THE VALUE OF DESIGN RESEARCH

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ARTEFACT MATTERS

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ABSTRACT

In this paper we consider the currently lively discussion on how and if to formalize the Research through Design (RtD) approach and argue that the role of the artefact is essential but underexposed in this discussion. Through three case studies we investigate the different roles the artefact can have within RtD and show that design relevant knowledge is in the process of designing the actual artefact, in the artefact itself as well as in its evaluation. Considering the role of the artefact more thoroughly portrays insights on how theory is built in the RtD approach, as well as in matters that do or do not make sense to formalize in the first place. We discuss this at the end of the paper through identifying similarities and differences between the three cases.

Keywords: Research through Design, Artefact, Design Theory, Physical Hypothesis, Formalization

1 INTRODUCTION

Over the last few years, many researchers have pointed at the growing interest in Research through Design (e.g., Stolterman, 2008; Forlizzi, Zimmerman and Evenson, 2008; Forlizzi, Stolterman and Zimmerman, 2009; Zimmerman, Stolterman and Forlizzi, 2010; Bardzell and Bardzell, 2011; Gaver, 2012; Bowers, 2013). Typically, these researchers discuss (1) the nature of RtD as well as (2) its need to mature and formalize. Although these discussions about formalization and rigor are very important (e.g., Buchanan, 1992; Horvath, 2007; Zimmerman and Forlizzi, 2008; Bardzell and Bardzell, 2011; Fallman and Stolterman, 2012; Gaver, 2012; Bowers, 2013) we feel that they tend to underexpose the role of the actual RtD *artefact*, the process leading to the making of it (Kroes, 2002), as well as the different roles the RtD artefact can play. In our opinion the artefact carries design relevant knowledge that extends knowledge that can be transferred verbally, and as such essential in the discussion about RtD. It is not widely considered in the known literature and seems to have faded into the background. Some researchers (e.g., Pedgley and Wormald, 2007; Zimmerman and Forlizzi, 2008; Koskinen et al., 2011) make an argument for the place of design (and design artefacts) in research but the actual role of the artefact and how it holds a different type of knowledge than which can be verbally transferred, is often merely touched upon. We feel that the role (or roles) of the artefact as a generator of knowledge needs a more central role in the discussion.

In this paper, by means of three case studies, we investigate the role(s) the artefact can have in RtD. Based on fifteen years experience with RtD, we are in

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the luxurious position to look back on a broad range of high-level prototypes (e.g., Djajadiningrat, 1998; Hummels, 2000; Wensveen, 2005; Frens, 2006; Ross, 2008; Bruns, 2010; Magielse and Ross, 2011; Hengeveld, 2011; Deckers, 2013; Mendels, 2013; Magielse, 2014) and derive lessons from that. Our works have in common that they build on or draw from a theoretical background in ecological perception psychology (Gibson, 1986) and more recently the phenomenology of perception (Merleau-Ponty, 1945). Another common denominator is that our work is predominantly driven by the question 'how to design for' rather than 'what to design'. In our experiments we treat the designed artefacts as physical hypotheses (Frens, 2006). By this we mean that we regard our prototypes as more than merely the physicalisation of a design; a prototype is also the physicalisation of the rationale behind the design. It embodies the choices a designer-researcher makes based on the knowledge (s)he has at a specific moment. This means that when a test subject interacts with a prototype he or she interacts with the designer-researcher's line of thought (Hengeveld, 2011).

The three case studies are presented in chronological order. At the end of this paper we present our insights, illustrating the different roles RtD artefacts can play as vehicles for/within research.

