PROTOTYPE EVALUATION IN SERVICE DESIGN
A CASE STUDY AT AN EMERGENCY WARD

Johan Blomkvist
Linköping University
johan.blomkvist@liu.se

ABSTRACT

Prototypes based on user research are embodiments of hypotheses about how behaviour and experiences will change. The purpose of prototypes has been discussed in academic literature but in the case of service design, some of that knowledge needs to be re-examined. In Service design, one of the problems is that the impact of prototypes is complex and difficult to predict. A way to counter this dilemma is to put more focus on making the hypotheses explicit and testable. This paper presents a practical process for using designers' hypotheses to generate survey tools for evaluating the impact of prototypes in service systems. This is also a way for designers to verbalize the purpose of service prototypes in a contextual and situated way. The tool was designed to be quick, easy, and light-weight, to suit the needs of design consultants, and it focused on measuring the experiences of a waiting room from the perspective of the visitors. The process has been applied to a project where the waiting room of an emergency ward was redesigned. The three-step process started with *building up the hypothesis structure*, where the designers' assumptions and intentions were used to make a representation of the hypothesis. The next step was *formulating questions*, where questions that tested the hypothesis were formulated. The last step – *making the questionnaire* – included the selection of what information to gather and iterative testing of the questions. It was found that the designers did not have a well-defined hypothesis. The suggested process can help designers identify a contextual and situated purpose for prototypes.

Keywords: service design, prototyping, prototype evaluation

INTRODUCTION

This paper takes a closer look at a specific instance of service prototyping. The aim is to suggest a process for measuring how people experience a prototype of a service, for designers and collaborating stakeholders to be able to evaluate it. The process should be easy to go through and usable for design practitioners trying to evaluate the impact of prototypes on service experiences. The case presented is based on a prototyping project conducted by a Swedish service design agency. The suggested process for evaluating service prototypes builds on the assumption that service prototypes, based on user research, are manifestations of hypotheses about how behaviour and experiences will change. In this case the desired change was an improvement on patients', and other visitors' experience of visiting the waiting room of the emergency ward at a large hospital.
Being able to measure the experience of a service prototype would allow designers to show the value of their work. Other aspects than the experience can be measured, such as behaviours, actions, and so on, but for services designers this might not be the most important factor. Thus, a quick and easy-to-use process for generating a questionnaire can be helpful for design practitioners that are looking for alternative ways to communicate about, and argue for the importance, of their work.

EVALUATING SERVICE PROTOTYPES

One of the challenges with evaluating how successful a prototype is in service design, is that the impact of prototypes is complex and difficult to estimate or measure. A way to counter this dilemma is to put more focus on making the goal and assumptions

behind prototypes explicit and testable. This study presents a practical process for using designers' hypotheses or assumptions to generate survey tools for evaluating the impact of service prototypes. The process also helps designers verbalize the purpose of prototypes in a contextual and situated way. The process has been applied to a project where the waiting room of an emergency ward was redesigned. The process and its benefits will be described in detail in this chapter.

PURPOSES OF PROTOTYPING

Prototyping as a technique in design has been used and developed in design fields such as product design and interaction design (Ehn & Kyng, 1991). A set of theoretical frameworks have been developed describing prototyping as an activity. Houde & Hill (Houde & Hill, 1997) e.g. suggested that designers mainly use prototypes to address one of the three dimensions; look and feel, role, or implementation. Perhaps the most rigorous classification has been made by Lim et al. (Lim, Stolterman, & Tenenberg, 2008), using the metaphor of filters as one dimension and manifestations of design ideas as the other dimension of what they call the anatomy of prototypes. Common to these conceptualizations is a focus on the idea behind the prototype, the hypothesis.

In service design, these hypotheses are part of complex and, many times, people-intensive product service systems (Pinhanez, 2009; Ericson et al., 2009). The hypotheses are closely tied to the purpose of prototypes; what the prototype should explore, evaluate, or communicate should be reflected in the assumptions about what the prototype is supposed to change. A step towards a better understanding of the purposes, suggested by Houde & Hill, is a categorisation into role, look & feel, and implementation.

