siena, Italy, where several adjacent rooms formed an experiential pathway.

“The exhibition was visited by about 500 people who left extremely positive comments in the visitors’ book. They reported strong impressions from the exhibit. They experienced difficulties and doubts, dissonance and empathy. They were called to feel, form, and express their viewpoint. The experience was a carrier of learning on human rights also for them in a vivid, involving and unexpected way” <Marti et al. 2013>.

A more detailed account of the design process, interactive installations and reflections on the exhibition as a whole can be found in Marti et al. 2013. For the purpose of this dissertation, this section will focus on a description and reflection...
of two installations in particular: Asylum and Conflict. These installations highlight and contrast the most salient themes towards unraveling the experiential qualities of aesthetic engagement.

Asylum

The Asylum installation (See Figure 5.5 and the video referenced in the colophon) expressed Article 13, summarised here as freedom of movement.

“This article addresses controversial societal issues, therefore the visitor was immersed in a controversial reality. The narratives and media in this space mixed two different stories related to this article. Stories related to patient conditions in 1960’s mental hospitals were mixed with contemporary stories of immigrants seeking asylum in southern Europe. Through this experience, the visitor was shown how reality may be viewed from different perspectives. Using lighting and projections in red and green, two parallel but separate realities were created within the space. In this way it was possible to realise that we often see or are influenced to see only certain aspects of reality and we have difficulty perceiving it in its entirety. Visitors entered a room in which the walls and floor were flooded with red and green lighting and multiple projections. Two videos, on in red and one in green, were projected onto the same surface of one wall. The red lighting and projections flickered erratically and told a fragmented and confronting side of the story. The green lighting and projections dimmed and
brightened calmly, and told a composed and objective side of the story. The visitor wore anaglyphic glasses with one red and one green lens. By covering one eye or the other, visitors chose to filter reality and engage with only one side of the story. As visitors explored the space, their movement increased or decreased the intensity of each colour’s dynamics. Mounted throughout the space, RGB LED bars flooded the walls and floor with indirect lighting in both red and green. Two overhead-projectors, one red and one green, displayed images onto the walls. Two video-projectors were equipped with monochromatic filters and projected two videos onto one wall. Wall mounted panels with background information and images were spread throughout the space, enticing visitors to explore. An ultrasonic sensor connected to an Arduino sensed visitors’ approximate position and translated this into dynamic lighting behaviour”<Marti et al. 2013>.

CONFLICT

“When Human Rights move from theory into practice, their inherent complexity becomes apparent. The rights of one can conflict with those of another, and it is up to all of us ourselves to take a stance. People have their own motivation and it is difficult to take a position and to form an informed opinion on a specific issue. It is necessary to listen to both sides. It is fundamental to understand what are the reasons supporting the different positions to be able to form one’s own”<Marti et al. 2013>.
Of the whole exhibition, the design most relevant to this research is the Asylum installation. Being in this space was confusing as both eyes received radically different information: each eye letting only one colour of visual stimuli through. The immersive all-around visuals and sounds contributed to this overwhelming experience.

Being in the space elicited visitors to physically interact. They were provoked to cover one of their eyes and decide which world and consequently which of the two stories they wanted to engage in. This meant they could only perceive and engage with part of the story told across the two realities at any one time. By making a choice to engage with one story or the other and by having the opportunity to switch continuously, the narrative each visitor experienced became a unique and personal selection of elements from the two stories.

Moreover, the audio-visual content spread throughout the space elicited them to move around and explore. Moving around the space triggered the lighting behaviour to change, but as these changes were triggered by multiple people in the space these effects remained ambiguous.

The other installations were less immersive and more closed: they did not elicit the possibility of being experienced in a multitude of ways to respect the complexity of the topic. This simplicity in the form of two-sidedness is best exemplified in the Conflict installation. The complexity of the Human Right's issue

The Conflict installation (See Figure 5.6 and the video referenced in the colophon) was based on article 19, freedom of opinion, by raising a story of confrontation between Roma and local people.

“It was a tough and articulated comparison, but required the visitors to engage bodily to express their point of view or to let their judgment remain suspended. When no one was present in the space, a dynamic lighting pattern moved in between the two perspectives, sometimes lingering on one or in between. Visitors stepped in the middle of two walls each one presenting one of the perspectives on the conflict. Stepping in front of one of the walls, visitors drew a dynamic lighting pattern nearer and highlight their perspective. When they moved towards the other perspective, the light followed them. Visitors could choose to let the highlight remain, as to emphasise their opinion to the next visitor. Alternatively, they could move indecisively and let the lighting continue to dwell and move in between the perspectives. Two vertical walls were angled towards each other. A panel was mounted on each wall. The walls and panels were lit by white LED bars mounted on the bottom and shining up. A dynamic lighting pattern was formed as the waves of warm and cold white light interweaved. In between the walls laid two pressure sensitive mats, connected to an Arduino controlling the lights” Martí et al. 2013.
in this installation was reduced to a yes or no question leaving little room for nuance or personal opinion. The two statements were clear but not felt through physical engagement. This reduced ambiguity to ambivalence and meant people were quick to act and forget this design. The dynamic lighting patterns in Conflict were carefully designed but their subtleties were hardly noticed by people and did not contribute to eliciting increased engagement.

KEYWORDS
complexity, narrative, overwhelming, immersive, rich, decision, ambiguity, ambivalence, complexity, simplicity.
2013 / 2014
RISE Interactive
Umeå Institute of Design
Department of Industrial Design, Eindhoven
University of Technology
DESIGNED BY Jeroen
Peeters, Stoffel Kuenen, Ambra Trotto and
Philémonne Jaasma
TECHNICAL SUPPORT BY
Mark Thielen, Jeffrey
Uitterhoeve, Chetram
Bangaru, Lars Isaksson
PARTNERS City of Eindhoven and Umeå Institute of
Design
EXHIBITED TO THE PUBLIC
at Umeå Institute of Design, Umeå, Sweden, June 2013
and City Hall, Eindhoven, the Netherlands, March/April 2014

VIDEO https://vimeo.com/rightsthroughmaking/diffractme
PREVIOUSLY PUBLISHED IN
Peeters, Jeroen, and Ambra Trotto. 2015. “Reflections on
Designing for Aesthetic Engagement.” In Proceedings of
Peeters, Jeroen, Stoffel Kuenen, Ambra Trotto, and Caroline Hummels. 2014.
“DiffractMe! – Using a Skills-Based Approach in Design Practice.” In Proceedings of the
International Conference on Kansei Engineering and Emotion Research. KEER 2014.
The initial design direction for the DiffractMe! project was established through a 4 week workshop. This workshop used an approach based on the Designing in Skills framework \cite{Trotto and Hummels 2013a} to explore the physical qualities of personal skills in an in-depth making-centred investigation. This framework has been developed to leverage skillful coping and embodiment to facilitate and support designs that elicit rich and meaningful interactions. For more details and an extensive presentation of the activities, insights, and results achieved during the workshop, see Peeters et al. \cite{2014}.

The result of the Designing in Skills workshop can be summarised as a deep and shared understanding in the design team of three subtle physical qualities of interaction. These qualities were extracted from personal skills and explored through a range of interactive prototypes.

This shared understanding and the abilities to give experiential form to this understanding formed the starting point for the design of the interactive installations DiffractMe! #1 and DiffractMe! #2. In this dissertation the descriptions and reflections are focussed on the two finished prototypes that were publicly exhibited.

The design intention for the DiffractMe! installations was to apply the design...
team’s understanding of physical qualities of interaction to create an interactive lighting installation that allowed the public to play with light.

Both versions of the installation consisted of three elements: One large wooden frame housing a matrix of acrylic prisms mounted on axis and two acrylic interactive surfaces mounted on plinths (See Figure 5.7).

Visitors manipulate the interactive surface by placing their hand on the surface and rocking it back and forth (See Figure 5.8 and video referenced in the colophon). The two surfaces are interconnected and equipped with sensors and actuators that allow the movements of one surface to be mirrored by the other surface. When two visitors interact with either of the surfaces they can feel each other’s movements. This engages visitors in a subtle haptic dialogue: they can resist or assist each other’s movements and are invited to find a common rhythm of movement.

The prisms are mounted on axis inside a wooden frame allowing them to rock back and forward. The prisms are interconnected through small antennae fitted with magnets. The movements created by people interacting with the surfaces are transferred to either end of the bottom row of a matrix of prisms. On each side of the bottom row one prism is actuated by a motor that rocks the prism back and forward based on the rhythm determined by the visitor’s hand movements. The movements of these actuated prisms slowly but surely influence its direct
neighbours, creating a ripple like effect to move through the matrix. This results in a colourful and dynamic display of light being subtly diffracted into the direct environment of the installation.

_DiffractMe! #1_ was designed and built immediately after the *Designing in Skills* workshop and was publicly exhibited at the Umeå Institute of Design during the yearly event *Design Talks*, in June of 2014.

In the second prototype, _DiffractMe! #2_, the electronic sensors and actuators that measured and mirror movements across the installation were replaced with a direct coupling through a system of pneumatic cylinders and tubing. _DiffractMe! #2_ was produced and publicly exhibited at the Eindhoven City Hall during March and April of 2014.

/ REFLECTION

When interacting with the _DiffractMe!_ installations two people experience a subtle dialogue mediated by technology through carefully designed physical qualities of interaction. This coupling is open-ended to some degree, people are free to explore if and how they move the interactive surfaces.

In _DiffractMe! #1_, the sensor–motor coupling between the two surfaces is electronic. The high accuracy of the sensors result in the surfaces’ movements to be mirrored with a high precision. However, the low power of the motors sacrifices force in favour of this precision. For people interacting with the installation there is greater subtlety in sensing and responding to the other’s movements. This provides more depth in interaction that needs attention to be discovered.

In _DiffractMe! #2_, the sensor–motor coupling is replaced with a pneumatic system. This system is less accurate but more powerful. This makes the haptic dialogue less subtle and it becomes difficult to ignore the other person’s movements. This elicits a different type of behaviour and people were observed to be more interested in dominating the interaction as opposed to achieving a shared rhythm through sensing the other.

Still, in both installations the coupling is direct and limited to hand movements. After initially exploring the subtleties, the interaction can become predictable, possibly because the interactive surfaces are not sensitive enough to elicit the potential complexity of an embodied dialogue between people.

In the _DiffractMe!_ installations a specific type of behaviour is elicited towards a very specific goal: moving one’s hands to move the prisms in order to achieve a form of resonance. This goal is difficult to achieve and not very rewarding because
the change in lighting effect is minimal. This makes the effect straightforward and predictable, shifting the attention that was intended to be on the whole of interaction and effect, to the haptic dialogue. This open-ended interaction elicits some experimentation, but with a limited effect there is little to discover in this process of experimentation.

Of note here is also how challenging the prototypes for both DiffractMe! Installations were to create. It proved difficult to transpose deep and subtle qualities from ad hoc prototypes into a large scale and durable installation. This involved several iterations, of which the two main ones are discussed in this section.