2 INVESTIGATING THE ROLE OF THE ARTEFACT: THREE CASE STUDIES

2.1 CASE STUDY 1: DESIGNING FOR RICH INTERACTION

The first case study revolves around Frens' doctoral work (2006), which aimed to explore and research an alternative interaction paradigm to the conventional 'menus on screens with navigation controls'. In this research, Frens (2006) used the act of designing as an instrument for inquiry, setting out to explore the question *how to design for a richer kind of interaction (or rich interaction)*. To understand the importance of the artefacts that were designed in this project it is crucial to see that the notion of rich interaction and its characterization was only formulated *after* the artefacts were designed. The artefacts are in no way a direct nor straightforward implementation of formal knowledge or theory. Instead Frens' thinking was catalysed by his design activity and the formalization of rich interaction a result of him 'thinking with his hands'. Theory formed a basis and acted as a framework for thought, as inspiration.

2.1.1 *Two rounds of making*

In the doctoral project two distinct rounds of 'making' took place: A design exploration of the to-be-formed rich interaction paradigm, followed by an elaboration of one of the designed artefacts into a complete working, modular prototype.

In the design exploration Frens set out to explore the solution domain of 'Rich Interaction' through designing. Frens chose a 'design-vehicle', a digital camera, and set a series of thematic constraints to spark creativity and to make the exploration go both broad and in depth. For each of the thematic constraints a different camera was designed (see figure 1-left), opening up the Rich Interaction solution domain. As such the act of designing was an act of defining.

Both the design process and the resulting artefacts proved to be sources of insight. As Frens intuited that the medium of exploration was of strong influence

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on the resulting designs he 'forced' himself to step away from 'traditional' 2D sketching techniques and CAD/rendering approaches in favour of cardboard and foam-core modelling techniques. This allowed for the simultaneous exploration of form and interaction by means of experienceable, physical models that incorporated expressive mechanisms.

The five cameras, in their intermediate stages during the design process, were a continuous source of reflection on what it was that Frens wanted to accomplish in terms of an alternative interaction paradigm. Important lessons were learned: (1) to assess the quality of an interaction style one has to experience it, (2) to compare interaction styles one needs to, as much as possible, keep the form-language the same, but to act on those lessons higher fidelity prototypes were necessary.

At this point Frens chose one of the cameras for further elaboration: a 'no labels on controls' camera (later renamed to 'rich actions' camera). After careful evaluation of the lessons learned in the experiment with the cardboard mock-up a modular redesign was made that allowed for four different 'interface' modules to be placed in the camera. This way the camera could offer four different interaction styles, ranging from rich to conventional, within the same form-language, see figure 1-right. This design was built in aluminium and equipped with off-the-shelf camera parts, resulting in a fully working prototype sporting different interaction styles. This allowed the camera to be used in an experiment where the interaction styles were compared to each other. The experiment demonstrated that the rich interaction paradigm performed equal to the more conventional interaction paradigm in conventional 'ease-of-use' measurements but that it was preferred over the other interaction styles: A positive outcome.

While this prototype was certainly not a 'ready for production' design proposal, it was adequately product-like in order to draw conclusions relevant to the product category of interactive products and the design of them. It was good enough for the purpose of experiential demonstration and use and thus for experimentation.

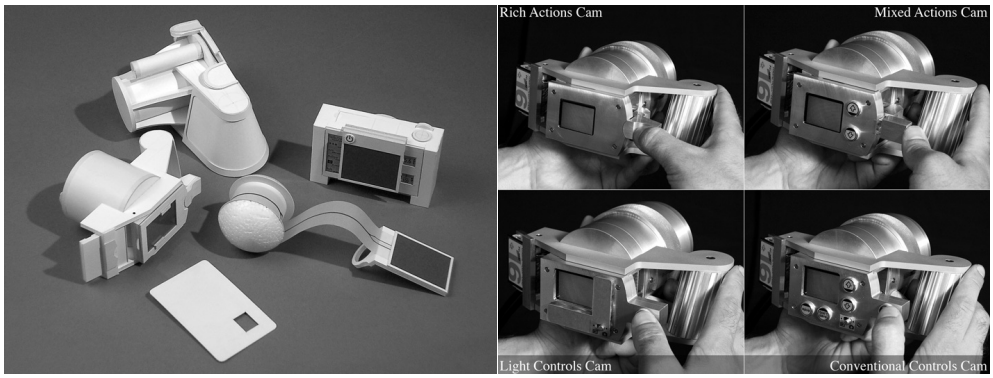

Figure 1 – (left) Five thematic cameras, (right) Different interaction styles within the same form language.