We agree with Houde & Hill in that more fundamental questions need to be posed about prototypes and their purpose but suggest that for prototypes of services, the proposed categories might not be as relevant or sufficient. For instance, the look & feel of the prototype should be divided into separate dimensions, since it is possible to test one withouth the other, e.g. carrying around a piece of cardboard estimating the size and weight of a mobile unit explores the feel but not necessarily the look of the artefact. An equivalent example for service design might be testing – by role play or bodystorming – a client meeting without the correct props and clothes, thus exploring the feel but not look of the service encounter. The categories suggested by Houde & Hill (ibid.) also does not suffice to answer e.g. relevant questions suggested by Schneider (1996) such as; What does the prototype show? What does it prove or disprove? The answers to such questions, which concern the prototype in itself, should be possible to identify by the purpose of prototyping. A contextual way of dividing purposes for prototyping is to return to the role of the prototype in specific projects.

In a study where practicing service designers were asked about their prototyping practices, they mentioned three different purposes; **exploration**, **evaluation**, and **communication** (Blomkvist & Holmlid, 2010). The research showed that explorative prototypes were used to generate ideas or as learning tools that facilitate collaboration. Evaluative prototypes were used to answer questions and receive feedback on assumptions while communication prototypes were directed at specific audiences to convey the main points of an idea.

PRECONDITIONS OF THE CASE

To further specify what the preconditions for this specific case were, this section describes the service and the challenges with prototyping in similar service contexts.

THE SERVICE PROTOTYPE

First of all, the service in this case is healthcare, or emergency healthcare. This is perhaps the best way to categorise the service since there is such a large number of different services and possible service categories. The prototype in this case was a set of, more or less temporary, improvements to the information available in the room and the registration flow when entering the emergency ward. The solutions were integrated in the existing waiting room, so in a sense, the waiting room became the prototype. Many parts of the prototype were seen as improvements and kept by the hospital after the prototyping phase.

Based on the division of purposes into exploration, evaluation, and communication, we can say some things about the prototype at hand. The project had gone through a research phase and the designers had developed their ideas about what a good solution would be. In this way, the prototype at hand was an evaluation prototype, aimed at answering the designers' questions about what the prototype could accomplish. Hypotheses behind prototypes are arguably most important when the purpose is to evaluate. This means that the hypothesis needed to be clearer because the point of prototyping was not to generate more ideas or knowledge, as with an explorative prototype. Similarly, the idea was not to convey an idea that would improve collaboration or increase the insight into the project for other stakeholders, as in communication prototypes.

CHALLENGES OF PROTOTYPING IN HEALTHCARE FACILITIES

On the basis of the existing plethora of literature, both on atmospherics (e.g. Hoffman & Turley, 2002; Greenland & McGoldrick, 1994) and from the field of environmental psychology (for an overview, see Holahan, 1986), it should be safe to say that the physical design of service facilities effects people. It is therefore reasonable to assume that changes to that design will also have effect on peoples' perceptions and experiences of and in those facilities. Predicting and measuring those changes is however not easy. Techniques have been developed in an academic context that assesses the impact of an environment on people's perceptions. For instance, a measurement technique called Perceived Environmental Quality Indices (PEQIs), which affords a qualitative assessment of the quality based on a group of peoples' experiences related to physical facilities can be used (Holahan, 1986). But rigorous academic measurements are not feasible for practical reasons when designers are contracted to make changes to facilities. Instead they need to rely on quicker ways of estimating or evaluating the impact of their designs.

When attempting to simulate or predict behaviours and experiences in interpersonal and elaborate services, such as in this case, issues of validity quickly arise. Validity is a term that can be used in service prototyping as a complement to fidelity as a way of describing how well the test situation corresponds to the intended implementation context (Blomkvist & Holmlid, 2011). A similar thought that has been presented is that the aspects; environmental, social, and intervention fidelity of the prototype should be considered (Wellings, 2009). Environmental fidelity corresponds to the level of finish in the prototype. Note that not all services are delivered and consumed in a specific location; we also have location independent services and facilities that are owned by other service providers or even the customers. Social fidelity has to do with 1) roles, behaviours, and emotions, 2) rules that govern behaviours and roles, and 1) how people engage and relate to the design. Intervention fidelity concerns the artefacts and how they are used and combined in the situation. The validity of prototypes corresponds roughly to environmental and social fidelity, while intervention fidelity has more to do with the prototype in itself. In this case the prototype has high validity, which is correlated with environmental fidelity, since it is already in its intended implementation context.

