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# Research In and Through Design - An Interaction Design Research Approach

Peter Dalsgaard

Department of Information and Media Studies & Center for Digital Urban Living  
Aarhus University  
dalsgaard@cavi.dk

## ABSTRACT

This paper presents and discusses an approach to interaction design research entitled *research in and through design*. This denotes the study of the design process through the active involvement of the researcher in experimental design activities. The approach is exemplified by a case in which interaction design researchers engaged in the development of an interactive façade in order to generate insights into how to plan and carry out design for this type of interactive systems. This is followed by a discussion of the criteria by which the process and outcomes of *research in and through design* can be evaluated.

## Author Keywords

Research approaches, interaction design research, criteria for research.

## ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces – Theory and Methods, User-Centered Design.

## INTRODUCTION

Interaction design research, and in a broader view design research in general, are emergent fields of study. There is debate as to which research approaches are valid and productive, and in continuation the criteria by which design research should be evaluated are also contested. Even the term *design research* is open to interpretation: does it refer to the study of the design process, to the product that stems from the process, to both process and product, or does it refer to a particular mode of inquiry and knowledge generation that occurs through designing? These discussions notwithstanding, there is a general consensus that the field of interaction design research is complex and in need of further examination and articulation. Some researchers (e.g. Rogers 2004) propose that theoretical constructs from other fields of study can be ‘imported’ in order to gain a richer understanding of interaction design, whereas others propose that design in itself constitutes a paradigm of inquiry that is best understood on its own terms rather than on the terms of articulations and criteria that have been developed within other paradigms; this perspective is often referred to as *design thinking* (e.g. Brown 2009; Cross 2007).

Motivated by the heterogeneity of understandings of what constitutes design research and the calls for further articulation and exploration of the topic, the contribution of this paper is a presentation and examination of a particular approach to interaction design research, *research in and through design*. This approach builds on definitions of design research made by Frayling (1993) and Ludvigsen (2006), but extends this work by presenting an approach that aims at exploring what happens in design processes through the researcher's engagement in experimental design projects. In order to exemplify and discuss the approach, the paper offers an example of how *research in and through design* was employed in a three-year research project. The paper concludes with a discussion of the criteria for evaluating the process and outcome of this type of research. The paper is thus aimed at interaction design researchers, rather than at design practitioners<sup>1</sup>.

## BACKGROUND AND RELATED WORK

According to Bayazit (2007), design research can broadly be characterized as “... the study, research, and investigation of the artificial made by human beings, and the way these activities have been directed either in academic studies or manufacturing organizations.” (Ibid p. 16). This is a tremendously broad and encompassing definition, pointing out that design research can be many things indeed. In exploring the relation between design and research, Fallman (2005) offers a distinction between *research-oriented design* and *design-oriented research*. Research-oriented design denotes a design situation in which research is employed as a means of generating insights that will feed into the design of a product. Design-oriented research, on the other hand, denotes a research situation in which design serves as a means for generating insights and knowledge for use in research. Many recent discussions of design research, including the aforementioned (Bayazit 2007; Fallman 2005) have been inspired by Frayling's paper *Research in Art and Design* (Frayling 1993). The paper outlines a distinction between different types of research pertaining to arts and design, specifically *research into art and design*, e.g. historical studies of art; *research through art and design*, e.g. investigations into properties of physical materials employed in design; and *research for art and design*, research where the end result is “embodied in the

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<sup>1</sup> Parts of this paper build upon the summary sections of the dissertation *Designing Engaging Interactive Environments - A Pragmatist Perspective* (Dalsgaard 2009)

artefact” (Frayling 1993 p. 5). In his research on designing for social interaction, Ludvigsen (2006) explores and develops the distinctions proposed by Frayling within the frame of contemporary interaction design research. This leads Ludvigsen to articulate of three types of research pertaining to interaction design, namely *research on design*, *research in design* and *research through design*:

*Research on design* has as its focus the product of design and the consequences that the product has in the setting into which it is introduced. The design process is of little interest in this type of research, which can be carried out through e.g. art historical or sociological approaches.

*Research in design*, on the other hand, explores the design process and the events that unfold in it. The outcome or product is of minor significance, rather the creative process and the practice and methods in it are in focus.

*Research through design*, analogous to Fallman’s design-oriented research, is research in which a designerly approach and perspective is employed by the researcher. The objective here is to address a research question or theme, and “through” implies that design serves as a model for how to explore the subject matter. A particularly interesting facet of this approach is that the iterative, explorative and constructive modes of inquiry that characterize designerly reflection and practice is presented as a valid research strategy.

Each of these approaches poses different challenges to researchers, requires different skill sets and results in the production of different types of knowledge. Ludvigsen argues that the approaches are not mutually exclusive, rather they may often overlap in research practice; e.g. it would be hard to consider a research in design process in which the product of design was not of some interest and vice versa. In the following, I will present and discuss how two of the approaches, *research in design* and *research through design* can be intentionally combined as a methodological choice in order to pursue specific research agendas within interaction design.

