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Why 'design research practice' is not design as we know it

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Abstract

Is there a difference between design practice and design research practice? Building on recent discussions within design research about whether the design practice which occurs within design research is distinct and separate from the design practice which occurs within the design profession, this paper presents a case where constructive design practice was employed within a research project, using this example to study the nature of the design process in research. Through a thorough analysis of the designs generated, the motivations behind their development, their use as research tools, and the knowledge they generated, we identified three ways in which the design process was altered when it was imported into the research. First, the degree of development of the designs shifted from fully functional to functional enough. Second, the designs were developed in order to ask questions rather than trying to solve a problem. And finally, the failure of the design was equally able to contribute to generating knowledge as its success. We argue that these shifts in values clearly distinguish design research practice from professional design practice, but come with very real consequences that challenge the core measures we use to assess design.

Keywords

Research through Design; Design Practice; Design Research Practice

Introduction

In the seminal paper, 'Research in Art and Design' by Frayling (1993), he proposes three distinct categories for the type of research done under the heading of 'artistic and design research': research into art and design, research through art and design, and research for art and design. Looking specifically at the design aspect of each of these categories, it is interesting to note how they break Design Research into three quite dissimilar areas of research. 'Research into design' describes design research where design is the subject of inquiry. The design process is observed by the researcher, who generates knowledge about this process without engaging with it. 'Research through design' describes design research in which the researcher engages in the design process as a method to research their subject of inquiry. In taking a 'research through design' approach to design research, the researcher creates new knowledge within their subject of inquiry through the creation of designed things. Finally, 'research for design' describes design research where design is the subject of inquiry and the method, with the end goal of the research being the designed artefact itself (Johnson, 2010). There is much debate around these categorizations, as well as misrepresentation of Frayling's original definitions of the types of research that is conducted within art and design (Friedman, 2008); however, they serve as useful guides to show how varied the work done under the heading of 'design research' really is.

There have been many papers written about how theory is generated from 'research through design', and examples of the types of knowledge that design research can

provide, however, a recent paper by Kuenen and Redström (2013) calls for detailed accounts of the role design practice plays within design research. They make a distinction between design practice and what they call 'design research practice', which they see as a new kind of practice. Their argument is that the design practice which occurs within design research is distinct and separate from the design practice which occurs within the design profession. This is due to the differing intentions of academic research and the design profession, where design researchers generally engage with design practice to generate knowledge while design professionals often engage with design practice to solve a set of problems.

So what does this new 'design research practice' look like? This paper attempts to answer Kuenen and Redström's question by providing a specific example of research that has been done where the researchers have engaged with design construction within their research to generate knowledge, just as quantitative and qualitative methods are used as means for generating knowledge within other fields, such as medicine and the social sciences. Within this paper, we present research that has employed a 'research through design' approach to study a particular context, where design construction – the act of creating physical artefacts – plays a central role in the research process. But how do we generate knowledge through our designs? And what type of knowledge do we generate?

In this paper, we present a research project in which we have used multiple different research methods to generate knowledge around the topic of 'the cancer patient experience of radiotherapy'. Using this project as an exemplar, we will discuss how and why we employed design construction within our research in order to generate knowledge, the specific knowledge generated through our designs, and finally, the consequences and limitations of designing in this way within research. Furthermore, we highlight three specific characteristics that distinguish design practice from design research practice, suggesting that when design is imported into research it undergoes a value shift.

Patient Experience of Radiotherapy

For the past 3 years, we have been conducting research into the patient experience of healthcare, focusing specifically upon cancer patients undergoing radiotherapy treatment. Radiotherapy is one of the three dominant treatment modalities for individuals with cancer, which uses targeted ionizing radiation beams to damage and kill cancer cells. It requires direct patient interaction with highly technical medical equipment, in addition to long-term interaction with the treatment environment due to treatment duration ranging from two to eight weeks of almost daily exposure. Our research project started with an interest in understanding the emotional experience of cancer patients going through radiotherapy treatment, and became focused upon situational anxiety triggered by medical technologies after our initial exploratory fieldwork resulted in the observation of a patient experiencing a panic attack triggered by the treatment technology.

Researching the Existing

If we look at 'traditional' understandings of research and data collection, there are three standard approaches to accessing data: observation, asking questions, and experimenting (Eikeland, 2006). The data gathered from each of these sources can be turned into information and transformed into knowledge by the researcher. The first two approaches to accessing data, observation and asking questions, are focused upon creating knowledge of what is, while the third approach of experimenting is about taking action in order to understand why things are the way they are.