/KEYWORDS
subtle, dialogue, open-ended, experimentation, direct, limited, motivation, physical qualities, goal, unrewarding.
5.5 BALLADE OF WOMEN

PREVIOUSLY PUBLISHED IN


which confused facts and impeded her to be remembered as an honest human and to be acknowledged as the symbol of knowledge in the Gospels. This painting was used to support our narration on the theme of self-determination.

Lucia di Siracusa (by Maestro dell’Osservanza, fifteenth century). Lucia di Siracusa was denounced to the Roman police and prosecuted for her religious beliefs as a revenge for having refused a pretender. She was deprived of her free will, her dignity and condemned to a painful and denigrating death. This painting was used to support our narration on the theme of violence and torture.

Marti et al. 2015.

“Such themes are inherently complex, affording many different points of view. The installation merged embodied and situated perspectives of visitors (offline) with virtual (online) perspectives expressed by people active on social media. By weaving views from both the physical and digital domain, the installation explored how these different domains might influence the dynamic information landscape created by the exhibition” Marti et al. 2015.

A common thread among these three characters is that they embody the notion of deviance: many versions of their stories distort their image. Such versions were produced by the accepted moral of the communities in which such women were living. Information is multiple and ambiguous, at times even controversial. At
the same time, women’s rights are a complex matter: while respecting the diversity of the individual, they sanction their universal validity. This paradox shows their fragility. The way the three chosen themes are treated in media, social media and interpreted are infinite and depend on so many factors that make it impossible to easily formulate a permanent safe opinion or stance.

These reflections led the design team to focus on fragmentation as the natural concept to explore. Fragmentation became the aesthetic drive to design the experience of Ballade of Women. Thus, by embracing fragmented visuals, audio and online content, the design team could create an installation that allowed visitors to raise questions appropriate to these themes. Furthermore, it embodied and respected the complexity inherent to such themes” (Marti et al. 2015).

/ INSTALLATION

“The installation was a dynamic space [See video referenced in the colophon] constituted by floating and mobile panels, created by slicing digital versions of the paintings along their contours. The behaviour of the panels was influenced by the physical presence of the observer as well as by the virtual presence of online discussion groups debating the themes of the exhibition. When the panels were positioned in a fragmented way, they displayed media collected from online groups, discussing the issues addressed in the exhibition [See Figure 5.9]. Software continuously monitored news related to the treated themes and online
discussions generated by this news. The number of threads was an input for the installation and influenced the speed of movements as well as dynamics with which the informative content was displayed in the projections.

The soundscape allowed the viewer to pick up fragments of poems, related to the three themes. Verses were whispered and vanished immediately after being heard. The dynamics of the fragmented panels redefined the contours of the three paintings from specific viewpoints in the space [See Figure 5.10]. By looking at three paintings, in a continuously changing manner, the installation aimed at playing with and perhaps changing our perspective of these universal issues, tackled from a feminine perspective.

The experience was designed to trigger personal reflections in visitors by actively involving them in the exhibition. The goal was to suggest that each of us could contribute to compose a coherent picture of women’s rights, by approaching it, and by being confronted with points of view of other people, facing the same topics from different perspectives from all over the world” [Marti et al. 2015].
EXHIBITION

The installation Ballade of Women was the main element of the exhibition. In one adjacent room, the original paintings featured in the installation were presented to the public. Another adjacent room featured a large screen that allowed visitors to monitor online activity related to the themes of the exhibition on social media. Furthermore, a scale model of the installation was exhibited next to the screen, demonstrating clearly the relationship in movements of the installation and online behaviour.

“The ambiguity of interpretation, elicited by the interactive installation, connected to the ambiguity of information, to its controversial nature. This offered different points of view and suggested the need for clearer understanding and embodiment of these issues. The information flow reflected both the old and new techniques for imparting, sourcing, and consuming information.

The purpose of Ballade of Women was to interactively engage visitors, empowering them to constitute their own take and point of view on themes related to gender. By giving it an experiential form, visitors were drawn into a proactive attitude and confronted with the opinions of other people. Our observations of the visitors’ behaviour in the space, online statements posted to social media, as well as the written records of the thoughts on the guest book suggest that relevant discussions were successfully raised and our approach to respect the complexity of the theme was well received” (Martí et al. 2015).

REFLECTION

“In Ballade of Women visitors are free to move around the space and experiment with the responsive behaviour of the installation. The space was rich and immersive, surrounding visitors with dynamic audio and visuals that responded to their full body movement in the space to open a dialogue. The behaviour of the installation was also influenced by comments and news on social media website, thus making it unclear and ambiguous how exactly it responded to visitor’s movements” (Peeters and Trotto 2015).

Ballade of Women does not clearly reveal a logical narrative structure, but presents three stories in a complex, fragmented way. The visual fragmentation of paintings, the snippets of poetry produced by directional speakers and the dynamic overlays of opinions sourced from social media form a web of stimuli and information. This elicited visitors to construct their own narrative structure which they inescapably relate to their personal feelings regarding the themes to form their own interpretation of the exhibition. In doing so, the installation evokes a personal point of view from each visitor which may be expressed through their interactions with the installation or with those around them.

The installation appeals to all of a visitor’s skills. It calls on perceptual-motor skills to move around the space and engage with the content. This experience of active perception is ambiguous and complex as to call upon cognitive and emotional skills when personal reflections are triggered. Women’s rights are a societal
issue and their complexity dictates different stances, opinions, and stories for everyone. The experience of interacting with the installation also appeals to visitors’ social skills: multiple people engage with the installation at the same time, their paths cross and content from social media effectively confronts visitors with points of view from outside the particular space they find themselves. Visitors were often observed to share their points of view by discussing their impressions of the interaction and contributing news or thoughts related to the themes.

/KEYWORDS

free, movement, narrative, complexity, fragmented, relate to personal, rich, immersive, unclear, ambiguous, share personal points of view.
The *Light through Culture* project series aims at weaving together innovative technologies with rich socio-cultural histories through the power of design. In this installment several design teams explored the relationship between design and politics by immersing themselves in the history of material expressions of local governance in Siena, Italy.

Such material expressions are plentiful in the medieval city of Siena. For instance, the *Sala della Pace* at the *Palazzo Pubblico*, seat of the nine elected merchants that formed the government, features a collection of frescos. One of these frescos is the *Allegory of Good and Bad Government* by Ambrogio Lorenzetti. This fresco communicated to both this government itself as well as citizens the fundamental values of good and bad governance and their effects upon the well-being of the city. Another example are the *Biccherne*, some of which are exhibited at the *Archivo di Stato di Siena*. The *Biccherne* are painted panels functioning as covers for the books that collected administrative records of a governmental period. They visually communicated which families had been part of the government and how they had governed through symbols and text. In a centuries long tradition, the local government commissioned major artists of the day to spend months creating each *Biccherna*. 

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*FIGURE 5.11* Close-up of the centre of the table, showing the topic (centre) and the cylinders that keep track of arguments used in the discussion.
These examples, among many others explored in the workshop, attest to the value that the medieval society of Siena placed on the quality with which local governments communicated to citizens. The Allegory of Good and Bad Governance visually communicated the morality of government to remind all of their responsibility. This value appears to have been changed in much of the way in which governments today communicate. For example, if one thinks of the design and typography of the European Union’s website[1] or its annual reports[2]. The richness and care of the Sienese expressions is replaced with simplicity and clarity of form, perhaps to suggest accountability and precision in reporting on actions but at the cost of complex terminology.


/CONCEPT

The concept for Aesthetics of Politics explored this relationship between ethics and aesthetics within the context of empowering citizens in a democratic process. Deliberative democracy is a type of democracy that revolves around deliberation: long and careful discussion.

Aesthetics of Politics is a round table around which participants can gather to
discuss issues (See Figure 5.11 and video referenced in the colophon). The topic is shown in the center of the table. Arguments that come up in the discussion can be written onto cylinders. The cylinders can be moved around on the table to suggest or emphasise relationships between arguments and their importance relative to each other (See Figure 5.12). The closer they are to the center of the table, the more important the argument is deemed for the discussion.

Dynamic lighting inside the cylinders emphasises their position on the table in communicating their relevance. Tokens can be attached to the cylinders to automatically store and if desired, retrieve, audio recordings of points of interest during the discussion. The position of cylinders can also be tracked and reviewed after the session to provide insight into the course of the discussion. Aesthetics of Politics provides a physical dimension to the discussion at hand. The design builds on earlier research that showed that embodiment and skilful coping can be a positive way to connect people in a shared discussion (Trotto and Hummels 2013b).

/ REFLECTION

Reflections on the exploration phase of the workshop, which involved researching the value placed on aesthetics by governments, highlighted the socio-cultural dimension of the aesthetic experience. The examples of medieval Siena express a different relationship between ethics and aesthetics when compared to contemporary governments. This suggests an opportunity for designers to explore alternative formulations of this relationship.

This also relates to language: what certain aesthetics convey. The visual language used in for example, the frescos and the Biccherne, builds on socio-cultural references that were, in more ways than just literal, foreign to the design team. However, there were recognisable elements and this ambiguity elicited imagination and discussion on the intention of the whole. On the other hand, when compared to policy documents of the European Union, the design teams experienced a similar – or perhaps increased – difficulty in understanding. Presumably aimed at clarity and precision the liberal use of legal terms aided sooner in eliciting confusion and disinterest than engagement.

The physicality of the Aesthetics of Politics table brings experiential qualities into view. The physical forms, lighting effects, the weight of cylinders and their friction in moving are but a few of the many dimensions along which the table allows sensory richness to be brought into a cerebral discussion.

/ KEYWORDS

ethics and aesthetics, values, language, communication, imagination, ambiguity, richness.
The second loop formulates, realises and reflects on a design program aimed at dimensioning the design space.
FORMULATING THE DESIGN RESEARCH PROGRAM

The first loop used six constructive design research projects to establish positions in the design space around aesthetic engagement. As a body of work, these positions aided in formulating an understanding of the experiential qualities of aesthetic engagement in three themes. Having explored the design space, a new loop can now push the boundaries of this established area to find its dimensions with more precision, in order to more accurately describe the qualities of aesthetic engagement.

The design program for the second loop can be described as: give experiential form to the themes of aesthetic engagement through the design of a handleable object, without digital components and without a practical function, so that it may only be interacted with for its own sake.

This program builds directly on the understanding formalised in the first loop by transposing the understanding of these qualities as described in the themes, back from abstract text into experienceable prototypes. Moreover, it explicitly pushes the boundaries of the known design space by proposing three requirements that are directly opposite to the six projects created in the first loop: small in size, without digital components and without a function.

REALISING THE DESIGN RESEARCH PROGRAM

To realise this design program, roughly 20 different prototypes that are best considered as three-dimensional sketches were created in rapid succession. Some of these prototypes are individually discussed in the next section to highlight how they aimed at materialising different experiential qualities. Action and reflection in this process were closely intertwined: insights from one prototype were often immediately addressed in the next. Reflections on these individual prototypes are therefore also presented within the individual descriptions of prototypes and their design processes. The next section of this chapter concludes with an overall reflection on the Rotations project.