2.1.2 ***Concluding***

Coming back to the role of the artefact in this RtD process, it needs emphasizing that the artefact was neither end result nor implementation of a thought process. The final artefact was a physicalisation of the thought process that was

catalysed by the intermediate stages that led to it. What is interesting to note is that the artefacts, together with the notion of Rich Interaction, challenged part of the theoretical position that formed the basis to the project (e.g., some foundations of tangible interaction (Ishii and Ullmer, 1997)).

While the five explorative camera designs formed the insights of what Rich Interaction comprises, the elaborated working prototype made Rich Interaction experienceable. The prototypes are knowledge themselves on two levels: (1) in interacting with them the notion of rich interaction is operationalized in experience and (2) the prototypes act as 'design templates', they write knowledge in the language of design.

Reflecting on the process and approach to design it is striking to see how the adoption of a new medium for exploration made possible a different quality of solution. Next to this, the reach of the design process is broadened to include not only the exploration of form, but also the exploration of interaction and even function. The question of how to design for rich interaction is answered by both a difference in approach (experiential, holistic) and a characterization of Rich Interaction both in example as in writing.

2.2 CASE STUDY 2: DESIGNING LINGUABYTES

Compared to Frens' work, the doctoral research of Hengeveld (2011) had more market-driven origins: the goal of the project (LinguaBytes) was to develop a tangible play-and-learning system (Balkom, De Moor and Voort, 2002) aimed at stimulating the language development of non- or hardly speaking children between 1 and 4 years old. As such one could consider the role of the RtD artefact to serve as interim calibrations towards a final design. However, an additional role of the artefact was to research which interaction style(s) would be suitable for children between 1 and 4 years old. Current interaction styles with intelligent products largely depend on skills related to adults, rather than those of pre-school (and as such pre-literate) children. As such, the role of the artefact in this track was focused on enriching current bodies of knowledge, in particular that related to designing for children. Thirdly the artefact served as a vehicle for researching 'how to design for adaptivity' as the success of the play-and-learning system depended on its tailorability to the individual needs of specific children. This role can be considered as being aimed at the act of designing itself.

The research was approached through five RtD cycles. In each cycle one or more experienceable prototypes were designed, built and tested in different child rehabilitation centres, with children from the target group and their caregivers. We briefly discuss each of the five cycles below, highlighting the role(s) of the artefact.

Figure 2 – Details of five generations of LinguaBytes prototypes.

2.2.1 ***Cycle 1. Exploring and defining the design and research space***

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The first RtD cycle was aimed at getting grip on the research and design space. This involved a study into the status quo of tangible play-and-learning systems and related systems in the solution domain, as well as a field study aimed at gaining empathy for the anticipated users and context of use. For this four experienceable 3D-sketches were developed and tested in a Wizard of Oz setup. The role of these first four artefacts was: (1) to get first-hand experience in designing within this particular context, and (2) to get an understanding for how the targeted children interacted with the designs. As prototypes can be considered physicalized lines of thought, being the Wizard of Oz helped Hengeveld identify flaws in his reasoning and as such nuance his understanding of the design/research space.

2.2.2 ***Cycle 2. Exploring adaptivity and heterogeneity***

The second cycle was focused on researching adaptivity (Hengeveld et al., 2007) and how to design for *heterogeneous user groups*. A new prototype was designed and executed as *adaptable* first, in order to help determine guidelines for making it *adaptive* in subsequent cycles. As such the role of the second LinguaBytes prototype was to help determine opportunities for adaptive product behaviour, as well as powerful mechanisms to design these.