The challenge with prototyping in this kind of service is not only the many factors that may influence the experience. Aspects of the physical location that affect customers of services also affect the service delivery staff (Bitner, 1992). Many times, the influencing factors are also hard to predict. The experience of eating at a restaurant for instance, is not determined exclusively by the food, it might not even be the most influential factor in judgments of a restaurant visit experience. Aspects such as the design and style of a restaurant, in addition to the food and service play an important part, as shown by e.g. Alonso & O'Neill (2010).

Things that might affect the experience of the service in this case, are waiting time, the cause for visiting the emergency ward (severity of injury/illness), staff and patient behaviour, and so on. Even small changes in the environment have implications for behaviours, such as changing the flow of transactions and supporting certain types of social behaviours (Bitner, 1992). The proposed process for measuring the impact of the prototype tackles this by isolating variables. The process also focuses on a limited part of the whole experience to

tackle the challenge of complexity. This is done by focusing on the hypothesis of the prototype. Predicting and evaluating improvements of services that are location oriented and complex is difficult. In this case we developed a questionnaire using a process that can be used to evaluate prototypes in these kinds of services. It is suggested that this process can be used by practitioners for two purposes. 1) to facilitate communication in design teams, by making the purpose more explicit and by creating a shared representation of the hypothesis behind the prototype. 2) to evaluate to what degree the prototype has been successful and thus enable designers to show the impact of their work on the service experience. Evaluation tools for service prototypes in situations like these need to be focused, contextualized, and situated. The process is not intended for all types of services since there are many different types of services.

CONTEXTUALIZING THE CASE

The project started when a Swedish design agency approached one of the biggest and most prestigious hospitals in Sweden with a proposition for a design project. Our role as researchers in this project was as a third party – we did not take part in the design activities. The hospital had been planning to make changes to the existing waiting room at the emergency ward. Hence it was agreed between the consultancy and the hospital that in the first phase, the design agency would do a short research study leading up to a number of recommendations for the emergency ward. After this phase there were some negotiations with the hospital and the second part of the project, which was supposed to be a prototyping phase, was delayed. This meant that when the project got started again, the designers decided that too much time had passed and they needed to do another, short research effort, see Figure 1.
The progression of the project was followed by continuous updates in the shape of design documentation, notes from meetings, and email conversations. One interview (interview 1 Figure 1) was conducted after the first research phase. A presentation the designers had held for the hospital was sent to us after the interview. The same designer was then interviewed after the next research phase when also another designer was interviewed (interview 2 in Figure 1). The interviews only had one purpose; revealing the designers' assumptions about the prototype, problems and solutions. The format of the interviews was open but started with questions about problems, what they wanted to do (i.e. to prototype), and finally what parts of the prototype that would achieve their goals.

RESEARCH PROCESS BY THE DESIGN AGENCY

In the following section some of the results from the research study performed by the agency will be presented. A short introduction of the waiting room of the emergency ward and the main problem areas found during the design team's research phase will be presented in the following sections.

The emergency ward waiting room

The waiting room (Figure 2) served both as registration and waiting room. There was a registration desk with two registration windows (a) and a window for payment (b). The desk ran along the glass covered triage area (c) and was located straight ahead on the right hand side when you entered the room. Before approaching the registration counter visitors were supposed to get a queuing ticket from a queue-ticket machine (d). When a visitor's number was shown on a display it was time to walk up to the registration window and