## RESEARCH IN AND THROUGH DESIGN

*Research in and through design* can be defined as research that (1) is directed at improving the understanding and practice of interaction design and thus includes inquiries into the design process itself, and (2) employs the researchers involvement in design experiments as a key catalyst for knowledge generation.

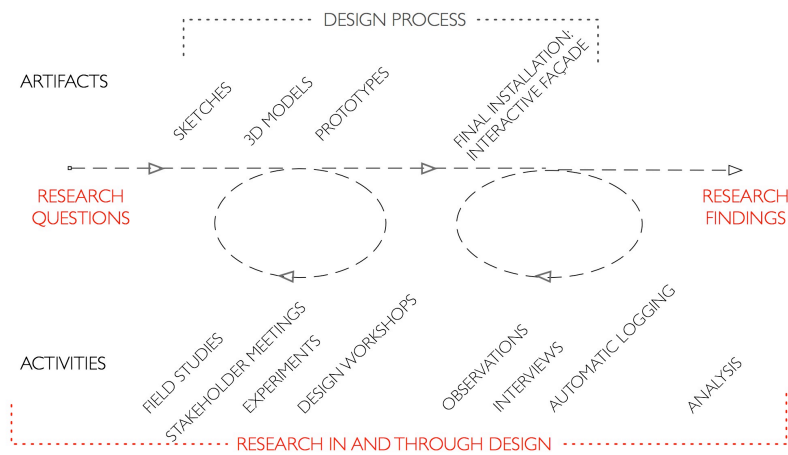
*Research in and through design* can be seen as a variant of case-study research (e.g. Flyvbjerg 2006). One reason for choosing to practice this type of research, which focuses on the particulars of a given situation rather than on generalizable findings, is that within the field of interaction design, researchers are often concerned with novel and distinct cases: the development and use of novel technologies, or the use of existing technologies in new situations; this makes it hard or impossible to do large-scale comparative studies. Another reason – highly salient in the light of using experimental design cases as

catalysts for knowledge generation – is that this type of case-based research can lead to certain types of insights that are valuable in understanding complex situated practices.

In order to exemplify how *research in and through design* may unfold in practice, I will introduce an experimental design project, namely the development of a large-scale interactive façade. In this case, my research colleagues and I collaborated with an architectural lighting company and animation experts to develop an interactive media façade for a concert hall. Our involvement was driven by a series of research questions that could be addressed within the frames of this project, including “how can we design and introduce media façades that facilitate social interaction?” and “how can we design an interactive façade that integrates into a well-known architectural landmark?” These questions guided our planning and execution of the project.

In a *research in and through design* perspective, this process can be understood as iterations between our involvement in orchestrating a series of *activities* - e.g. field studies, ideation workshops, interviews etc - and developing a series of *artifacts* - e.g. sketches, prototypes and, eventually, the interactive media façade. This can be construed as research *in* design since we were seeking insights into how the design process can be developed in order to address the challenges of a new type of technology, interactive façades, and how traditional methods and techniques could be modified or supplemented. It can be construed as research *through* design because we were actively involved in all major steps of the process in order to gain insight into both particular methods and the overall structure and flow of the process, as well as of the results of the process. This interplay between activities and artifacts, and also between research and design activities, is illustrated in figure 1 (on the following page).

In the early phases of the project, activities such as field studies, discussions about the experience of interaction, material and technological experiments, and design workshops drove the development of artifacts including sketches, 3D models, prototypes, and eventually the final installation. When the installation was put into use, we then collected a number of qualitative and quantitative data through observations, interviews and automatic logging and analyzed the entire project on the basis of our research questions. Although the general structure of the process was planned, it was non-linear in the sense that emerging realisations and findings derived from the exploration of design artifacts would influence design activities and vice versa. As made clear from figure 1, the product of the design process, the interactive façade, was not the end of the research project; rather it was a catalyst for knowledge generation related to the framing questions. In the model, this is illustrated by the fact that the process of research through design (illustrated at the bottom of the model) extends beyond the design process (illustrated at the top of the model).



**Figure 1: Research in and through design as iterations between activities and artifacts in the interactive facade case (Adapted from Brvnoskov et al. 2009).**

Furthermore, in the light of our research agenda this individual design project was not a clean slate: it was influenced by findings from similar preceding projects, which had led us to insights regarding e.g. the importance of understanding multi-user challenges, social interaction, the level of complexity of large-scale public installations etc. An important point to stress by way of this example is that although the research process was guided by a set of research questions and objectives, it was developed and refined in response to themes and insights that emerged through the process.

#### **DISCUSSION: CRITERIA FOR RESEARCH IN AND THROUGH DESIGN**

There are a number of ways to approach the study of interaction design, of which *research in and through design* is but one. Just as it holds specific potentials, e.g. with regards to generating deep insights into the design process through engaged participation, there are also limitations to the approach which require attentive reflection.