2.2.3 ***Cycle 3. Fixing the design boundaries***

The third cycle was aimed at increasing realism, which resulted in a more elaborate design, both in terms of content as well as interface elements. The higher level of realism of this prototype allowed for identifying more concrete design guidelines, not only for the play-and-learning system itself, but also for opportunities for adaptive behaviour. As such the role of the artefact was a double-role: on the one hand it fixed the boundaries on the LinguaBytes design space, as such paving the road towards a final design, on the other hand it provided valuable insights in the potential of adaptivity, even more than in how to design adaptive behaviour itself; it showed that context was leading over content.

2.2.4 ***Cycles 4 and 5. Refining and developing durable, full prototypes for longitudinal testing***

In general, the fourth cycle was one of refinement as the third-cycle prototype functioned predominantly well. Most effort was put in solving functional and constructive issues, plus in expanding the system to increase adaptability. This resulted in a fully functional prototype that supported a full subset (one of six) of content and interactions that served as a predictor for the final prototype. In the fifth cycle the final shortcomings were resolved and the prototype was extended to encompass all content and interactions. Three copies of the design were longitudinally evaluated. In these last two cycles the role of the artefact(s) shifted gradually from serving exploration towards serving corroboration, when compared to the first three cycles.

2.3 CASE STUDY 3: DESIGNING FOR PERCEPTIVE QUALITIES

The third case study revolves around Deckers' doctoral research (2013). The main objective of this project was to investigate if and how it is possible to design for perceptual crossing between person(s) and artefact(s). In her research, building on work done in the field of experimental phenomenology (Lenay et al., 2007; Lenay, 2010), Deckers investigated a new perspective on

forming and framing an artefact's intelligence in an action- and quality-centred way rather than the conventional function-centred way.

There were three main research tracks in this project. In each of these tracks the act designing played an essential role. The first track approached the research from a theoretical perspective; the second from a contextualized angle aimed at bringing the work to practice; in the third track Deckers' first-person perspective was confronted with a third-person perspective, aimed at corroboration. The three tracks fed into each other, which in retrospect was crucial.

2.3.1 ***Track 1: Fleshing out theory***

The first track centred around an artefact called PeP, short for 'perception pillar': a minimal design pillar housing a behaving light-body (see two iterations of PeP in Figure 3). The aim of PeP was not to resemble consumer products but to have sufficient behavioural qualities to draw valid and relevant conclusions from (Frens, 2006). By designing and evaluating the prototypes the goal was to provide knowledge that is relevant for a broader design context, namely knowledge about designing intelligent systems and product behaviour. For this reason the design and contextualisation of the pillar was kept to a minimum, to fully attract attention to the behaving light-body and gain insights in perceptive qualities and the occurrence of perceptual crossing.

The generated design relevant knowledge was formulated in the form of a set of design notions, which were on the one hand directly linked to the theoretical foundations but also gave practical insights for designing. As such (and as emphasized earlier) the aim of the artefacts in this track was to make theory experienceable and to inform the subsequent two tracks in theory and application.

Figure 3 – Impression of two iterations of PeP (left), and an impression of two iterations PeR (right)..

2.3.2 ***Track 2: Contextualizing theory***

Knowledge and insights gained in the first track were applied in several iterations of a second RtD artefact: *PeR*, short for 'perception rug'. *PeR* explores how the theory could be applied in our daily environment. Building on the insights from the first track it was possible to design dynamic light behaviour in PeR, using touch sensors (and in later iterations additional pressure sensors) to make *PeR* sensitive for a person's action, and incorporating integrated LEDs and light transmitting fibres for generating the behaving light-body.

A first prototype of the rug (figure 3) was completely hand made, while a second prototype was developed in cooperation with a professional flooring company.

Looking at the role of the two versions of PeR we could observe that the hand-made prototype was essential for establishing the industrial collaboration, as it allowed for the proposed interaction to be directly experienceable. The role of the second version of the artefact was extremely important as confronted a lab reality with an industrial reality. As such the second artefact showed the feasibility and value for the market of the design relevant knowledge generated in the first track.

Apart from contributing to the core research topic this second track generated a considerable amount of knowledge in the field of textile materials and on how to combine them with electronics. As such the artefact helped propel the discipline of designing interactive artefacts on the level of the raw material itself, too.