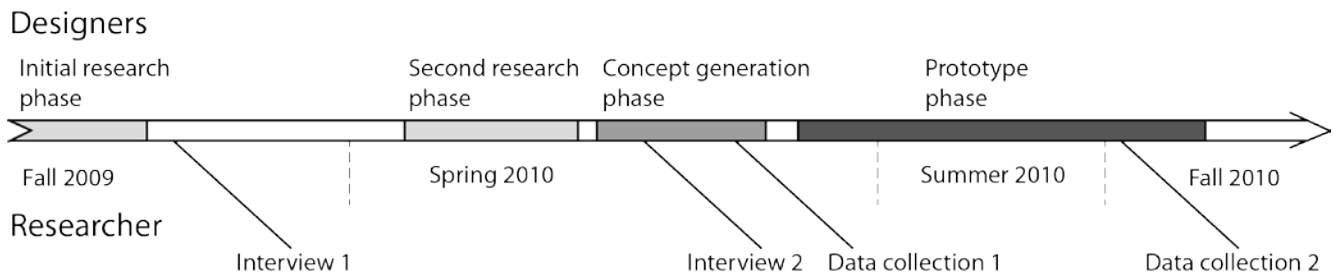

Figure 1. Visualisation of the case process, divided into what the designers and researchers did.

sit on a chair in front of it while stating the purpose of the visit. After that, visitors were supposed to get up and walk over to another window to pay the standard fee for a visit to the ward. After that, they were asked to sit down until their name was called. However, if chest pains or shortness of breath was experienced, the visitor was supposed to walk directly up to the counter and ask for help. The research phase that the design firm carried out revealed 3 main problem areas; information, registration flow, and environment. They will now be discussed in detail.

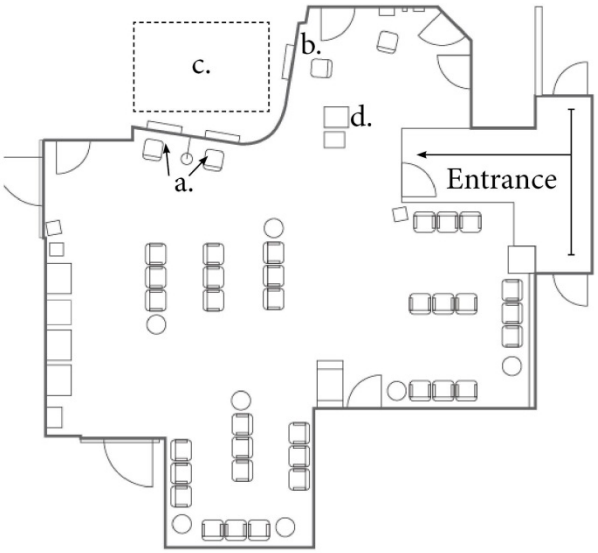

Figure 2: Overview of the waiting room with important areas marked.

Problem area: information

There was too much information in the waiting room. The staff had put printed papers in all sizes on doors, walls, and pillars mixed up with official information from the hospital and information about travels and other situations. The sender and intended recipient of the various messages in the room were not clear and this also affected the ability of visitors to know what to do to get a queue ticket. Because there was so much irrelevant information, people did not see the important information, such as where to get queuing tickets or what to do in an immediately life threatening situation.

The information that patients actually wanted to get was only partially available, if at all, in the room. For instance, the ward informed about how to find a psychiatrist, where to smoke and not, particular infections, how to get a taxi and so on. People on the other hand, wanted to know where they were, why the vending machines didn't work, how much longer they were going to have to wait and so on.

Problem area: registration flow

Partly as a consequence of the information overload people also had problems with doing everything in the intended order. Abundance of information and confusing spatial layout lead to problems with the process of registration and how to behave during the first few critical moments of entering the room. For instance, it was difficult to see the difference between where to register and where to pay. Many just walked up to the registration window or formed a queue behind others because they did not understand the intended flow. More alarming, there was a risk that seriously ill people would wait for a queuing ticket instead of walking directly up to the window. Also, some people stopped right after entering the room with confused expressions, thus preventing the flow through the room additionally.

Problem area: environment

The last area of problems was the environment and how people experienced it. The perception of the room, as interpreted by the designers, was that it was

- *cluttered and messy*, which made it difficult to see structures and routines leaving a disorganized impression
- *hard to get clear instructions*, communicating a lack of clarity
- *messy, worn, and untidy*, which was interpreted as unsanitary
- *mixed materials*, making it feel like a home environment which made the place seem unprofessional and
- *missing a holistic approach*, making it feel low prioritized.