In setting up our research, we decided to engage with different types of research methods in order to generate insights about the patient experience from multiple inputs, since methods for conducting user research often provide a very singular view of the user. For example, quantitative methods such as surveys are very good at looking at statistical

differences between patient groups at the population level but cannot provide detailed information at an individual level, while qualitative methods are much better at providing rich detail about the experiences that take place at an individual or small community level but are much more difficult to use for generating information about larger populations. We decided to draw on the strengths of different research methods to generate a richer and more holistic understanding of patient experience.

Design researchers often draw on method from other fields, especially those researchers that are taking a grounded approach and focusing on real world problems (Zimmerman and Forlizzi, 2008). Ethnography, a method with originated in the social sciences and anthropology, is often employed to generate understanding of the context first and the insights drawn from this understanding are used to drive the creation of design prototypes (Koskinen et al., 2011). Within this research project, we utilized two different types of methods to create understanding around the patient experience of radiotherapy treatments; qualitative methods from the social sciences to observe patient interactions and gather stories and specific details about their experiences, and quantitative methods from medicine and nursing to analyse the prevalence of anxiety in this population and correlate it to different aspects of the treatment process.

This research – conducted via ethnographic fieldwork, patient questionnaires, and design probe kits – found that the fixation devices used in radiotherapy to immobilize and provide reproducible patient positioning can trigger situational anxiety and claustrophobic reactions in patients (Mullaney et al., 2011; Mullaney et al., 2012a). Furthermore, these findings suggested that this anxiety can be partially attributed to the passive, disempowered role that patients assume while in the treatment room, where they are completely dependent upon the radiotherapy staff to manually push, pull, and lift them into the correct treatment position (Mullaney et al., 2012b; Mullaney et al., 2014).

Taking Action

While the knowledge we generated about the patient experience through these different methods helped us to understand the negative emotional impact of the medical technologies within this environment, as designers, we were not satisfied with simply understanding the situation; we desired to change this experience for the patient. We wanted to challenge the existing patient experience by creating alternative experiences and possible futures for the current radiotherapy treatment system. This active participation in intentionally constructing the future is suggested to be what separates design researchers from other researchers whose research is limited to an analysis of the present and the past (Zimmerman and Forlizzi, 2008; Gaver, 2012).

Design has been defined as “the process through which new things are created,” (Telier et al., 2011:51), and “as a kind of making” which requires “the ability to put things together and bring new things into being” (Schön, 1987:41-42). While these definitions can be applied to various aspects of the design process, what interested us is this idea of the *new*, the emphasis on design being able to construct something that does not exist yet. We decided to engage in a constructive design practice within our research project in order to provoke change in the radiotherapy environment, through the introduction of new artefacts, in order to observe what happens. We call these provocations design ‘interventions’, with each intervention arising from a question that we had about the anxiety caused by the fixation device within radiotherapy treatment.

Intervention 1

The first design that we constructed was driven directly from patient stories gathered from the journals we distributed in the design probe kits. The patients were quite vocal about their dislike for the bare ceiling of the treatment room and having nothing to look at during treatment, and so we asked the question, would it be possible to decrease patient anxiety

if the patients have something engaging and distracting to focus on during their radiotherapy treatments?

The first intervention, implemented clinically, focuses upon providing self-selecting visual and auditory stimuli to patients during their treatments. The design, *Taklandskap*, was a touch screen interface that allowed patients to choose from a selection of nature videos and relaxing music which were then projected onto the ceiling and played through the sound system of the treatment room. The intention behind this design was twofold: to actively engage the patients in curating their treatment experience, as well as to provide them with visual and auditory stimuli to help them relax and focus during treatment. This design, despite being a prototype, was installed within the clinical environment to assess its impact (see Figure 1).