2.3.3 ***Track 3: Corroborating theory and context***

In the third track (which ran simultaneously) student projects and shorter assignments starting from the same theoretical background and built from the same sources were initiated, as such bringing forward artefacts that could be experienced, analysed and compared. By doing so Deckers' first-person perspective could be validated and enriched through additional perspectives and experiences. Over the course of 2½ years this resulted in about 25 artefacts of which 17 are of sufficient quality. We illustrate three here (all are shown in Figure 4).

Firstly, WWIJZ, which is a signage system incorporating perceptive qualities to support the way finding process in hospitals. WWIJZ welcomes the visitors and in the interaction points out the direction in which the person needs to go. Subtle clues in directional signs that the person encounters later confirm the person is going in the right direction. The process of designing and building WWIJZ gave valuable insights regarding the design notions, for example that where some design notions will enrich the artefacts behaviour from a qualitative perspective they become confusing in a functional setting.

Figure 4 – Impression of WIJZZ (left), Wonderturf (middle) and Manoeuvre (right)..

Secondly, Wonderturf, which is a context-aware and context-creating artificial turf. Wonderturf welcomes visitors, supports their activities or creates opportunities: it is able to invite them to play, provide them with appropriate lining for their ball game or create a personal space when they lie down. This artefact hints possibilities for context and function in the field of leisure, sports and play.

Thirdly, Manoeuvre, a project in which the student investigated the difference between using a static grid of sensors or a dynamic sensor in designing for

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perceptual crossing, which in Hengeveld's doctoral work is a reoccurring point of discussion. Manoeuvre is a table with an interactive top. In the top surface a dynamic body, 'a wave' can move from left to right and vary its height. A static grid of sensors in integrated in the table top; the dynamic sensor is directly mounted on the dynamic body. When a person approaches it the body will try to lure the person into touching it and follow the person's touch.

3 DISCUSSION

In the previous we presented three Research through Design cases emphasizing the role of the artefact in each. As different as these cases seem to be patterns do emerge. Here we wish to highlight these patterns but also the differences, and highlight lessons to inform future RtD projects.

3.1 THE ACT OF DESIGNING IS THE ACT OF DEFINING

Frens emphasized how his design actions were key in defining the concept of Rich Interaction. Hengeveld focused on how his highly iterative approach was crucial to his decision making process in LinguaBytes. Deckers discussed how she set up her project in chapters so that she could explore the concept of perceptual crossing on different levels of abstraction. The artefacts proved to be much more than end-results of a thought process: in their intermediate stages they were catalysts of thought, transformers of theory as well as contextual probes. In each of these projects the artefacts were instrumental in gaining the insights that the designer-researcher was after. The act of designing was the act of defining the concepts under investigation. The prototype embodies the design rationale and thus the designer-researchers line of thought.

3.2 DEMONSTRATORS AND DESIGN TEMPLATES

Frens claims that his final artefacts are in fact exponents of knowledge themselves in several ways: (1) they are demonstrators that operationalize the concepts under investigation in experience; (2) they act as 'design templates'. While this is clearly true for both his project and Deckers' project it appears to be different in Hengeveld's project. The crucial difference seems to be in that both Frens and Deckers aim to investigate concepts outside of the constraints of a context while Hengeveld is acting on societal needs. On first view Hengeveld's artefacts are not meant to be exponents of knowledge but a solution to a problem. We wish to point out that also in Hengeveld's case the artefacts are an exponent of knowledge: they are an experiential answer to the question of how to design for heterogeneous target groups and act as a design template for designers in that business. Yet another layer of richness is added in that the artefacts are actually used in context to this day.

3.3 GOOD ENOUGH

Another recurring pattern in the cases that we present is our notion of 'good enough'. All of our artefacts are 'good enough' to take the next step in the RtD process. This is clear in all three cases but the case of Deckers takes an interesting twist to this notion: her first chapter characterizes itself through a minimalist approach. Here she is actively reversing the notion of good enough to mean most minimal but acceptable. The opposite can be seen in Hengeveld's fifth cycle, in which the creation of three full prototypes put an enormous strain on the notion, as it meant eight months of prototyping.