THE PROPOSED PROCESS

This section will describe how the process is suggested to work by using this specific case as an example. The process to define the evaluation instrument is comprised of three steps and starts before the actual prototype is created, after the initial research phase. The process describes the steps involved up until the moment when the

questionnaire is finished and ready to use. Documents generated during the project were sent by the designers to us and we also had contact regularly throughout the second phase of the project through mail and telephone/Skype. The phases of the project be seen in Figure 1. The first step of the process is building up the hypothesis structure.

BUILDING UP THE HYPOTHESIS STRUCTURE

The first step of building a hypothesis structure involves a thorough investigation of the assumptions behind the prototype. This should be done already when the original idea for the prototype is generated and formulated. The purpose of doing this is to make the assumptions verifiable so that it can be decided whether the prototype actually had its intended impact – in a situated and contextual way. It is valuable to know what aspects were affected and if the prototype accomplished to do what it was supposed to do. In this study, the assumptions were made explicit through interviews with the designers after they had gone through the initial research phase and concept generation. The subsections of the first step were;

- extracting the emotional keywords
- finding bridges, and
- organising themes.

First we extracted emotional keywords. We started with the designers' interpretation of how the concerned stakeholders felt during their time in the waiting room. To find out what the designers thought of how people experienced the emergency ward waiting room we asked them to explain, in their own words, what affected the experience and what the emotional response might have been. This resulted in a number of words loaded with emotional or experience related values. The words were e.g. frustration, confusion, suspicion, understanding, trust, insecurity, (feeling of) security, and relaxation.

Notice that there were both words with negative and with positive connotations. This is because the designers started talking about solutions and problems interchangeably. So when they said that e.g. information overload lead to confusion, they also said that the right information at the right time makes people feel secure. This is how the argument and the structure of the hypothesis were built (see Figure 3).

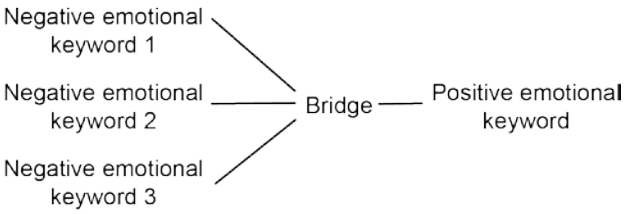

Figure 3. Hypothesis structure example.

To find the thing that made the situation better we looked for the bridges between the negative and positive keywords. So in the example with information overload for instance, a new and improved information sign was the bridge. When those bridges got repeated or when similar bridges occurred, themes emerged. The bridges were identified by the researchers after the interviews and without involvement from the designers. This was a way to analyse how well formulated the designers' ideas about the prototype were. It is probably a good idea that the designers perform this activity themselves so that they can make their assumptions explicit and share their ideas with each other. Once the thoughts about the emotional impact were clarified, it was time to verbalize which aspects of the experience that the prototype would affect.

This was done by organising themes. Based on interviews with the designers, there were four areas that they felt were more decisive for the experience as a whole and for a successful prototype, than the others. These were entrance information, queuing, behaviour, and questions. The relationship between the reported feelings and the categories were not always as clear as in the example above with confusion – information – security, and it was not always a direct relationship between for instance queuing and frustration, but the designers had an idea about how improvement within these areas indirectly would improve the experience or change the behaviour in a desired way. Besides looking for bridges to find themes we also asked them explicitly about what they wanted to change with the prototype and how. This was a helpful exercise for the designers because it made them verbalize their implicit assumptions about the prototype.

After the interviews we could conclude that the work of the designers was intended to result in better and more easily available information by the entrance, a clearer idea of visitors about how long they were going to have to wait, knowledge among visitors about what to ask the staff about and what not to ask about, and finally how to deal with registration. To achieve this, the designers choose to move the queue-ticket machine so that it was the first thing visitors saw when entering the room and they also changed its appearance so that choices were more clear. The designers also redesigned a lot of information in the room and took away unnecessary information. Important things and official information from the hospital were gathered in one place along one of the walls in the hospital. At about the same time, new televisions were installed in the waiting room and minor redecorations occurred. A strategic choice was made to also move the food dispensing machines. Those were the major changes in the room as a consequence of the prototyping phase. The next step was to start constructing the questions for the questionnaire.