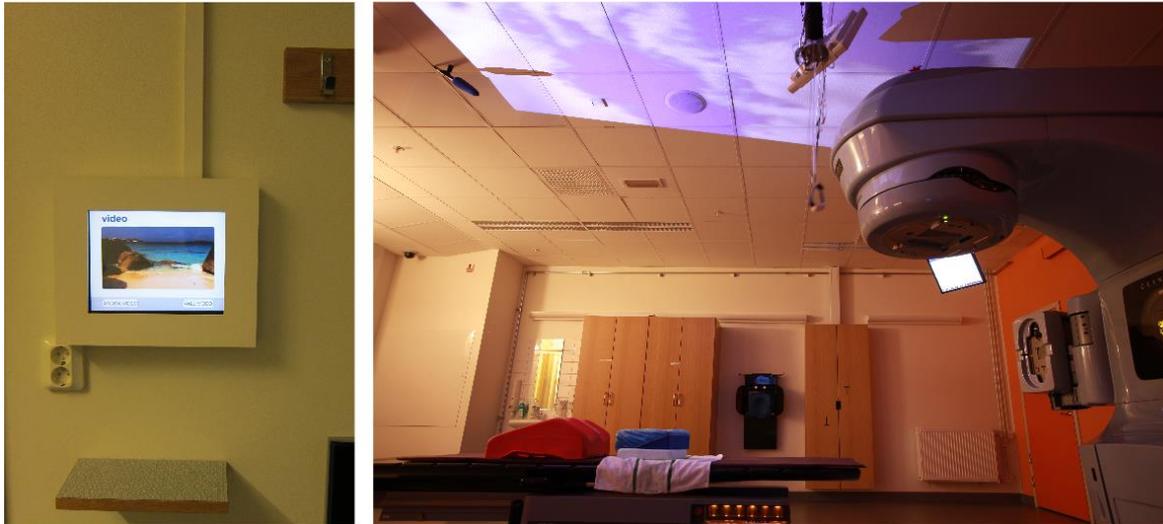


Figure 1. *Taklandskap* touch screen interface and ceiling projection in the treatment room.

Because we were able to fully implement our design prototype within one of the treatment rooms at the radiotherapy clinic we collaborate with, we were also able to conduct a before/after comparison study through our qualitative and quantitative methods. While we have not yet fully assessed the impact of this intervention upon patient anxiety levels, other insights arose through the construction and implementation of this design.

The first insight our design generated was an understanding that *Taklandskap* would only ever be able to mediate any anxiety cause by the fixation device, not eliminate it. This is because the design does not act directly upon the source of the situational anxiety within radiotherapy -- the fixation device. This insight led to the realization that if we wanted to implement our designs within the clinical environment, we were very limited in what we could actually change without disrupting treatment efficacy. Our second insight was that the area of possible intervention *within* the healthcare environment is very small, with 95% of the environment fixed and inaccessible to design intervention.

In order to act directly upon the anxiety-provoking fixation devices, we realized that the next design step available to us within this research context would have to be developed outside of the constraints of clinical implementation, with designs that exist solely as exemplars of what could be, without the capability of assessing them through our other measures. Understanding these constraints, we decided to create a second design which directly addressed the role of the fixation device within the radiotherapy treatment process.

Intervention 2

Since the fixation device is one of the main sources of treatment-related anxiety within patients undergoing radiotherapy treatment, our second design was driven by our desire

to alter the patient relationship with this technology. Drawing on our knowledge of the positioning and immobilization process within radiotherapy (Mullaney et al., 2012b; Mullaney et al, 2014), we hypothesized that it could be possible to remove the fixation device from the radiotherapy treatment protocol if we were able to create a system that allowed patients to become actively involved in their positioning process. Using the skeletal and blob tracking capabilities of the Microsoft Kinect, we created software that allows patients to visualize their body position in relation to the desired treatment position, and provides visual cues for when the two are aligned (see Figure 2).

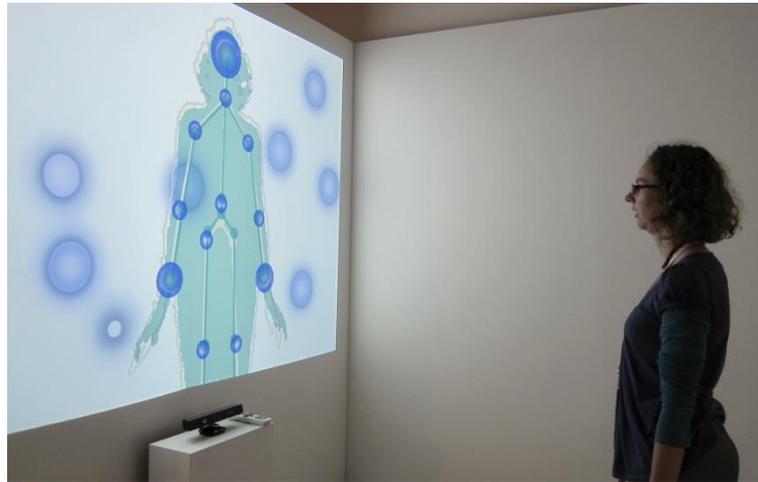


Figure 2. The Kinect prototype being tested in an exhibition.