Many projects in the first loop involved different stakeholders, such as a design team where individuals had their own agendas or interests and clients...
for which the designs were created. As a self-directed and individual design research project, the context for realisation of the design program in the second loop also differed from the first loop. In Rotations, the work is more explicitly and solely directed towards the overall research trajectory: to build on intermediate research results with a specific aim to further specify those results.

/ REFLECTING ON THE DESIGN RESEARCH PROGRAM

To use an understanding of a collection of work as a starting point for a new design project is to engage with the same content in a second loop of reflection-on-action. Abstract qualities described in the prior publication, become concrete again in tangible proposals. Reflecting on these tangible proposals allows a re-examination of what these qualities are and how they can be more accurately described. As a body of work, the prototypes created for Rotations were successful in eliciting a more detailed description of the initial themes into qualities of aesthetic engagement. As individual prototypes however, all of the sketches failed to address a unity of the themes and focused on particular (aspects of the) themes instead.

Reflecting on the second loop highlights a tension between the abstract and the concrete. An abstract description of aesthetic engagement generalises experiential qualities and quickly omits their viscerality as it becomes disconnected from the material essential to having the experience. Moreover, abstract articulations have a tendency to pull apart elements of experience that are inextricably linked. Conversely, it is difficult for a concrete manifestation to elicit all aspects of the more holistic understanding of aesthetic engagement, as it tends to emphasise a particular quality. Moreover, concrete manifestations exist in a particular time and space that is inaccessible to you, the reader.

This tension exposes an issue at the core of this research: how to articulate and communicate knowledge about experiential qualities in a way that balances their generalisation with the materiality from which this knowledge is created. This tension formed the explicit focus of the third loop.
Both volumes can rotate around the axis independently. The inner sphere is permanently fixed to the axis. The outer sphere is not fixed to the axis and can rotate independently. A sleeve around the axis that protrudes on the right side is fixed to this outer sphere. This allows movement of one hand to rotate the inner sphere while the other hand rotates the outer sphere.

Affording a certain type of movement – rotation – from a person’s hands makes the object more actively handleable than a set of modular “building blocks”. More importantly this movement provides boundaries for open-endedness: to control the two sphere independently allows for experimentation between their respective boundaries of movement.

The direct and clear coupling between the movement of two hands and the rotation of the two spheres is predictable. A series of other prototypes sought to add an unpredictable element to these movements (See Figure 6.3). For example, in one sketch, a third volume was mounted on the same axis and embedded within the inner sphere. This volume was attached to the axis with a piece of elastic that allows it to rotate semi-independently from the two spheres.

As one interacts with the object and makes the two spheres rotate, momentum...
the squares on each face to rotate as their centre of gravity shifted. In this prototype complexity is explored by creating a large number of predictable but continuous and hard to oversee indirect movements of many elements.

Another set of prototypes explored the integration of open-endedness, unexpectedness, and visual complexity. One Rotations prototype (See Figure 6.7) consisted of three forms: two controlled by rotations of each hand and one with unexpected and semi-independent movements. Each form had a different number of surfaces and each of these surfaces is covered in a pattern. Together, the surfaces form frames of an animation that brings the patterns to life in movement. The intention was to create a visual effect of interference between the different animations as they varied and changed in front of a person’s eye under their different speeds of movement.

REFLECTION

The Rotations project was largely an internal designerly exploration and it is questionable whether the objects were fully successful in responding to the strict limitations of the design brief.

The difficulty experienced during winds and unwinds the elastic resulting in semi-independent movement of the third volume. This adds unpredictable and uncontrollable movement to the interaction that is heard, seen, and felt.
However, reflecting upon the difficulties of synthesising the qualities into these prototypes reveals insights that further expose what these qualities are. The reflections below discuss insights from the design process as well as insights gathered during informal feedback sessions where colleagues interacted with the prototypes.

The first prototype, a set of modular “building blocks” highlighted a serious difficulty with the concept of open-endedness: it seems difficult for open-endedness in itself to trigger interaction and elicit engagement. Subsequent iterations show that a more seductive form, some type of affordances for possible explorations and sensorial richness in interaction may aid in this and trigger curiosity leading to an engagement with the object.

A degree of unexpectedness seems to play an important role in actualising open-endedness by affording experimentation. Once a person interacted with one of the objects that featured an element that was not entirely controllable in its movements, they explored how it responded to their different movements and attempted to control it. This significantly increased the time-spent in interacting with an object and opened a dialogue between person and object.

The qualities of complexity and ambiguity are closely related. In the publication that inspired the Rotations explorations, these qualities were articulated as an intellectual part of people’s experience. The difficulty found in Rotations to make complexity and ambiguity experienceable is related to the prototype’s
explicit lack of a function. Other projects in this dissertation that deal with complexity and ambiguity, such as Ballade of Women stretch the notion of a function beyond what one could consider a strict practical use. However, there is still a function in interacting with that installation, as a way to become engaged with women's rights. Part of a function is the formation of a narrative in use.

The difficulty with the Rotations prototypes, without a practical function, is that there is little to elicit a narrative. Without a narrative, complexity, and ambiguity lose much of their potential and applicability. In the Rotations prototypes complexity was confused with complicatedness. This occurred both in the engineering of making the prototypes as well as the design of visually complex forms and patterns. A complicated thing might be hard to oversee, but if it does not elicit the development of a personal narrative – to take a perspective on the complexity and make sense of it – it remains just that, complicated.
Articulating the Design Space

The third loop formulates, realises and reflects on a design program aimed at articulating the design space.
This does not only relate to the foundations of design, it also relates to a theoretical foundation of this dissertation: the notion of embodiment. Embodiment places emphasis on the role of the body, asserting that we perceive the world in terms of how we can act in it and upon it. That meaning arises in dialogue with the world around us as we act in it. It is thus difficult to describe our dynamic, ephemeral, and subjective experience of the world accurately in words. Moreover, this approach means that perception comes from action and precedes cognition.

Having explored and dimensioned the design space, the tensions between abstract and concrete, active and passive, bring forth an issue of articulation in the third loop: how to clearly and wholly communicate findings within the design space around aesthetic engagement. The third loop investigates this articulation of the design space by focusing on a particular opportunity to address these tensions: the form of this dissertation. As a book that aims to communicate the findings of this research, there is an incongruence between the cognitive, theoretical knowledge that the dissertation aims at communicating and the largely passive interaction the reader has with it, to access this knowledge.

The design program for the third loop explicitly explored this tension...
and can be described as: articulate the experiential qualities of aesthetic engagement by transposing salient qualities from interactive artefacts into the domain of print.

The goal of this design program was two-fold: Firstly, to explore how the design of the book form of this dissertation may actively embody the content presented within. Secondly, to explore how transposing experiential qualities into the domain of print design might inform a better understanding of these qualities.

/ REALISING THE DESIGN PROGRAM

The publication Reflections on Designing for Aesthetic Engagement <Peeters and Trotto 2015> was used a starting point for this loop because it can be considered an early version of this dissertation. The publications presents four research-through-design projects in the form of an annotated portfolio, embedded within a background section and a conclusion presenting more general insights towards aesthetic engagement.

The process of realising the design program was initially concerned with identifying what would be suitable to be communicated interactively. The theoretical content (e.g. the background section) in the prior publication proved more difficult to be given experiential form. Concrete artefacts provided necessary handles in the form of a visual language and interactive experience, facilitating the process of transposing experiential qualities into print.

For example, the haptic interaction in the DiffractMe! installation, opens up to explorations that elicit the reader to touch the page and provide a response to this touch. This is easier to design with and for, than something more abstract as for instance the fundamental ideas behind ecological perception theory.

Where the Rotations project in the second loop directly transposed an abstract understanding of qualities into a new design domain, the particular focus of the third loop thus required a different path. In order to better articulate experiential qualities it became necessary to directly transpose salient aspects of the concrete manifestations themselves into a new design domain.

/ REFLECTING ON THE DESIGN PROGRAM

To search for ways in which to communicate the experience of interacting with an artefact through another medium such as print, raises questions of representation. The richness and complexity in dynamically experiencing an artefact, is immediately reduced to an inherently limited representation of that experience when we communicate about it, for instance, in a dissertation.

To show glimpses of this richness found in the artefacts, design research publications are commonly supported by visual material or video links. In such supplementary material, the dynamic qualities of the experience are
“frozen” into various levels of abstraction and disembodiment. These different abstractions each communicate a particular, perhaps clear, but narrow perspective on the whole experience of being with the artefact. For instance, a photograph does not show the dynamics or the third dimension of the artefact. A video shows the dynamics of interacting with the artefact, but offers only a single point of view, while a text omits the sensuality of the artefact.

Redström 2013, 26 discusses how such representations, where our perspective on the artefact has been fixated and temporal unfolding has been removed, run the risk of becoming themselves the definition of the artefact they represent within discourse. The Interactive Dissertation project explored a particular way to attempt as much as possible to avoid such a situation.

Creating a multimodal representation of the artefact, with layers of information presented in different forms that appeal to different skills, can aid in promoting a deeper understanding of the original design. To actively engage with a range of abstractions of the original design, forces one to actively leap from one fixated perspective to another. This elicits comparisons and sense-making of these different perspectives to acquire a unified view on the whole. To use a range of media increases the chance of content resonating with the reader and emphasise the inherent limitations each representation offers by itself.
INTERACTIVE DISSERTATION

2015

RISE Interactive
DESIGNED BY Marlies Peeters and Jeroen Peeters
VIDEO https://vimeo.com/rightsthroughmaking/interactivedissertation
The *Interactive Dissertation* project aims at establishing a consistency between the reading of the dissertation and its theoretical and practical content. This aim of congruence is not only a relevant intention for the research presented in this dissertation. It also addresses developments in the wider field of design research around dissemination. The presentation and reflection of the project here focus on its direct relevance to the overall research trajectory. Chapter 9.3 reflects on the *Interactive Dissertation* project from the perspective of dissemination of (constructive) design research.

The *Interactive Dissertation* project explicitly focuses on this type of dissemination: the dissertation. Dissertations, like other academic publications, could be considered the final outcomes of design research, and are often governed by explicit as well as implicit rules, expectations, and traditions, which may or may not be particularly suited for dealing with design. *Interactive Dissertation* responds to this opportunity for design research. The project aims to develop and probe this tension and through this, contribute to the wider discussion in the field around suitable dissemination formats.

### Explorations

The design process for the *Interactive Dissertation* project followed a making-centred approach. Cycles of reflection-on-action were used to continuously articulate and develop the design process. The design team explored different ways to give experiential form to the content of the prior publication, using a mix of analogue and digital tools, techniques, and materials. Shared reflections on these explorations identified successful and unsuccessful ways in which the content of the prior publication became embodied in interactive elements, guiding further development and refinement of these ideas. This section highlights three selected avenues of exploration aimed at eliciting interactive behaviour from a reader with a page.

### Fragmented Typography

The main design theme in the *Ballade of Women* installation was fragmentation. Visitors were triggered to form their own personal narratives from a complex whole of fragmented visuals and sound. Here, this is transposed into fragmented typography (See Figure 7.1). This requires effort on behalf of the reader to (re)construct what is communicated. It elicits active involvement from the reader and
accepts ambiguity by providing a degree of freedom as to how the information that is conveyed becomes subjectively interpreted.