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3.4 *HOW TO DESIGN FOR…*

The last pattern we wish to discuss is the pattern of the cases starting with a '*how to design for…*' question. In our eyes, this question is essential to how and why we do research and formative for the type of knowledge that our projects yielded. We are interested to investigate that what *could be* instead of that what *is*, this naturally leads to a '*how to design for…*' question rather than an ontological '*what is…*' question. Design is a holistically oriented discipline that has both integrative and transformative characteristics (Hummels and Frens, 2009). We use it as an instrument to tackle the '*how to design for…*' question creating experiential artefacts that write knowledge in the language of design.

In the introduction we point to the lively discussion regarding the Research through Design approach: the discussion on rigor versus relevance. Also we identify that the role of the artefact has faded into the background. Coming full circle we feel that these two issues cannot be seen separate from each other. Hidden under the call for firm methodology is a distrust of the subjectivity of the design process in which the artefacts take form. This distrust extends to the artefacts but is based, we feel, on a logical fallacy: the subjectivity of design process does not mean subjective findings. Experiments have shown that design intent can be perceived reliably by third parties (e.g., Hummels, 2000) despite the subjectivity of the design process. Yet, the artefacts are valuable, not despite, but because they result of a subjective process (Kroes, 2002). The solution domain that is opened through a design process makes for different insights, designers ask different questions and complement other forms of research. Finally, we see this not as an argument that anything goes. The knowledge from a RtD process, captured in the artefact and in writing, needs to be understood in terms of the positioning of the research. The answer on the 'How to design for…' question is not a general law but a conditional one.

To come full circle, we feel that the wish for a formalization of the RtD approach and thus the making activity currently diminishes the value of the artefact. It is leading to an inevitable separation of research question and design question so as to contain the subjective process. This undervalues the powerful thought-catalysing capacity of making and the intertwinement of research question and design question, and will thus lead to results that are of lesser quality.

4 REFERENCES

BALKOM, L.J.M. VAN, MOOR, J.M.H. DE, and VOORT, R. (2002) *LinguaBytes. Een studie naar de ontwikkeling van een computerprogramma voor niet- of nauwelijks sprekende peuters met een motorische beperking*. EAC.

BARDZELL, J. and BARDZELL, S. (2011) *Pleasure is your birthright: digitally enabled designer sex toys as a case of third-wave HCI*. Proc. CHI 2011, 257-266.

BOWERS, J., (2012) *The Logic of Annotated Portfolios: Communicating the Value of 'RESEARCH Through DESIGN'*, Proc. DIS2012, ACM Press, 68-77

BRUNS ALONSO, M. (2010) *Relax! Inherent feedback during product interaction to reduce stress*, Doctoral Dissertation, Delft University of Technology

BUCHANAN, R. (1992) *Wicked Problems in Design Thinking*, Design Issues, Vol. 8, No. 2, 1192, pp. 5-21.

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DECKERS, E.J.L. (2013) *Perceptive Qualities in Systems of Interactive Products*. Doctoral Dissertation, Eindhoven University of Technology

DJAJADININGRAT, T. (1998) *Cubby, detailed form manipulations in VR*, Doctoral Dissertation Delft University of Technology

FALLMAN, D., STOLTERMAN, E. (2012) *Establishing criteria of rigour and relevance in interaction design research*, Digital Creativity, Vol. 21, No. 4, pp. 265-272

FORLIZZI, J., STOLTERMAN, E., ZIMMERMAN, J. (2009) *From Design Research to Theory: Evidence of a Maturing Field*, Proc. IASDR2009

FORLIZZI, J., ZIMMERMAN, J., EVENSON, S. (2008) *Crafting a Place of Interaction Design Research in HCI*, Design Issues, Vol. 24, No. 3, pp. 19-29

FRENS, J. (2006) *Designing for rich interaction: integrating form, interaction, and function*. Doctoral Dissertation, Eindhoven University of Technology

GAVER, W. (2012) *What Should We Expect From Research Through Design*?, Proc. CHI 2012, ACM Press, 937 945

GIBSON, J. (1986) *An ecological approach to visual perception*. London: Lawrence Erlbaum Associates.