Because this second intervention actively challenged the need for fixation within the radiotherapy treatment process, we were not able to implement it clinically. Instead, we presented our functional prototype in workshops, conferences, and exhibitions in order to test our concept with other designers and radiotherapy experts, and create a dialogue around the design. Furthermore, because this design was not implemented clinically, we were not able to draw on the same data-generating methods we have been using within the hospital environment. Instead, we began to lean more heavily upon reflection-in and -on our action as a tool to analyse the impact of our designs and the knowledge generated by them (Schön, 1987).

Our first insight came from presenting our design at these different venues and receiving feedback from radiotherapy experts. There is an important distinction between positioning and immobilization within radiotherapy treatment, which our previous research had failed to fully emphasize; positioning gets the patient into the right place, but the immobilization provided by the fixation device helps to keep them there. As a result, while our Kinect prototype could be extremely useful for enabling patients to position themselves for treatment, if the fixation devices were completely removed, these patients would lack a support structure to help keep them aligned. If used alone, the Kinect prototype could potentially generate stress in the patient because they would be solely responsible for maintaining their position for a long duration of time without support. This led to our second insight, which was that with our Kinect prototype, we could simply be replacing one anxiety provoking technology with another.

From this new knowledge, we reflected further upon the role of the fixation device within this environment, and came to the realization that the fixation device is simply a tool to support the linear accelerator in dosing the patient. In order to eliminate the need for a fixation device, you must change the type of interaction the patient has with the linear accelerator and its dose-planning software. While the fixation device may be the trigger of the felt anxiety in patients, it is not the source of this anxiety because the need for this equipment is embedded into the very structure of how radiotherapy treatment is planned and delivered.

Three ways design changes when imported into research

By engaging with the design process within our research project, and through the creation of two designs that offer alternatives to the current treatment experience, we have been able to build an understanding of the structures that shape the patient experience of radiotherapy which were hidden or inaccessible through the other research methods we employed. Our design interventions helped us to understand how highly regulated the clinical environment is for radiotherapy and how difficult it is to act on the trigger of anxiety in some patients – the fixation device – because the root of this anxiety stems, not from the fixation device itself, but instead from the stringent positioning requirements needed for targeted radiation dosing.

Within this ‘research through design’ approach, we engaged with design construction to create designs which we could then use as tools for generating knowledge, however, in doing so, we realized that this type of designing is unique and different from design that happens within professional practice. When you bring designing into research, it changes and becomes a different approach. Based upon our experience with implementing a constructive design practice within our research of patient experience, we have identified three aspects to design construction that changes when it is brought into a research context.

Degree of Development

According to Koskinen et al. (2011), design construction within design research usually takes the form of a prototype, a scenario, a mock-up, or a detailed concept, and this is true of both of the interventions we present in this paper as well. The question is why are designs within research not taken to the same level of refinement as those that are developed within a professional context? We argue that there is a difference in the use and evaluation of design that is developed within research, which deemphasizes certain design values in order to emphasize new ones.

Design within research does not have a client, or manufacturing constraints, or a need to be marketable. Its value is in its ability to generate knowledge, and therefore it is up to the researcher to decide how far they must develop the design in order for it to be able to accomplish this goal. The degree of development can differ from one design to the next and from one research project to the next. For example, Taklandskap was developed to the point where the software was functional enough to allow some level of patient selection on a touch screen. If this prototype were to be developed into a marketable product, it would require major redesign and development of the software to make it more stable and versatile. In comparison, Taklandskap was developed much more thoroughly than the Kinect prototype, because it was implemented within the radiotherapy clinic which required that it be simple to use for the staff and not require direct oversight by the designer. The change from being functional to functional enough is one of first value changes in design construction as it transitions from a professional context to a research context.

The consequence of this value shift is double-sided. On one hand, the shift to functional-enough allows design researchers more freedom to explore the possibilities of design without having to consider real-world constraints, but on the flip-side, this means that designs generated within research can be perceived as having little value in the real world, making it difficult for individuals outside of the academic context to relate to the design work being done within research.

From Solution to Question

The second value change that happens when design is brought into research is a shift in the intention behind design construction. Zimmerman et al. (2007) proposes that while design professionals focus on creating commercially successful things, design

researchers focus on making the 'right thing'. We agree that this is part of the difference in the two design practices, but that there may be more to design construction within research than just creating the 'right thing'.

In our research, the designs we created were *not intended to be solutions*. We used them as physical tools that could help us *test our ideas and ask questions*. For example, our Kinect prototype arose from the research question, 'Can we remove the fixation device from radiotherapy treatments if we provide patients with the ability to get themselves in the correct position?', and we used it as a tool to help us understand the role of the fixation device within the treatment process. Used in this way, the knowledge generated by the Kinect prototype helped us reframe the research questions we were asking about patient anxiety; from a singular focus on the fixation device to a deeper investigation into how radiotherapy treatment is planned and delivered.