In the *DiffractMe!* installation, visitors could manipulate one of two interactive surfaces, to engage in a subtle haptic dialogue. In print, this tangible interaction is transposed into folded elements (See Figure 7.2). Folding is technique used to elicit bodily engagement and trigger the reader to actively participate. Folded elements add a third dimension to the paper, eliciting manipulability and flexibility.

This flexibility extends to what is communicated, allowing for instance letters or different combinations of letters to appear and disappear.
although technically through a different rotation than the original design. The second phase of the design process aimed at integrating and synthesising these skills and understanding into final prototypes. These prototypes focused on the four research-through-design projects that were presented in the prior publication, along a reasoning that we will elaborate on in the discussion of this text. On the following pages, we present these four booklets individually. Ironically, we of course have the same problem in communicating the qualities of these interactive artefacts within the medium of this text. Therefore, it is recommended to the reader of this dissertation to watch the video of the booklets referenced in the colophon. The video more completely and dynamically presents the four booklets.

Implied by Light is a lighting installation that implicitly informs travellers of the state of the Dutch railway network. A continuous light pulse travels through an abstracted map of the whole network, ambiguously signifying disruptions with a slight delay in the pulse.

The *Implied by Light* booklet comes in the form of a cassette (See Figure 7.4, top), flanked by the project description and reflection. Light, the main material of the *Implied by Light* installation itself, is emphasised through the use of high-contrast black and white materials and typography. Hexagonal perforations

/ THERMOCHROMIC PAINT

Another way to transpose the haptic interaction found in *DiffractMe!* was achieved using thermochromic paint. Thermochromic pigment is used to create paints that change colour when heat is applied. Here, it is used to elicit the reader’s physical engagement with a page. When touching the page for some moments, body heat turns a layer of black thermochromic paint transparent, revealing otherwise hidden typography underneath (See Figure 7.3).

/ RESULTS

The explorations developed skills in the use of different techniques and materials that could elicit an interaction with a page and an understanding of how such an interaction might support the knowledge that is communicated. Skills here relate to a material understanding of how to elicit active perception, for example the layering of thermochromic and acrylic paints (Figure 7.3) or the placement of letters on folded elements as to reveal and hide them in interaction (Figure 7.2). Understanding here relates to knowledge of how to represent salient experiential qualities of the original design in a new interaction. As a new interaction, it became more important to represent the experience elicited by the original artefact, rather than to literally copy it. For example, the top right title in Figure 7.1 literally copies the rotation of physical elements in the original design into typography. The top left typography more accurately represents the experience, although technically through a different rotation than the original design.
in the cassette refer to the form of the physical components of the installation.
Highly reflective fluorescent yellow paint on the inside of the cassette is not
directly visible to the reader of the booklet, but reflects light from the en-
vironment onto the insert (See Figure 7.4, background image). Pulling the
insert out of the cassette (See Figure 7.4, middle) subtly changes the
colour of each hexagonal cell, while the letters of the project title appear
and disappear (See Figure 7.4, bottom). This echoes the lighting pulse that
travelled through the original installation and elicit the reader to construct
the title of the project.

/ NODLES BOOKLET

Nodes is a design that enables people to manage wireless connections between
devices in a smart home. The design is distributed, requiring people to move
around the space to place physical start and end points to establish connections
and form a network.

The Nodes booklet presents a title and short description of the project.
Corners can be folded to reveal keywords that describe the concept and
interaction (See Figure 7.5, top left). The first spread of the booklet fea-
tures an overview shot of a home context in which the design would be
placed. Graphical elements highlight where the design could be placed in
a particular use scenario (See Figure 7.5, top right). The second spread of the
Nodes booklet shows a partial sequence of still images of the original design in use. Folding along suggested lines completes these partial images (See Figure 7.5, bottom). Physical engagement from the reader turns a seemingly haphazard composition into a schematic overview of the actions involved in using the original design.

DiffractMe! is an installation that invites people to engage with each other in a subtle haptic dialogue (See Figure 7.6). Two people manipulate a small platform, feeling each other’s movements and moving together to create a subtle ripple effect to move through a matrix of prisms.

The cover of the DiffractMe! booklet (See Figure 7.6, background image) is made of birch plywood, one of the main materials used in the construction of the DiffractMe! Installation. The cover is painted with blue thermochromic paint, eliciting the reader to touch and to explore how it responds to her body, referring the haptic interaction of the original installation. The center page features a folded piece of light diffracting foil that...
folds and unfolds with the (repeated) opening and closing of the booklet (See Figure 6, bottom). The foil very subtly diffracts sunlight like a prism, resulting in a colourful projection on the white page beneath. The foil is pre-folded, but is somewhat resistant. It requires repeated subtle hand movements, coordinated between the two hands, to explore the visual effect of diffraction, referring to the interaction between people in the original installation.

BALLADE OF WOMEN BOOKLET

Ballade of Women is an immersive interactive exhibition. Independently moving projection panels, directional audio and a combination of online and offline content, created a space that triggered reflections on issues of women’s rights by inviting people to form their own meaning from the fragmented and complex whole.

The spreads in the Ballade of Women booklet are horizontally divided into three separate elements, inviting the reader to flip through them freely (See Figure 7.7). The content on these spreads includes fragmented typography, artistic renderings, photographs of the installation, additional imagery of the exhibition that the installation was part of and technical images from the design process. The way in which the reader flips through these elements, results
in new and varying compositions of this content. This elicits the reader to make sense of the fragmented content by forming a personal narrative to weave the different elements together, echoing the experience of interacting with the installation itself.

/ REFLECTION

The brief for this project was to give an experiential form to the publication *Reflections on Designing for Aesthetic Engagement* Peeters and Trotto 2015. In this publication each project is presented in a textual description and a textual reflection.

The *description* presents the more formal features of the design: its intent, context, and function. The *reflection* highlights the salient experiential qualities the design elicited. The idea of *projection* was developed as a third way to present projects, positioning a combination of interactive elements and other supplementary content such as images. The projection is the combined set of supplementary materials (images, video) binded together in an interactive element that represents a salient part of the experience of interacting with the original design. For example, the first page of the *Ballade of Women booklet* presents a description of the installation and the last page presents a reflection on the installation. The spreads
Moreover, the projection provides a bridge between an objective description of each design’s formal features and the more subjective reflection on the experience it elicited. The projection here supports sense-making by eliciting active perception to understand the main texts. Vice versa, the projection is framed by the description and reflection.
Part III discusses the findings of this research that substantiate the research program positioned in Part I with knowledge generated through the work presented in Part II. Part I of this dissertation elaborated on the research program and positioned this investigation within the wider discourse of informatics and interaction design research. Part II presented the design activities undertaken within this investigation, exposing how three design programs were formulated, realised, and reflected on to reveal the design space from a multitude of perspectives. The third part of this dissertation consolidates the knowledge generated by taking these perspectives and exposures on the individual design projects as a body of work to distill experiential qualities that form shareable knowledge of how to design for aesthetic engagement.
Chapter 8 responds to the research program outlined in Part I: to contribute to the development of design research by articulating first-person ways of knowing. Chapter 9 responds to the main aim of the research program: to contribute to the development of designerly ways of knowing by articulating first-person experiences in design research. Chapters 3, 4, and 10 present the methodological structure of this dissertation and the methodological structure of this dissertation, respectively. These chapters are consolidated in the form of implications and recommendations for other researchers and design practitioners. Chapter 10 presents an overview of the aims, findings, and opportunities for further research.
8 A Perspective

The introduction chapter of this dissertation outlined the research program that guided this investigation.

This research program outlined the two contributions of this dissertation:

on Designing for Aesthetic Engagement
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The qualities that emerged from this point of view are discussed in relation to existing research work that touches upon similar themes, in order to position this knowledge as a shareable academic contribution and to extend its functionality for design.

Chapter 3 articulates how my point of view as a design researcher actively repositions between perspectives of theory and practice around the artefact. This process embodies knowledge in the artefact and extracts knowledge embodied by the artefact. This process demonstrates the mechanism of knowledge production.

Chapter II illustrates this model with concrete design work and reflections on the work to demonstrate this mechanism of knowledge production. Design work and reflections on the work are used to demonstrate this mechanism of knowledge production.

T hese characteristics, discussed as qualities of aesthetic engagement in section 8.2, are conceptual values that can be used in the design of interactive artefacts. Because these qualities are inherently dependent on one another, and as a whole they depend on the perceiver, this discussion should not be considered a complete and definitive conclusion to the question of how to design for aesthetic engagement. Rather, it is a particular perspective on aesthetics of engagement, at a certain point in time at the end of this research process and from a certain point of view (See My Point of View in sections 3.2 and 9.2).
in response to the research program, and within a body of work that generates shareable knowledge. Demonstrates how taking a multiplicity of perspectives on the creation of the inward looking portfolio in order to be part of the second contribution outlined in chapter 1: to articulate how first-person experiences can be leveraged to generate an academic contribution. This is achieved by exploring and structuring the many perspectives that emerged from this research. This contribution is to demonstrate how first-person experiences can be leveraged to generate an academic contribution. This is achieved by exploring and structuring the many perspectives that emerged from this research. This contribution is to demonstrate how first-person experiences can be leveraged to generate an academic contribution. This is achieved by exploring and structuring the many perspectives that emerged from this research.

The presentation of the design projects as a whole, the description of their role in cycles of programmatic design research and even the design of this dissertation itself are all intended to demonstrate how this knowledge of designing for aesthetic engagement is generated. These efforts to demonstrate how this knowledge is created and explorations in how it can be communicated, constitute part of the second contribution outlined in chapter 1: to articulate how first-person experiences can be leveraged to generate an academic contribution. This is achieved by exploring and structuring the many perspectives that emerged from this research.

Section 4.1 of this dissertation introduces the notion of an annotated portfolio as a way to describe a design space and the two ways in which this notion has been appropriated in this research. Firstly, an outward look is taken as a tool to structure and communicate the constructive design research projects. Secondly, an inward looking annotated portfolio is used as a tool to structure and document the process of reflecting on these projects. The next section takes a closer look at the creation of the inward looking portfolio as well as document the process of reflecting on these projects. The next section takes a closer look at the creation of the inward looking portfolio as well as document the process of reflecting on these projects.
8.1 FROM INDIVIDUAL REFLECTIONS TO SHAREABLE KNOWLEDGE

The process of creating an inward looking annotated portfolio was made by comparing and contrasting the eight design projects presented in the previous section using a visual software tool, Freed. Freed is a software application designed by Philip Mendels in 2013, that allows designers to organize the digital results of their work. The program uses a force-based layout and the ability to create different views on the generated content. It is designed to facilitate reflection on the work and in particular to explore the different relations between elements of the content.

The use of this specific tool, Freed, is not crucial to create these reflections, but it is useful to document and keep track of the reflections. Because the tool allows importing of different media such as images and video, annotations are always visibly linked to the manifestation of each design project, rather than its title. This facilitates emphasis on the qualities it elicited in interaction and the design decisions it embodied, rather than its entirety as a design project with assorted other concerns and histories that are not directly relevant to the research. Moreover, because the design projects were carried out in teams, the emphasis is on the development of each design rather than the individual designer's contributions.