FORMULATING QUESTIONS

The creation of questions to test the hypothesis is the most time consuming step. Here, questions that test if the prototype will achieve its purpose should be constructed. In this case, respondents were asked to report their level of agreement with statements, ranging from strongly agree to strongly disagree. Questions were then developed that answered aspects of the different areas the designers wanted to improve; entrance information, queuing, questions, and behaviour.

Most areas had specific aspects that the designers wanted to change. For instance, when it came to the information in the entrance they wanted to find out if people would immediately understand what to do when entering the room. The queuing area had two different aspects that the designers wanted to change; knowing how long waiting time and knowing the position in the queue. They also wanted to decrease the number of irrelevant questions for the staff such as issues concerning queuing, directions, phone numbers and so on. Questions that could be distilled from the designers' hypotheses about behaviour were closely tied to questions about the entrance information. The designers wanted to know if people would know how to behave in relation to the intended process of getting a queuing ticket, sitting down and waiting, approaching the registration window and then moving over to pay in the final window.

We wanted the process of filling out the questionnaires to be quick and easy and decided to only have a few questions for each area. The questions were balanced so that there were two questions for each area; one positive and one negative. Formulating the questions, and mixing them, as positive and negative prevents respondents from just answering mechanically in the same way. The final questions looked like this.

Entrance information

- It is clearly instructed what to do to get the correct queuing ticket
- It is difficult to know where to go depending on errand

Queuing

- I have good idea of how long I will have to wait
- It is unclear what my place in the queue is

Questions

- It does not disturb if I ask the staff about something I wonder
- It does not feel right to interfere in the staff's work with questions

Behavior

- It is difficult to know how to behave when you enter the room
- It is clear where to go when you come into the room

Self-assessment manikin, SAM

In addition to the questions derived from interviews and material generated by the designers it was clear that we needed some information about the actual experience, the emotional consequences of visiting and spending time in the waiting room. The prototype that was created did not directly have

anything to do with the emotional effects of being in the room but many aspects of the room was thought, by the designers, to have an indirect impact on the experience of being there. When using a questionnaire it is however impractical to ask for secondary effects, if the hypothesis is that people will understand the intended flow better, ask if they understand the flow better and not whether they feel more safe.

In this case, most of the things the designers wanted to do, in their opinion have implications for the experience. To find out on a more general level whether the prototype changed the experience we used the Self-Assessment manikin (SAM) measurement tool. Measuring emotion can be done in a few different ways. Generally speaking, there are two approaches to explain and categorize different types of feelings and their relationships to each other - one discrete and one dimensional approach (Capota et al., 2007). The discrete approach divides all feelings into separate emotional states. The SAM tool uses a dimensional scale where the assumption is that emotions can be identified in a space defined by the three dimensions pleasure, arousal, and dominance (Bradley & Lang, 1994). Using pictures to facilitate affective reports, the SAM tool allows subjects to report their emotional responses. This was a good complement that was unrelated to the specific prototype and would indicate any positive or negative effects of the prototype.

MAKING THE QUESTIONNAIRE

When making the questionnaire, the information to respondents and questions you want to pose need to be carefully considered. In our case it was imperative that the information about how to fill out the questionnaire and who was asking the questions was easy to understand. The information text located in the beginning of the questionnaire basically said that we were collecting data about how the waiting room of the emergency ward was experienced – as part of a research project, and that we needed some help, and would be thankful for information that help us understand how to improve healthcare. The whole questionnaire fit on an A4 page with information and questions on the first page and more questions and the SAM tool on the other side. We included a highlighted sentence that participation was anonymous, and we also informed them that we were gathering data for a project run by the university.