Designs generated within professional practice are often characterized by a problem-solving and solution focused design process. In contrast, designs generated within research can be characterized by their problem-finding and discovery-oriented nature. The change in focus from problem-solving to problem-finding is the second value shift that occurs when constructive design practice is implemented within a research context.

The impact of this shift is seen most clearly in the changes it evokes within the design process. Instead of placing emphasis upon finding the best solution and culling all ideas that are less than ideal, the design researcher can instead choose to explore many different ideas. He may develop one idea to see what is learned, and then go in a drastically different design direction with the next prototype, as evidenced by the two interventions presented in this paper. As a result, refinement of a singular concept is sacrificed for the ability to develop a much broader set of ideas.

Success or Failure

Using a problem-solving approach to develop our designs within this research project would have generated drastically different results. Take for example, the problem of patient anxiety caused by the fixation device. If we had chosen to focus on solving this problem, we might have put all our effort into the redesign of the fixation device, or we could have created a system similar to the Kinect prototype in an attempt to remove the fixation device completely. If we had chosen to try to eliminate the fixation device and design a new system which would cause less anxiety in the patient, the Kinect prototype would have been seen as a complete failure because of its inability to replace the fixation device and would have been summarily dismissed as a concept.

However, as a prototype implemented within a research context and used as a way to ask questions about the patient experience, the perceived failure of this design to remove the fixation device from radiotherapy treatment is irrelevant. Instead, this *'failure' played a crucial role in the generation of new knowledge*. The Kinect prototype's inability to solve the problem of anxiety caused by the fixation device came from our misunderstanding of the role of the fixation device in the first place, which was made clear only through reflecting upon the reasons for its failure.

The third value shift that we can see when design is practiced within research is that the perceived failure of a design is as valuable as its success. Failure is no longer evaluated by whether or not a design is successful in solving a problem, but by whether or not it is able to generate new knowledge. The implications of this shift upon design research practice are twofold: the generation of designs for research can be more open, and less

grounded in directed user research; however it does require that their construction is very intentional and focused upon a clear research question.

Implications

It is obvious that engaging with design practice within a research context changes the shape and value of the design output, making it distinctly other from the designs generated within professional design practice. The three value shifts that we call attention to above are evidence of the idea that design research practice is markedly different from design practice. However, if design research practice is different from design practice, what are the consequences? And why is it important to differentiate between these practices?

Kuonen and Redström (2013) suggest that design research practice addresses a different set of questions, issues, and problems than those that are typically found in professional design practice, however both are design practices and therefore also share very many similarities. By elucidating some of the differences between the design practices done within a design research context versus a professional context, this paper aims to build a better understanding of the practice of constructive design research. We believe that this distinction can be used to help the design research community reassess how research through design projects are evaluated, discussed and disseminated.

Over the last few years, the design profession has raised concerns about design research and its relevance to professional design practice (Stolterman, 2008). If the differences in design practices outlined in this paper have played a role in this disconnect between research and the profession, perhaps by acknowledging and articulating these differences in practice we can begin to create a common language between design research and the design profession that will facilitate better knowledge transfer between the two. Rogers (2004) has suggested that in order for research to be better able to contribute to design practice, we need to create new mechanisms of bi-directional knowledge transfer between the two contexts, and create a more extensive design language - a lingua franca - that can be used for both research and design.

This paper just touches the surface of this discussion. We have only draw on two design examples within a research through design approach, and it would take an in depth exploration of many more cases to strengthen our argument. Furthermore, we have only looked at designs that have been created through constructive design research, and it bears asking if all design practice used within research share these value shifts, or if this is specific to constructive design research. While we do not have answers to these questions, as design research practice struggles to differentiate itself from both design practice and traditional research we suggest that these questions bear further investigation.

Conclusions

In this paper, we have attempted to provide a detailed account of the role constructive design practice plays within design research through an examination of a particular research case, where the creation of design interventions played an active role in knowledge generation. Furthermore, through an analysis of these designs and how they generated this new knowledge creation, we identified three differences in values between designs generated through design research practice and designs generated through professional design practice: their degree of development, whether they ask a question or solve a problem, and how the design is evaluated as a success or a failure. The shift in values that occurs when constructive design practice is taken from a professional context to a research context solidifies the idea that design research practice is indeed a distinct

entity, unique from design practice, raising new questions about how we work and communicate both within and between these two different design practices.

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