The process of creating this inward looking annotated portfolio started with annotations on the individual projects. From these observations and reflections differences and similarities between projects start to emerge. This highlights salient themes for the body of work created in the three loops of programmatic reflection.

Reflection is a process of reviewing one’s own actions to think about and evaluate what has been learned from them. It is a way of processing experiences, ideas, and information in order to make sense of them and to draw conclusions about the world. Reflection is a complex and dynamic process that involves both cognitive and emotional processes. It requires the ability to think critically about one’s own thinking and the ability to evaluate the effectiveness of one’s own actions.

Figure 8.1: Example of an in-progress view on the Ballade of Women project in Freed.
Freed allows different views to highlight or exclude annotations. This allows focus on a particular set of annotations. For the individual reflections in chapters 5, 6 and 7, the annotations focused on exposing the experiential qualities that the final prototypes of each project elicit. This aimed at highlighting the salient aspects of each individual in eliciting aesthetic engagement.

The second step is to compare and contrast projects by placing them together in a view (See Figure 8.3). This can take the form of formally comparing projects along an introduced parameter (e.g. number of people involved at a time when using the design, context of prototype, etc.). Annotations of the same project may be hidden or shown in different configurations. These views (See Figures 8.1 and 8.2) form the starting point for the individual reflections. Every project is individually annotated to describe its salient aspects. These annotations span the entirety of the project's timeline and beyond from design goal and brief to the process, outcomes, and insights the entirety of the projects' learning and beyond from design.

Since its completion, project data and other interpretations of the project can be shared and discussed. These annotations can be shown or hidden in different configurations. These views (See Figures 8.1 and 8.2) form the starting point for the individual reflections. Every project is individually annotated to describe its salient aspects. These annotations span the entirety of the project's timeline and beyond from design goal and brief to the process, outcomes, and insights the entirety of the projects' learning and beyond from design.

Digital files related to each project were important into the software program Freed. These digital files form a collection in the program. Within a collection, content can be freely annotated and these annotations can be shown or hidden in different configurations. These views (See Figures 8.1 and 8.2) form the starting point for the individual reflections. Every project is individually annotated to describe its salient aspects. These annotations span the entirety of the project's timeline and beyond from design goal and brief to the process, outcomes, and insights the entirety of the projects' learning and beyond from design.

**FIGURE 8.2** Schematic of a Freed view in progress, showing an image of the project surrounded by four annotations.

**FIGURE 8.3** Schematic of a Freed view that starts to add annotations by comparing several projects.
Precisely describe the use of the body. For example, which part of the body is used, whose body, and in what way.

Step 4: Identifying Perspectives in the Design Space

Having identified recurring themes across projects, one can identify perspectives to take on that theme (See Figure 8.5). Taking a particular perspective does not isolate a particular theme from the other annotations. The dependency of themes on one another is crucial in order to embrace the complexity of aesthetic engagement. Rather, taking a perspective provides a vantage point—a lens—upon which diverse annotations are highlighted, implicating a particular theme. Having defined perspectives allows repositioning of the projects in that theme (See Figure 8.6).

Step 5: Articulating Perspectives

Having taken a perspective allows repositioning of the projects within that perspective (See Figure 8.6). It allows further detailing between two key aspects that appear to be the same but in the background. This allows a closer examination of the themes. Identification of the foregrounded theme through the vantage point of a particular theme allows further articulation of that theme from the perspective of aesthetic engagement within that design space. The annotations for each project form the basis of Part II's individual reflections on the key aspects of each concrete artefact from the perspective of aesthetic engagement. With enough detail, the annotations of similarities and differences start to show recurring themes across independent projects. These recurring themes start to shape and describe the design space these projects collectively inhabit. An example here could be how some projects direct a person to use their body in certain ways, while other projects are more passive in terms of physical interaction. This allows the designer to understand the parts of a whole theme in the background.

Step 3: Similarities within Differences

Design Space
Part II of this dissertation frames this body of work into three loops of programmatic design research. The first and second loops, presented in chapters 5 and 6, successively explored and dimensioned the design space to understand what opportunities exist in this space. These opportunities are formed by describing experiential qualities that may elicit an aesthetically engaging experience in interaction.

As research unfolded, it became clear that there is tension between the abstraction of these qualities and their manifestation in concrete artefacts. The third loop, presented in chapter 7, directly addressed this tension by exploring how to articulate understanding of the design space in the medium of print by building on active perception. The design of the book form of this dissertation and the way in which the design projects are framed and communicated in it, is one attempt to address the visceral dimension of this understanding of aesthetic engagement.

In this following section, emphasis is placed on communicating this understanding in text. The experiential qualities are all closely interdependent, as it is difficult to separate the complexity of what constitutes an engaging aesthetic experience into clear and independent categories. The attempt to do so in this chapter is inherently problematic. The description of qualities is best considered as a provisional description of conceptual values, ways or mechanisms that can ignite engagement.

Following the example, taking the perspective on, for example, the physicality of interaction, creates a new view in Freed.

In this view the projects are examined from the perspective of physical interaction to look at other themes or make a theme more specific. Or, one can take other themes or make a theme more specific. Or, one can take other themes or make a theme more specific. Or, one can...
Women, evokes a response from visitors to actively engage in an interactive dialogue with the installations. More than a kind of aggressive provocation of the senses, richness can also be a way to seduce one to interact. Implied physical involvement is minimal, but the visual quality of the system elicits interest and curiosity. The prototypes produced for Nodes did not emphasise sensorial experience. Their feel and visual appearance were extremely simple. Nodes required physical involvement to function, but exhibited no qualities that seduce or reward this physical involvement with a satisfying sensorial experience. As a result, the design was quickly perceived as laborious by those interacting with it. Lacking richness and depth, Nodes did not elicit engagement beyond the minimum to function.

Richness relates to sensorial experience and describes a complex orchestration of multimodal stimuli that immerse (a) person(s) in interaction. Richness elicits engagement through multiple senses in a complex whole of stimuli that is captivating, in part because it is inescapable. Interaction is a dialogue between artefact(s) and person(s). Richness forms a powerful and active part of this dialogue from the side of the artefact because it elicits a response. The full immersion into a dynamic space, such as in Asylum or Ballade, cannot be experienced by others looking on and it can also be ignored by a person as they interact. These haptic qualities are not salient. However, this subtle and dynamic interplay where

Although inescapably incomplete, this description aims at being functional to the design of aesthetic engagement and through this, contribute to our understanding of what aesthetic engagement is. To extend the functionality of this description, the experiential qualities are linked to existing work in interaction design research that resonates with the understanding presented here. Moreover, these experiential qualities are described with the support of examples from the design projects explored in Part II. Although it may appear germane to include particular examples in this section, they serve as a way to clarify the design space by illustrating different points within the interdependency of qualities, to demonstrate what mechanisms are at work here and linked to philosophical descriptions of aesthetic experience.
Designs often reduce complexity; the many options offered by digital technologies are constructed to form a path that only narrows the closer one gets to accessing a particular function. To let part of the inherent complexity remain and be solved by the person respects people's ability to make sense of the world and its complexities. To present a complex whole from which one constructs his own narrative forces involvement. It elicits engagement because it elicits participation in the sense making process.

For example the function of Ballade of Women is to evoke a personal stance for each visitor. The complex and rich design of the installation do not suggest a clear position or opinion. Instead the installation elicits participation to place the different fragments into a narrative structure. Forming this narrative structure requires involvement, a dialogue that teases out a personal reflection that may elicit a clearer opinion on the matters presented.

Nodes follows a similar line although it is a design directed towards the more concrete and limited functionality of establishing a network. Within these limitations it does offer the possibility for a handful of different personal narratives to be constructed of how devices can be connected. The experiments in Rotations misappropriated narrative complexity for complicated. Without any function at all the prototypes lacked a narrative of use. Without some kind of use information there is no narrative to elicit participation in the complexity of the artefact. For componented, without any function at all the complexity in function is unresponsive market.

To deal with the complexities of (daily) life, and especially the complex interactive digital technologies that are added to, might require to shift some of that complexity from the people using them. To let part of the inherent digital technologies remain and be solved by the person respects people's ability to make sense of the world and its complexities. To present a complex whole from which one constructs his own narrative forces involvement. It elicits engagement because it elicits participation in the sense making process.
dialogue. Unexpectedness is the counterforce of experimentation from the side of the artefact. Unforeseen responses in the artefacts' behaviour provide play within the dialogue between human and artefact. For example the simple addition of a third volume in the Rotations series responds to a person's experimentation in unexpected ways. This elicits further experimentation within the open-endedness and keeps the dialogue active.

Narrative complexity refers to a person actively shaping their own narrative of use in interaction with an artefact. Ambiguity here, refers more to the way in which the opportunity to actively shape this narrative complexity, is perceived. Ambiguity here is a mechanism to give form to complexity in a way that elicits engagement.

Ambiguity builds on a person's past to invite shaping of the narrative complexity of the artefact. A person's past experiences colour perception of the ambiguity presented by the design and their decision on the meaning that arises. It is important here to note that ambiguity is not the same as vagueness. Ambiguity in design needs to suggest that it may be resolved, in order to elicit participation.

For example, Implied by Light presents the entire railway network as a whole, but one particular hexagon can have multiple meanings. It is ambiguous because it may show the shape of multiple railway lines and it leaves room for interpretation. Ambiguity is important here to keep the dialogue active and engaging.

Open-endedness elicits engagement through experimentation.

Open-endedness as a dimension describes degrees of freedom in interaction from the perspective of perceptual-motor skills. Interactions elicit engagement when there is not a narrow predetermined path to follow through the interaction but the artefact affords experimentation and opens up different paths along the way. Open-endedness supports narrative complexity, and opens up different paths and avenues for experimentation and exploration. The way in which a person chooses to do so in interacting with an artefact, plays a role in how they engage with it. Without limits, there is no direction and there are no paths to explore.

In a concrete sense this means exploring how to use one's body to interact. This open-endedness does not require boundaries. Boundaries provide limits in the interaction between artefact and person. Without limits, there is no direction and there are no paths to follow. Any arbitrary boundary can be used to constrain a narrative.

Open-endedness elicits engagement through experimentation within open-endedness.

Open-endedness is the contributor of complexity and keeps the dialogue active. It is important in interaction to keep the user engaged and interested. The role of open-endedness is to foster engagement and to keep the user interested. The role of ambiguity is to give form to complexity and to engage the user in exploration. Open-endedness is a dimension that describes degrees of freedom in interaction and the role it plays in engagement.

In the Asylum installation anaglyphic glasses provide a way to deal with the sensorium's overload of multiple realities. The way in which a person chooses to do so (e.g. covering one eye with a hand or closing an eye) is open-ended. Experimenting within open-endedness broadens the dialogue between artefact and person. Experimentation elicits engagement by allowing one to play and explore within the interaction.
ambiguity can take different forms in an interaction, it may...
interactions that the installations require there would be no active way to participate in constructing a narrative with the information. This in turn elicits only minimal engagement.