Pilots of the questionnaire were constructed. Both the questions and the information were changed continuously to arrive at comprehendible and straightforward questions. The questions were tested on colleagues and on students just to make sure they were understandable. Each time the questionnaire was tested new things came up, but after three or four iterations the amount of feedback started getting smaller and concerning small details where it was more a matter of personal preferences than actual misunderstandings. To find out what information about the respondents to ask for we thought about the situation and context for data gathering as well as what we thought could affect the responses. We decided that we needed to know whether the respondent was a patient or not, how long waiting time, if they had been to the emergency ward previously and how long ago that might have been. Those were the only four questions about the respondents. Those questions were asked to find out how big the influence of waiting was on overall judgments and to be able to know whether they had been to the emergency ward previous to or after the first prototype was in place. It is also reasonable to think that the experience can differ between patients and their kin or friends that accompany them.

The questionnaire only had one open format question, which was; What in the emergency waiting room has had the largest impact on your experience? This question was meant to help identify variables that might have had a large meaning for the interpretation of the final results. After making sure that the text was legible, and avoided ambiguous formulations, the questionnaire was ready to be used. The questionnaire worked well on its own and did not need much introduction in the waiting room which made it easy to collect data. The first data collection was made before the prototype and the other collection was made while the prototype was in place. Since it is important to isolate variables we used the same phrase to initiate contact on both occasions, and we collected at similar time of the month on the same day of the week both times.

RESULTS

The results will focus on reflections on the process of creating the questionnaire and what that process meant for the project and for the prototype. It should be stressed that this is supposed to be a pragmatic approach that can be used by people who are not used to conducting this kind of research, which influences the approach and scope of the process. The main advantage of using this process is that the hypothesis becomes explicit and that it allows testing and evaluation of specific assumptions.

The first part of building the hypothesis structure mainly helped with verbalising the designers' view of how people experienced the waiting room. This is an interpretation of how others might feel and experience things that is usually done in service design by visualising the customer journey. However, there is no step in the "usual" process where these interpretations are discussed thoroughly or arranged in a structure linking the experiences and assumptions about their cause and effect.

BUILDING UP THE HYPOTHESIS STRUCTURE

Throughout the project, the hypothesis and interpretations of what needed to be done changed a bit. The initial assumptions that the designers made were later reassessed and the initial problems were not necessarily prioritised in the solutions. This was to be expected; the problem and solution is gradually uncovered simultaneously. This was also obvious in the work with finding bridges. It highlighted how natural it is for designers to think about the problem and the solution simultaneously; when asked about what problems they had discovered during the research phase the designers usually started talking about solutions interchangeably. When constructing the hypothesis it was better however to keep those separated. Being clear about what a problem, or problem area, is makes it easier to organize the assumptions into themes. This exercise was also a good way for the designers to make explicit connections between problems and solutions. Looking at the result however, reveals that the connection between problem and solution was not entirely matching; indicating that more work could be done with making this relation explicit.

GENERATING THE QUESTIONS

The designers did not have a clear hypothesis structure, the relationship between problem and goal was sometimes unclear. This could be observed by looking at the designers' documentation and comparing it to the suggested structure. This meant that a choice between asking for problems and asking about the things that the designers explicitly said they wanted to change had to be made. In this case we chose to generate questions based on what the designers wanted to achieve, even though the connection between problem – prototype – solution was not always clear. Sometimes the problem was clearly defined, and the solution, but not how the prototype should address this situation. Similarly, at times they were clear about what the prototype should look like but could not really make a clear argument for what the connection to a specific problem or solution was.

It was surprising how limited the scope of what the designers wanted the prototype to achieve was. They basically only had a small number of areas that they thought they could affect; entrance information, queuing, questions, and behaviour. Even though these areas are quite broad, the more specific questions for each area were limited. There were also a lot more information about problems in their own documentation than came out during the interviews. The designers had identified many problems with the experience of the room in their research data and problem areas, but the behaviour influenced by problems with information was the only thing they worked with in the end. So, a rich material turned into a quite limited hypothesis. Working more with the assumptions and linking research data with actual solutions or features of the prototype could potentially be a way of generating more ideas and facilitate communication.