HENGEVELD, B., HUMMELS, C., OVERBEEKE, K., VAN BALKOM, H., VOORT, R. and DE MOOR, J. (2007) *Adapt or be Adapted*. Proceedings of Physicality 2007. Lancaster, United Kingdom. 2-3 Sept. 2007.

HENGEVELD, B. (2011) *Designing LinguaBytes; A Tangible Language Learning System for Non- or Hardly Speaking Toddlers*, Doctoral Dissertation, Eindhoven University of Technology

HORVATH, I. (2007) *Comparison of Three Methodological Approaches of Design Research*, Proc. ICED2007

HOVEN, E. VAN DEN, FRENS, J., ALIAKSEYOU, D., MARTENS, J.B., OVERBEEKE, K., PETERS, P. (2007) *Design Research & Tangible Interaction*, Proc. TEI'07, ACM, 109-115

HUMMELS, C. (2000) *Gestural Design Tools: Prototypes, Experiments and Scenarios*, Doctoral Dissertation, Delft University of Technology

HUMMELS, C., FRENS, J. (2009) *The reflective transformative design process*, Extended Abstract CHI 2009, 2655-2658

ISHII, H. and ULLMER, B. (1997) *Tangible bits: towards seamless interfaces between people, bits and atoms*, Proc. SIGCHI 1997, p.234-241

KOSKINEN, I., ZIMMERMAN, J., BINDER, T., RESTRÖM, J. and WENSVEEN, S. (2011) *Design Research Trough Practice, from the lab, field and showroom*, Morgan Kaufmann

KROES, P. (2002). *Design methodology and the nature of technical artefacts*. Design Studies, *23*(3), 287-302.

LENAY, C. (2010) *"It's so touching"; Emotional value in distal contact.* International Journal of Design, 4/2, 14-26.

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LENAY, C., THOUVENIN, I., GUÉNAND, A., GAPENNE, O., STEWART, J., and MAILLET, B. (2007) *Designing the ground for pleasurable experience*. Proc. DPPI, 2007, 35-58.

MAGIELSE, R. (2014) Designing For Adaptive Lighting Environments, Doctoral Dissertation, Eindhoven University Press.

MAGIELSE, R. and ROSS, P. (2011) *A design approach to socially adaptive lighting environments*, Proc. CHItaly 2011, 171-176

MENDELS, P. (2013). *From Collection to Reflection. On designing Freed, a tool for free and flexible organization of designers' digital work*, Doctoral Dissertation. Eindhoven, The Netherlands: Eindhoven University of Technology.

MERLEAU-PONTY, M. (1945) *Phenomenology of Perception* (Original: Phénoménologie de la perception). D. Tiemersma & R. Vlasblom. Boom.

PEDGLEY, O. and WORMALD, P. (2007) *Integration of Design Project within a PhD*, Design Issues, Vol. 23, No. 3, pp. 70-85

ROSS, P. (2008) *Ethics and aesthetics in intelligent product and system design*, Doctoral Dissertation, Eindhoven Universtity of Technology

STOLTERMAN, E. (2008) *The nature of design practice and implications for interaction design research*, International Journal of Design, 2(1), 55-65

WENSVEEN, S. (2005) *A Tangibility Approach to Affective Interaction*, Doctoral Dissertation, Delft University of Technology

ZIMMERMAN, J., STOLTERMAN, E. and FORLIZZI, J. (2010) *An Analysis and Critique of RtD: towards a formalization of a research approach*, Proc. DIS2010, ACM Press, 310-319

ZIMMERMAN, J. and FORLIZZI, J. (2008) *The Role of Design Artefacts in Design Theory Construction*, Artefact, Volume 2(1)