Open-ended interactions allow for a person to act and thereby perceive to form a narrative space of their own, and this is aided by ambiguity. The opportunities for using ambiguity in designing for engagement have been clearly described by Gaver et al. (2003), who outline ambiguity of information, context and relationship as three ways in which ambiguity can be useful in interactions. The description of ambiguity as an experiential quality here is more general. Ambiguity allows a person’s unique past to shape their present experience, this elicits a personal perspective, empowering and respecting their individual identity. Ambiguity presents different pathways within the narrative space that a person can form in interaction, it elicits a decision, with consequences for the narrative complexity that is unraveled in interaction.

Narrative complexity and ambiguity built on the ability to interpret and perceive the information conveyed by a design in one’s own way, instead of forcing a single point of view onto someone. Richness, depth and in particular the more active characteristic of open-endedness brings a physical, sensual dimension to this process. For opportunities to participate and involve oneself, a design needs to actively express this potential. Open-endedness relates to rich interaction articulated in the work of Frens (2006), the integration of form, interaction and function a design needs to express its function and act.

Asylum and Ballade of Women reframe the inherent complexity of Human Rights is transposed into an experiential form that elicits bodily experimentation and participation to be made sense of. The open-ended interactions allow for someone to compose a narrative structure in which to place the complex information. The prototypes in the Rotations project on the other hand, provide open-endedness in an active, physical sense, but their inherent complexity of the design does not support the open-endedness provided in the physical here.

Similarly, DiffractMe! focuses on the depth and subtleties in haptic interactions that are used to communicate between two people. The expressive qualities of the interactive surfaces that mediate their experience of this dialogue provide a depth. However this interaction is focused on a clear and uncomplicated goal: to move the prisms so that they allow a subtle change in the environment. The expressive qualities of the information conveyed by a design’s inherent and explicitly presented handles on the ability to form a personal narrative do not necessarily offer consequences to the formation of a person’s action. However, the presence of an active, physical space allows for a person to perceive and become engaged in the project in a way that is directly accessible by building on their inherent needs to express their function and act.

In Asylum or Ballade of Women, the inherent complexity of the narrative is transposed into an experiential form that elicits bodily experimentation and participation to be made sense of. The open-ended interactions allow for someone to compose a narrative structure in which to place the complex information presented by the installation. Without the open-ended interactions, the installations require there would be no engagement with the information.
Berleant’s notion of aesthetic engagement emphasises not only the complexity of this experience, but also how it explicitly builds on so many personal factors, on subjectivity. Aesthetic engagement comes forth by respecting the uniqueness of a person, the place the experience has in relation to other experiences in the past, the uniqueness of his or her body and his or her action through it to perceive. To recognise this uniqueness is to leverage on a person’s point of view and allow it to be expressed. This respects a person’s being in the world, his or her point of view within an interaction is not judged to be right or wrong, but permitted to exist and be expressed.

From a philosophical standpoint, the relationship between the qualities is perhaps best exemplified in Berleant’s notion of aesthetic engagement. Berleant describes experiences in the arts, but his insights resonate with the knowledge generated toward design. In his description, aesthetic engagement joins perceiver and object in perceptual unity, in a coherent way that has at least three characteristics: continuity, perceptual integration and participation. Continuity describes that the aesthetic experience that engages is not exist in separation but is part of full scope of individual and cultural experience. From a philosophical standpoint, the relationship becomes familiar: From an interaction becomes familiar, and then an interaction becomes a process, a process of object and perceiver, to design for it, if the artefact needs to resonate with the way in which it is open-endedness also resonates with the insides of it.

Open-endness also resonates with the insides of it. If the artefact needs to resonate with the way in which it is open-endedness also resonates with the insides of it. From a philosophical standpoint, the relationship between the qualities is perhaps best exemplified in Berleant’s notion of aesthetic engagement. Berleant describes experiences in the arts, but his insights resonate with the knowledge generated toward design. In his description, aesthetic engagement joins perceiver and object in perceptual unity, in a coherent way that has at least three characteristics: continuity, perceptual integration and participation. Continuity describes that the aesthetic experience that engages is not exist in separation but is part of full scope of individual and cultural experience. From a philosophical standpoint, the relationship becomes familiar: From an interaction becomes familiar, and then an interaction becomes a process, a process of object and perceiver, to design for it, if the artefact needs to resonate with the way in which it is open-endedness also resonates with the insides of it.
This chapter reflects on the consequences of leveraging the first-person perspective in design research.
For aesthetic engagement and the process of designing for aesthetic engagement, the design space becomes the focal point of the investigation. The design space is described as a complex and dynamic environment that requires a multi-faceted approach. The first-person perspective serves as a guiding force for the first-person perspective. The following sections reflect on three consequences of the research approach dissected and elaborated on in this dissertation.

Reflecting on this research process, it reveals

The first section reflects on the research program as a guiding force for the first-person perspective. To respond to the research program, the perspectives in this research were directed at describing the design space. To describe the design space, the perspectives in the research program were focused on aesthetic engagement and the process of designing for aesthetic engagement. The design space is described as a complex and dynamic environment that requires a multi-faceted approach. The first-person perspective serves as a guiding force for the first-person perspective. The following sections reflect on three consequences of the research approach dissected and elaborated on in this dissertation.

There are however consequences to this way of doing re-

search. The first-person perspective allows flexibility and the integration of concerns from multiple directions (e.g. theory and practice). However, in being flexible and personal, the first-person perspective is also influenced and shaped by the design researcher, his environment and the research process. The following sections reflect on three consequences of the research approach dissected and elaborated on in this dissertation.

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The third chapter positioned and framed the methodological structure of the design research. This structure illustrated how a design researcher can move between theory, practice and aesthetic engagement.

The third section reflects on the relevance of the Interactive Dissertation project for current discussions around dissemination in the wider design research community. The third section reflects on the relevance of the Interactive Dissertation project for current discussions around dissemination in the wider design research community. The third section reflects on the relevance of the Interactive Dissertation project for current discussions around dissemination in the wider design research community. The third section reflects on the relevance of the Interactive Dissertation project for current discussions around dissemination in the wider design research community.

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to the lives of the people that use them. This is a personal stance on designing for social transformation and it finds expression in the designs presented in the dissertation. Moreover, it is expressed in the articulation of a design research approach that leverages first-person experiences, emphasising the importance and responsibility of a personal stance in designing.

Second, in building on existing work around the aesthetic experience in interacting with digital artifacts, this work continues in a pragmatic sense, along a line where the relationship between ethics and aesthetics in design has more explicitly been addressed. This section presents a brief overarching reflection, touching upon these themes and the relationship between the research findings and ethics. This reflection starts to form a connection between knowledge of how to design for aesthetic engagement and existing work on why to design for aesthetic engagement. The shareable knowledge of how to design for aesthetic engagement describes a design space. This design space is characterised by experiential qualities that open interactions with digital artifacts to the subjectivity of people interacting with these artifacts. These experiential qualities describe ways in which an interaction can appeal to the sensitivity of the perceiver, build on his bodily capabilities, and invite participation in the sense-making process. Together, these qualities enable a foundation on which an aesthetic approach can build to the aestheticity of the perceiver, expanding on the aesthetic experience. These qualities are effective at appealing to the subjectivity of people interacting with digital artifacts and describe a design space. This design space is characterised

9.1 ETHICS IN AESTHETIC ENGAGEMENT

The research program is directed at generating shareable knowledge of how to design for aesthetic engagement. This narrows the investigation down to a particular type of knowledge that is to be generated, practical knowledge. The intention of generating knowledge towards how to design for aesthetic engagement makes this knowledge more specific, but also negates some of the complexity of the topic. For example, knowledge of why one should design for aesthetic engagement is not directly addressed in the way that the research outcomes are presented. However, one should design for aesthetic engagement if one deeply believes in the power of aesthetics. This belief leads to a desire to create experiences that are aesthetically engaging. The why of designing for aesthetic engagement relates to ethics. A desire to design for experiences with digital artifacts to be beautiful and engaging is to take a position on what a better world should be like.

Opening interactions to a person’s subjectivity releases the power of expression of the person’s own point of view. Opening up to subjectivity strongly relates to theories of

...
This dissertation is certainly inspired and influenced by existing work around aesthetics of interaction with a wider base in ethics and philosophy of technology (see for example section 2.4). However, this dissertation does not aim at contributing to the wider understanding of the relationship between ethics and aesthetics in the design of digital artifacts on a theoretical level. Rather, this dissertation aims at building on this existing work in a pragmatic sense, to contribute designerly knowledge of how to design for aesthetic engagement and by proposing ways in which this knowledge can be generated and embedded in practice.

Technological Mediation is a large and complex research area to which my point of view in the design research process is also my point of view in the design research process. This first-person perspective process relies on leveraging first-person experience in order to engage in a very practical and actionable way in which the findings of this research can be generated and embedded in practice.

In particular, it relies on what Ross (2008, 2009) refers to as the first-person perspective in which the designer becomes more responsible for the actions of the system, a change towards a more responsible design. In this way, designers become more responsible for the actions of the system, a change towards a more responsible design. This dissertation, with its focus on how to design for aesthetic engagement, contributes to the wider understanding of the relationship between ethics and aesthetics in the design of digital artifacts on a theoretical level. Rather, this dissertation aims at building on this existing work in a pragmatic sense, to contribute designerly knowledge of how to design for aesthetic engagement and by proposing ways in which this knowledge can be generated and embedded in practice.

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The dissertation is certainly influenced and informed by the work of Verbeek (2005) on the necessity of engagement to challenge the rule of power and to enable participation in the design discussion for everyone. In particular, it refers to what Ross (2008, 2009) refers to as the first-person perspective in which the designer becomes more responsible for the actions of the system, a change towards a more responsible design. This dissertation, with its focus on how to design for aesthetic engagement, contributes to the wider understanding of the relationship between ethics and aesthetics in the design of digital artifacts on a theoretical level. Rather, this dissertation aims at building on this existing work in a pragmatic sense, to contribute designerly knowledge of how to design for aesthetic engagement and by proposing ways in which this knowledge can be generated and embedded in practice.
More informally, this same process of sharpening one’s point of view before and during contact with the points of view of others is a fundamental characteristic of the design process. This is most evident in the six constructive design research projects presented in chapter 5. These projects were undertaken in particular environments, some in an educational context and some in a design practice environment. In both environments, multiple designers and stakeholders were involved in the design process. Each person involved had their own point of view from which they saw the design process, from which they directed their intention and acted in the process. In the process of designing something together, this process of expressing, sharpening, and expressing again one’s point of view is fundamental. It is necessary to find resonance and to find common ground or trust for design decisions. Design decisions that are made on this basis go beyond resonance between points of view, they integrate points of view. Moreover, in the design process, where the design team makes together, such integration is facilitated because it utilises the expressivity of designers as opposed to limiting them through the use of language.