On a practical level, one of the main reasons for becoming involved in real-life design cases as a researcher is that it is arguably the most efficient way of gaining access to empirical data from design processes; in addition, this involvement establishes closeness to the case, potentially yielding very rich insights. It is exceedingly hard to get access to this type of empirical data if the researcher is not part of a design project, on the one hand because stakeholders in design projects may not be willing to divulge information, on the other hand because the nature and scope of secondhand information would be very different from that obtained through participation. A further argument for involvement revolves around the fact that since design processes often deal with wicked problems [Rittel & Webber 1973], it is not possible to predict how they will unfold in practice. Being part of a project enables the researcher to frame and to a certain extent guide events on the basis of his or her research agenda.

The *research in and through design* approach is not the easiest approach to adopt as an interaction design

researcher, in the sense that alternative approaches from more established disciplines require less presentation and argumentation. When opting for an approach that is not yet well established, it is crucial to outline the criteria by which it – and the knowledge that springs from it – can be challenged, criticized and evaluated.

The main criterion for a research approach is ultimately that it should generate knowledge about the field of inquiry. Binder & Brandt (2007) argue that the knowledge that springs from experimental design research inquiries should be of a type that makes it accessible to and arguable among peers: “... knowledge production in experimental design research involves a traceable *genealogy*, an *intervention* in the world and the articulation of an *argument* for others to engage with.” (Ibid p. 3, my emphasis). I regard this triad, *genealogy* – the history or process of the case or experiment – *intervention* – the transformation of a situation as a consequence of the case or experiment – and *argument* – the resulting knowledge in a form that is contestable to argument from outside parties – as necessary components of research contributions with regards to the *research in and through design* approach. However, these components can be presented in numerous ways and be of different weight, dependent on the type of project and forum in which they are laid out. It is the combination of these three components that make it possible for peers in the community to which the researcher contributes to understand not only what argument is being made, but also how and why the argument has come about. This allows for peers to make informed evaluations and criticisms of the contribution. It also allows for past contributions to be re-examined in the light of more recent findings as the field evolves and more research inquiries are carried out. To these criteria suggested by Binder & Brandt, I will add *discipline* and *rigor* as serious concerns in *research in and through design*. Although the approach can be construed as an alternative to hypothetico-deductive approaches such as those found in e.g. the natural sciences, the disciplined documentation of experiments, as well as the rigor of repeated experiments, should not be naïvely discarded because

they spring from a different paradigm of inquiry. Indeed, I will argue that a foundational understanding of the nature of experimental design research will allow for interaction design researchers to enter into fruitful conversation with other disciplines, e.g. engineering-oriented HCI, and incorporate insights from those fields into their own work in an informed and reflected manner. Ludvigsen (2006) states that "Doing a scientific investigation from a research-through-design point of departure thus means to change the thesis as one engages the subject-matter context and possibly only have a general notion of direction instead of a solid research question or hypothesis before entering the context of investigation. In some scientific traditions, like ethnomethodology, this is the acknowledged way of conducting a scientific study, as the researcher instead enters with a field of interest and a basic curiosity" (Ludvigsen 2006 p. 109). I agree with this understanding of the nature of research through design, but if anything, this only increases the need for disciplined accounts of the research process if one is to be able to straightforwardly present genealogy, intervention and argument. When presenting their findings to the research community, interaction design researchers should strive to make clear the process by which they reach their findings, as indicated by the notion of genealogy, as well as adhering to the notion that the argument presented should be contestable.

## CONCLUSIONS AND FUTURE WORK

Given the scope of the field of interaction design, it is unsurprising that there are many ways for researchers to approach this domain of study. However, since the field is emergent and expanding, there is no widespread consensus as to what constitutes interaction design research; it can instead be considered an umbrella term for a heterogeneity of approaches. This implies that researchers have to be both reflective and articulate concerning their choice of research methods. Importing approaches from other research disciplines is one way to address this challenge; this paper takes a different approach by outlining a method that has been developed in order to address some of the particular dilemmas of design, including the notions of design thinking and wicked problems. This approach, *research in and through design*, can be defined as the study of design processes in which the researcher's involvement in experimental design activities is a catalyst for generating knowledge. This approach resonates with the theme of the OZCHI conference ("Design - Interaction - Participation") by addressing the active participation of the researcher in interaction design projects as a fundamental component of the research process. As is the case with all research approaches, *research in and through design* has certain inherent potentials and limitations. It can generate rich insights into the design process and offer access to data that may otherwise be inaccessible to researchers;

however, the active involvement can be problematic, e.g. with regards to the objectivity of the research. The researcher's accounts should openly address these problematic aspects, for instance through the explicating the genealogy, intervention and argument of the research and/or through triangulating analyses. *Research in and through design* is just one way of doing interaction design research; in addition to explicating this particular approach, this paper will hopefully also invite further discussion about how to conduct interaction design research and how to understand the knowledge that springs from this type of research.

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