MAKING THE QUESTIONNAIRE

The designers' assumptions mainly concerned the cognitive side of the internal responses of people visiting the waiting room. The cognitive responses were then assumed to influence emotions. For instance, not knowing what to do when first entering the waiting room was supposed to make people feel anxious and out of control. Effects on behaviour associated with being anxious were not discussed,

and thus not included in the questionnaire. So, the problem of identifying a connection between problem and goal was a problem also when making the questionnaire.
Formulating the questions was also difficult because when doing it the quick and dirty way, it is hard to know if people will answer the question you are asking, and if you are asking the question that the designers need to know the answer to. The designers never said "ask this and that question", they reasoned about what they wanted the prototype to do and tried to connect the different experiences and the features of the room and the prototype. From that the questions became clear gradually but with training this process would probably be more fluent and easy. After the interviews we were left with a structure and some concrete points that the designers wanted to improve, and from that the questions were created. It did however take around four iterations before we were confident that the questions and the questionnaire would work.

DISCUSSION

Making the hypothesis explicit and being specific in terms of the purpose of the prototype has been said to benefit prototyping (Houde & Hill, 1997). The results in this study indicate that the awareness of what the prototype actually was supposed to achieve was low. The designers were hoping for "improvement" in general rather than specific changes that affect the experience. One reason why Houde & Hill (1997) suggested that more emphasis should be placed on the purpose of prototypes was that interactive computer systems are complex. Considering the additional complexity and scope of services it is extra difficult to pinpoint what prototypes are expected to achieve. Dividing service prototypes into categories such as look and feel, role or implementation is not helpful. It would not make sense for designers to try and divide or categorise the prototype in role or implementation, since the prototype could not say something about any of those categories exclusively. Nor would it be possible to talk about look and feel as a category because they are different, and they can both be manipulated on separate scales of fidelity (McCurdy et al., 2006). For a prototype that attempts to capture the experience of a service, or a confined area of service delivery facilities like in this case even, the categories suggested by Houde & Hill (1997) are too broad and vague.
One way of dealing with this is to be more explicit and specific about which aspects the prototype should affect. To be useful, the process must also be pragmatic and easy to use by anyone. This has been a guiding principle in this study. On a more general level this process also addresses the issue of how to show the value of service prototypes. This is important, both for the quality of prototypes as well as for practitioners trying to communicate and sell their services to clients.
The process suggested as an answer in this study is not all-encompassing but has credibility in the proposed specific service category. It is impossible to prototype everything at the same time in a service, without actually creating the complete service proposition. But since services are made up of so many different things you might want to prototype them in a holistic manner. Doing so means that you might be testing the role, implementation, look, and feel in parallel, but in different aspects of the service. These aspects might be information material, social interactions, colours, artefacts, and so on.
The division of purposes into exploration, evaluation, and communication allows for a first simple categorisation of prototypes in service design. The prototype in this case was an evaluation prototype that had specific challenges as a consequence.

CONCLUSION

We have suggested that this process can be used by practitioners to facilitate the understanding of the purpose of prototyping, when evaluation prototypes are used. This approach is believed to be useful in similar services such as other hospital waiting rooms and situations with a close resemblance in terms of complexity, social context, and a focus on the location where the service takes place. This research shows interesting tendencies and a way to approach and verbalise the hypotheses behind prototypes. The challenge with this kind of service is that it is hard to decide if the prototype is successful, due to complexity of variables. The proposed process for measuring the impact of the prototype tackles this by isolating variables. Another way we dealt with the

complexity was to focus on a limited part of the waiting room experience by asking for the hypothesis behind the prototype. The other alternative would have been to only ask general questions about the experience of the room. This would have been an approach that didn't say anything about what the prototype specifically had contributed. This method for thinking about the purpose of prototypes in information systems that are not confined to the borders of a computer has the advantage of being more specific. It allows designers to talk about the purpose and potential improvements in a language that is detailed and relevant to the existing situation. In this case, it was clear that the designers are not trained to think and talk about prototypes in terms of actual areas of improvement. Their process was more based on a feeling grounded in the user studies performed earlier in the project. The assumptions they made about the prototype was limited and concerned only parts of what they had identified as problems.

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