This process of sharpening points of view when designing together is not only relevant for the design projects presented in this dissertation. This process is continuous within the studio environments where the projects in this dissertation were created. As an environment with multiple designers and researchers working on multiple projects, the projects in this dissertation are an environment with multiple perspectives and are an environment where the projects in this dissertation were in the process of continuous evaluation and criticism. The process of the projects is a continuous process of evaluation, where the critical feedback from the team members and the ongoing evaluation of the project is a fundamental part of the design process. This critical feedback is necessary to find resonance in the project and to find common ground or trust for design decisions.

In such more formal attempts of sharing one’s own point of view, the development of new knowledge and supported by accepted theory is essential. Knowledge of the field and supported by accepted theory is essential. If we, as designers, are to contribute to the continuous process of sharpening one’s point of view, we must express our ideas in a way that is clear and understandable to others. To communicate the knowledge generated from a first-person perspective in a way that is clear and understandable to others, we must be able to express our ideas in a way that is clear and understandable to others. This means that we must develop our skills in expressing our ideas in a way that is clear and understandable to others. In this way, we can express our ideas in a way that is clear and understandable to others, and thus, we can contribute to the continuous process of sharpening one’s point of view.

It is important to point out that these perspectives are not only influenced by individual actions and reflections. Changes in perspective in this research are often influenced by the points of view of others. Contact with the alterity shapes and sharpens an individual point of view, leading to new perspectives. This contact with the alterity shapes the research process continuously, both more formally and more informally.

In a more formal context, the expression of shared knowledge occurs when the design team works together. This knowledge is shared and discussed among team members. The process of sharing knowledge is a fundamental part of the design process. It is important to point out that these perspectives do not develop in isolation. The development of new knowledge and supported by accepted theory is essential. If we, as designers, are to contribute to the continuous process of sharpening one’s point of view, we must express our ideas in a way that is clear and understandable to others. To communicate the knowledge generated from a first-person perspective in a way that is clear and understandable to others, we must be able to express our ideas in a way that is clear and understandable to others. This means that we must develop our skills in expressing our ideas in a way that is clear and understandable to others. In this way, we can express our ideas in a way that is clear and understandable to others, and thus, we can contribute to the continuous process of sharpening one’s point of view.
The field of design research increasingly explores ways of disseminating research outcomes in designerly ways that resonate with the richness found in design itself. This is part of the maturing process of the field, as it seeks to further establish itself as an accepted academic discipline.

This richness is found not only in complex functional, interactive, and formal qualities of final artefacts. It is also found in the rich nature of processes, where this potential in a specific design situation is explored through a variety of media and techniques. Such ways of working have long been established in the design tradition (Blevis, Hauser, and Odom 2015). Moreover, as Gaver and Bowers (2012) assert, textual descriptions of the artefacts of design research can never communicate the entirety of that artefact. Rather, textual descriptions should be seen as annotations that emphasize certain elements of the design, at the cost of others.

One result of these developments in the field is that established methods and forms of academic publications are increasingly challenged. Examples of such efforts include the Gaver 2011 and annotated portfolios by Bowers 2012. Jarvis et al. made an eloquent case in using a photo essay to highlight both the material dialogue essential to design, as well as the need for publication formats to accommodate such outcomes.

The Interactive Dissertation project can be seen as a contribution to these developments. In chapter 7, this project is framed as an investigation into articulating knowledge of the design space around aesthetic engagement. This serves a function within the research program, as it addresses the tension between abstracted and textural knowledge in artefacts and their concrete manifestations in artifacts.

This tension exists within the field in other instances, and it is also of relevance within the wider aim of this research to explore ways in which the medium of print can be used to actively embody its content points to the overall discussion of how theory and practice co-exist in design research. In particular, it points to the way in which knowledge generated by design research is disseminated in ways that balance theory and practice. The results of the Interactive Dissertation project were publicly presented and discussed among a group of designers and researchers in order to position the work as a way of probing tensions around this topic. The following reflection relates the Interactive Dissertation project within the current developments of the field around this topic.
that did or did not allow for a more experimental format, were based not on explicit formal requirements but on tacit practices and personal drives.

Several scholarly efforts, e.g. Gregory, 1966; Seago and Dunne, 1999; Cross, 2001; Gaver, 2012, were made to articulate the fundamental epistemological and methodological differences between design and scientific traditions in academia. Such efforts are instrumental in understanding what these differences are, but as rational and analytical texts, they intrinsically reside in an arena governed by exactly those traditions that by their nature are different from design.

In order for design research to form its own intellectual culture, not only its ways of knowing need to be articulated and debated: also its ways of communicating what becomes known. The Interactive Dissertations project is one proposal for how design research may also probe the tensions around novel practices in academia.

Design research, with its ability to synthesise and bring together perspectives, is often described as a way to gain knowledge that is fundamentally different from, and of knowledge that is articulate and defined in the ways of Western culture. Design research is one proposed way in which design researchers can communicate what becomes known. The Interactive Dissertations project is one proposal in which design researchers can communicate what becomes known. The written and unwritten rules and expectations as to the form of a PhD dissertation vary widely from institution to institution and country to country. In the public discussion of the first iteration of Interactive Dissertations, published in a very local and confined way, a particular element of such conflicts was revealed.

One concern was increased printing costs or inaccessible hard copies of a dissertation. Another example, although strictly speaking perhaps not belonging to the field of design research itself, is Nick Sousanis' EdD dissertation "Unflattening" (2015). This work addresses the primacy of words over images in Western culture in the form of a graphic novel.

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This dissertation presents the results of a constructive design research process that investigated how to design for aesthetic engagement in interaction.
Here, aesthetic refers to the aesthetic experience as articulated from a phenomenological and pragmatist position. An aesthetic experience in this era refers to the aesthetic experience as an artfulled from a phenomenological and pragmatist position. Engagement is borrowed from Berleant (1991), who outlines it as an involved relationship between a person and an artefact, or between people through an artefact. The term aesthetic engagement signifies this experience as a deeply personal experience, coloured by our past experience, our intellectual and other sensory experience, and our personal, dynamic and formed artefacts. Engagement is described as dynamic and personal, appealing mutually and inseparably to both our bodily, sensed experience, and our intellectual experience, being dynamic as described from a dynamic and personal, appealing mutual experience.
is realised through a series of design experiments. Each design experiment is formulated as a more specific version of the research program, intended to expose a particular part of the complex design space around aesthetic engagement. Each design experiment is realised through the lens of these design programs. Each design program is formulated to learn from experience about the specific knowledge and intuition to learn from experience around specific parts of the design space for aesthetic engagement. How we can design interactions to elicit aesthetic engagement by exploring the first-person perspective is the main contribution of this research. The second contribution is to articulate how first-person experiences can be leveraged to generate shareable knowledge in an academic context. These two contributions are framed in a research program, anchoring it in theoretical and methodological groundings of what an experience is and how it can be explored through design.

Therefore, the findings of this research are formulated as responses to the two main components of the research program: the shareable knowledge of how to design for aesthetic engagement and the articulating of how this knowledge is generated by leveraging the first-person perspective. The first contribution is most directly related to the act of designing by providing insights into how we can design interactions to elicit aesthetic engagement by appealing to the subjectivity of people interacting with a design. The second contribution relates to the methodological structure of how this knowledge is generated by leveraging first-person experiences.

The findings of this research are formulated as responses to the two main components of the research program: the shareable knowledge of how to design for aesthetic engagement and the articulating of how this knowledge is generated by leveraging first-person experiences. These two contributions are framed in a research program, anchoring it in theoretical and methodological groundings of what an experience is and how it can be explored through design.

Therefore, the research presented in this dissertation explores, from a design perspective, what this aesthetic engagement is, with particular focus on how we may design for it. This first contribution is shareable knowledge of how qualities of an interactive artefact can be designed to elicit an aesthetic experience and through this foster a personal, involved and engaged relationship between a person and an artefact, or between people through an artefact. The intention of contributing pragmatic and actionable knowledge of how to design for aesthetic engagement leads to the second contribution of this research: to generate this knowledge through design and articulate how this is done. This second contribution is to articulate how first-person experiences can be leveraged to generate shareable knowledge in an academic context.

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are conceptual values that can be used in a pragmatic way in the design of interactions. The aim of these qualities is to open up ways to support and appeal to the subjectivity of people interacting with the design. Richness and depth describe qualities that appeal to the senses. They widen the “bandwidth” of the embodied dialogue in interaction and open up sensitivity in the perceiver. Narrative complexity and ambiguity elicit personal sense making, allowing one’s personal experiences from the past to shape the present interaction through participation in active interpretation. Open-endedness in interaction unites these qualities in, allowing sensitivity and active physical involvement to explore, reveal and experiment with meanings.

Together, these qualities are ways to open interactions for subjectivity in experience, emphasizing a unity of mind and body and addressing a multitude of a person’s abilities that are essential to eliciting aesthetic engagement. This respect one’s total being-in-the-world: the uniqueness of one’s body as well as one’s past experiences, in the broadest sense.

The research process of this dissertation is based on a methodological structure in which activities and reflections building on the first-person perspective are leveraged to generate shareable knowledge. This methodology is a logical continuation of, and concurrent with, the work’s theoretical foundations.

Reflective practice in design research

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Reflective practice in design research

The research process of this dissertation is based on a methodological structure in which activities and reflections building on the first-person perspective are leveraged to generate shareable knowledge. This methodology is a logical continuation of, and concurrent with, the work’s theoretical foundations.
In generating knowledge through design research within the academic context of informatics and interaction design, its value, however, cannot be measured according to traditional metrics: it has to be explored and assessed in terms of rigour and relevance. The level of such rigour and relevance depend on how, thoroughly and effectively points of view are shared as the process unfolds, in order for these points of view to resonate with those of others.

The methodological structure of this dissertation forms a model that positions design research as a dialectic process in which the first-person perspective of the designer continuously and actively positions around the artifact that is created. In moving across and between the perspectives of theory and practice and taking positions at different distances from the artifact, knowledge is generated. This methodological structure builds on the first-person perspective to allow skill and intuition to guide how practical and theoretical knowledge become embodied in an artifact. This process is framed through a programmatic articulation of a particular way in which first-person experiences can be expressed and consolidated through design. The methodological structure proposes a particular way in which design research should be conducted, and in which it should be evaluated.

Beyond the method and model, the knowledge that has become embodied in the artifact and encoded in the first-person perspective is exposed and consolidated to form an academic knowledge contribution to the field, and also to form an academic knowledge that can be extended into a stream of thought and action. The necessary influence from both theory and practice, and the necessity of influence from both theory and practice, and the need to design for aesthetic engagement, contribute to the wider discourse on the role of digital technologies in our life.

This research explicitly addresses the methods of this research. However, the ethics and aesthetics of design are closely intertwined. To design for aesthetic engagement relates to the wider discourse on the role that digital technologies have in our life. This research deals explicitly with how to design for aesthetic engagement, but it relates to designing for aesthetic engagement, and it relates to designing for aesthetic engagement, and to designing for aesthetic engagement in a way that is not congruent with a conjecture. The question of why is not congruent with a conjecture, but it relates to designing for aesthetic engagement, and to designing for aesthetic engagement in a way that is not congruent with a conjecture.

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The methodological structure of this dissertation forms a model that positions design research as a dialectic process in which the first-person perspective of the designer continuously and actively positions around the artifact that is created. In moving across and between the perspectives of theory and practice and taking positions at different distances from the artifact, knowledge is generated. This methodological structure builds on the first-person perspective to allow skill and intuition to guide how practical and theoretical knowledge become embodied in an artifact. This process is framed through a programmatic articulation of a particular way in which first-person experiences can be expressed and consolidated to form an academic knowledge contribution to the field, and also to form an academic knowledge that can be extended into a stream of thought and action. The necessary influence from both theory and practice, and the necessity of influence from both theory and practice, and the need to design for aesthetic engagement, contribute to the wider discourse on the role of digital technologies in our life.
and where aesthetics refer to the sensorial quality of the design materials, rather than the rewarding and fulfilling experience an interaction could be.

This current state of affairs, despite a significant body of research work into the design of less function-oriented experiences, can be attributed to inherently difficult, ephemeral and complex notions of what experiences and aesthetics are. To engage with such notions fully, requires a willingness to take risks and trust in the skill of letting go of control. In a world largely governed by other motives than those in the research community, it is safer to build on the more established traditions through values such as functionality and ease-of-use. However, as we witness the rapid and ever-increasing pervasiveness of digital technologies in mediating our daily life, such traditions sketch a worrisome future in which we risk to lose what makes us human, the poetics and beauty of being in the world.

The portfolio of design projects described in this dissertation are intended to serve as examples to practitioners, to show what an open-ended approach to the design of interactions, appealing to a person's subjectivity, might build on. In particular, the reflections that highlight the effect of design decisions are meant to suggest how values other than functionality and ease-of-use may be embodied in interaction design.

The description of the design space around aesthetic engagement, described in experiential qualities, consolidates these reflections in a more formalised manner. The complexity and subjectivity of aesthetic engagement in principle make it impossible to provide a step-by-step guide or formalised approach. Instead, aesthetic engagement in practice may involve these reflections in a more formless manner. The concept of aesthetic engagement, described in experiential qualities, consolidates the description of the design space around aesthetic engagement.

The methodological framework of this research and the designerly knowledge that is generated, articulates a balanced relationship between practical and theoretical knowledge. Related insights of this research suggest that further research is needed to find appropriate ways for such knowledge to be shared, for practitioners to be equipped in order to find designers. The boundaries of traditional academic forms for publications need to be expanded in order to find designers. The boundaries of traditional academic forms for publications need to be expanded in order to find designers.

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For Designers

Recommendations

10.3 Implications and Recommendations

As a constructive design research project, the results presented in this dissertation are relevant for both the community of practitioners in interaction design as well as the community of researchers in the overlapping fields of Interaction Design Research, Human-Computer Interaction and Design Research. Although the term Experience Design is firmly cemented into the visions and competences of the interaction design industry, it often remains a shadow shell for a function-oriented approach. Too often, the focus is on the design of experiences that are soon to disappear, and where aesthetics refer to the rewarding and fulfilling experience of the design materials, rather than the rewarding and fulfilling experience of the design materials, rather than the rewarding and fulfilling experience.
The qualities of aesthetic engagement presented in this dissertation are intended as a contribution to this area of research from a practical, designerly perspective. By articulating a particular perspective on what qualities may elicit aesthetic engagement, this dissertation aims to contribute to the field's understanding of what an aesthetic experience in interaction is.

**CONCLUDING REMARKS**

Ultimately, design is an activity aimed at making sense of complexity. It takes a holistic perspective towards the societal, contextual, technological, economical, and many other interacting elements that form the complexity of a particular situation, and proposes a design, a particular assembly of parts, that takes a position within that complexity.

This always involves some simplification of the situation as a whole, and this simplification balances concerns from the many elements in a way that allows a person to interact within that situation in what the designer deems a desirable way. Designing takes careful consideration, as every simplification of the complexities involved in a particular situation takes an implicit or explicit stance on their importance.

The perspective of designing for aesthetic engagement as described in this dissertation is a particular way to deal with this complexity. The qualities of aesthetic engagement, placed in practical and theoretical perspectives, are ways to reduce this complexity responsibly.

The complexity of our lived world is vast, and always has been, but this complexity is ever increasing as our world becomes filled with more and more interconnected systems and processes. As a result, designers are faced with a particular challenge: to create designs that are not only aesthetically pleasing but also functional and efficient. The qualities of aesthetic engagement presented in this dissertation are intended as a contribution to this area of research by providing a framework for designers to consider when creating new designs. This framework helps designers to explore the different aspects of aesthetic engagement and how they can be incorporated into their designs.

This dissertation builds on related work in the field of aesthetic interaction that has put forward methodologies, approaches and frameworks. This previous work has been instrumental in both unraveling what these complex notions of aesthetics and experience mean in interaction design and providing a way to integrate these notions into the design process. In this dissertation, I propose a methodological structure that leverages the first-person perspective to generate shareable knowledge in an academic context. This methodological structure builds on reflective practice, intuition and skills as essential generators of this knowledge. The model proposes a way in which we may use the same mechanism of reflection to create an essential foundation of this knowledge. The model proposes an essential foundation of this knowledge, and skills to structure building on reflection to generate this knowledge in designing.

The methodological structure presented in this dissertation contributes an approach for knowledge generation in design research that leverages the first-person perspective to generate shareable knowledge in an academic context. This methodological structure builds on reflective practice, intuition and skills as essential generators of this knowledge. The model proposes a way in which we may use the same mechanism of reflection to contextualise and transpose shareable knowledge gained from the first-person perspective in designing.

This dissertation is mainly intended as a methodological contribution to the fields of Interaction Design Research, Human-Computer Interaction and Design Research. Second, this dissertation also contributes to the existing understanding of aesthetics in interaction from a practical perspective. Aesthetic interaction is not only connected to the complex understanding of human-computer interaction and design, but also to a particular perspective that form the complexity of a particular social and technological context. This perspective is focused on the role of aesthetic engagement in designing interactive systems and how they can be incorporated into designs.

Ultimately, design is an activity aimed at making sense of complexity. This dissertation aims to contribute to the field by providing a framework for designers to consider when creating new designs. This framework helps designers to explore the different aspects of aesthetic engagement and how they can be incorporated into their designs.
We are created to be beautiful, spectacular, and humane.

This is imperative for the technophilosophy mediated world that we now live in. Our bodies are not made to understand, a digital one. Luckily, people have the ability to make sense of this complexity, and to help each other in doing so, using our many skills.

When designers attempt to reduce the complexity of these relationships to an extreme with the ideal of making something easy to understand, then they risk missing their goal. In dictating what sense to make of a situation, they present a single point of view that no one can take, as we all have our own perspectives.

The perspectives presented in this dissertation are by no means exhaustive. The skills we have developed since the day we were born and the ways our skills have developed since the day we were born are essential in helping us understand and shape the world around us. These skills enable us to understand and shape the world around us.

In a technologically mediated world, it is important to remember that we are all unique. Each person has their own perspective on how to leverage these skills and apply them to design.

The perspectives on how to leverage these skills and apply them to design are by no means exhaustive, but they are essential in helping us understand and shape the world around us. Each person has their own perspective on how to leverage these skills and apply them to design.

In my belief, my personal perspective is imperative for the technologically mediated world that we are creating to be beautiful, respectful, and liveable.
References


Acknowledgements

I look forward to the future, as I have missed the fun we have enjoyed everyday while I was writing this dissertation. A big thank you goes out to the current core members who I haven't mentioned yet and have helped me so often and so well: Fredrik Nilbrink, Ru Zarin, Olov Långström and Jerôme Cezac. Thanks also to those who hang out with us, who have helped to shape the studio it in the past and especially all the interns that have brought so much. My gratitude also extends to the other studios of RISE Interactive and the great people at HQ: thank you for creating such a fine and supportive environment to do my PhD research. I would like to thank Daniel Fällman for giving me the chance to start this project and for his initial supervision. Thank you, Karin Danielsson Öberg, Andreas Lund and Robyn Schimmer for your valuable involvement as panel members at my 90% seminar. Umeå is a special place, not in the least because of the Arts Campus that provides an amazing environment for design research.

Reflecting on the time that has passed since I arrived in Umeå, I think of so many people whose contributions, big or small, have made this dissertation possible. It is overwhelming to think of all the ways in which the many forms of kindness and support have shaped my journey over the past years, and therefore difficult to write down here. Nevertheless, there are some people I would like to express my sincerest gratitude to:

First, I would like to express my sincerest gratitude to my supervisors, Anna Croon Fors and Ambra Trotto. Anna, I asked for your help in difficult times, and you jumped in without any hesitation. Your wisdom and unconditional support have helped me through this journey. Thank you for your patience, positivity, wisdom, and unconditional support. Ambra, I am humbled by the trust you place in me. Thank you for your guidance, support, and encouragement. I am forever grateful for your belief in me. Thank you for your patience, your wisdom, and your unconditional support.

I am grateful for the many people whose contributions I have missed. I have missed the fun we have had every day while I was writing this dissertation. A big thank you goes out to the current core members who I haven't mentioned yet and have helped me so often and so well: Fredrik Nilbrink, Ru Zarin, Olov Långström and Jerôme Cezac. Thanks also to those who hang out with us, who have helped to shape the studio it in the past and especially all the interns that have brought so much. My gratitude also extends to the other studios of RISE Interactive and the great people at HQ: thank you for creating such a fine and supportive environment to do my PhD research.

For putting me on this path, I would like to thank the members of the Designing Quality in Interaction group at Industrial Design, Eindhoven University of Technology. In particular, I would like to thank Pierre Lévy for his insightful and sharp comments on an earlier version of this dissertation while serving as opponent at my 90% seminar. Furthermore, my gratitude goes to Caroline Hummels for her help along the way, as well as to Caroline Hummels for her help along the way. I would like to thank the members of the Designing Quality in Interaction group at Industrial Design, Eindhoven University of Technology. In particular, I would like to thank Pierre Lévy for his insightful and sharp comments on an earlier version of this dissertation while serving as opponent at my 90% seminar. Furthermore, my gratitude goes to Caroline Hummels for her help along the way.
Patrizia Marti for creating the conditions to develop three of the projects in this dissertation.

Coming closer to home, there are many more people to thank for their essential contributions, in different ways. First of all, the “crew”, I am so proud to still call all of you my closest friends after so many years. Growing up with you has been a privilege, and a greater influence on me and my design work than you might know. Let’s never be clever and let the good times roll. Tim-Tijn, Jeroen, Bart, Stijn, Bram, George, Frans, Willem, Ruud, René, Robin, Mitchel, Willem-Jan, Tim, Jan and Kacper, thank you for it all.

To conclude, I would like to thank my family. My brother Michiel: your drive and enthusiasm are what I aspire to, thank you for your support. My sister Marlies: our conversations on design and everything else have been vital. Your work on this book is exceptional and speaks to your talents as a designer and scholar. I look forward to working together again in the future. Jan and Mia, thank you for always being there.

Lastly, and most importantly, I would like to thank my parents, Leo and Joke. For always supporting me and for always believing in me. For always believing in what I want to do even when I wasn’t so sure myself. And most of all, thank you for instilling these values in me.