External Representations in Service Design: a Distributed Cognition Perspective

Johan Blomkvist, Fabian Segelström
Linköping University, Linköping Sweden
johan.blomkvist@liu.se

Abstract

A defining characteristic of service design is the use of external representations which support the design process at various stages. Representations support designers in making intangible aspects of services accessible and shareable, making external representations especially important in service design. External representations are used both to represent current and future states, for the purposes of articulating insights, learning, communicating, collaborating, and maintaining empathy for customers. Many techniques are available that support designers in making representations of services. A comparison was made between the purposes for, and techniques used, in making external representations for service design with theories from cognitive science about benefits of using external representations to think. A pattern emerged during the analysis, indicating that the service design techniques could be divided into two groups, one of interactive techniques and one group of static techniques. Interactive techniques allow designers to interact with a dynamically changing representation, while static representations are unaffected by actions. The analysis also revealed that none of the included techniques explicitly support designers in making multiple simultaneous representations of services. The research contributes knowledge about how purposes for visualising and prototyping are related to general benefits of making external representations. It also provides insights about how to choose and use different service design techniques based on theories of distributed and situated cognition

KEYWORDS: External Representations, Service Design, Cognitive Science, Distributed Cognition
Introduction

Early service design discourse has to a large extent focused on the tools and techniques used in the field. In the first few years a category of techniques which often are referred to as visualisations were discussed at the Service Design Network conferences, on blogs and social media. As the discipline has matured the prototyping of services has received much discussion in the public discourse. A common trait of visualisations and (service) prototypes is that they represent services in an external way, moving them out of the single designer’s head to a shareable medium.

Much research has been dedicated to how representations support service design, indicating that it is a central aspect of service design practice to make representations of services. This means that to become a successful service designer one needs to be skilled in the craft of creating representations of services. The craft of using the various techniques available to service designers fits well with a tool box metaphor; one has to fill one’s tool box with various tools, but just having a full tool box doesn’t make someone into a craftsman. It is just as important to learn which tool to use for which purpose and being able to find new solutions when the existing tools aren’t enough.

This paper will investigate the tools used for creating external representations in service design with the help of the theory of distributed cognition. The investigation will highlight the pros and cons of the tools from a novel perspective for service design research, thus making it possible to help service designers hone their skills in choosing which tool to use when, as well as aid educators in planning their teaching to aspiring service designers.

Distributed cognition

Distributed cognition has its roots in cognitive science. The birth of cognitive science\footnote{The term “constitute” might be better suited to signify what is represented, especially in relation to prototyping. See Westerlund (2011) for a more extensive discussion. However, in this paper the more common “represent” is used to imply that representations are the external representations of otherwise internal processes or things (Binder et al., 2011) which aid designers in thinking and exploring design situations and alternatives.} as a research field can be traced back to the mid-1950s when important steps were taken both in the

\footnote{This section is based on parts of Segelström (2012).}

\footnote{In "A Companion to Cognitive Science" cognitive science is introduced as: "The expression cognitive science is used to describe a broadly integrated class of approaches to the study of mental activities and processes and of cognition in particular. Cognitive science is broad in the sense that cognitive scientists tend to adopt certain basic, general assumptions about mind and intelligent thought and behaviour” (Bechtel & Graham, 1999, p. xiii).}
fields of artificial intelligence (computer science) and linguistics. Together with psychology, philosophy, anthropology and neuroscience, they form cognitive science, a “multidisciplinary scientific study of cognition and its role in intelligent agency. It examines what cognition is, what it does, and how it works” (Bechtel & Graham, 1999, p. 3). As the field developed, criticism grew against a focus of cognitive research on disembodied processes in individual minds, and a lack of research exploring how humans think and act in different contexts, using a lens of humans as socially and culturally situated beings (Hutchins, 1995; Clancey, 2009; Wærn, 1999). “The emphasis on finding and describing ‘knowledge structures’ that are somewhere ‘inside’ the individual encourages us to overlook the fact that human cognition is always situated in a complex sociocultural world and cannot be unaffected by it” (Hutchins, 1995, p.xiii). Clark (1999) later expressed a similar view and added an embodied perspective, “[b]iological brains are first and foremost the control systems for biological bodies. Biological bodies move and act in rich real-world surroundings” (Clark, 1999, p. 506). These views of humans as socially and culturally situated beings with embodied cognition constitute the distributed cognition perspective.

Distributed cognition can be seen as a framework for understanding how people think and act, not as a result of brain activity alone, but as a result of the constant interplay between brains, bodies and situations. External representations play a special role in this interplay, and allow for more elaborate and complex “thinking” than would otherwise be possible. A main character for the development of distributed cognition is Edwin Hutchins (1995). The theory of distributed cognition was a result of observations of human activities, where Hutchins and others saw that humans use their surrounding environment to enhance memory and other aspects of cognition. For Hutchins it was clear that “there is nothing metaphorical about talking about the bearing record books [in a ship’s cockpit] as a memory, or about viewing the erasure of lines drawn in pencil on a chart as forgetting” (Hutchins, 1995, p. 363). According to the theory, cognition is distributed in time, location, and across agents (individuals and artefacts). Together these form systems, a key notion in distributed cognition.

“Key concepts within the distributed cognition framework are the ’cognitive system’ and the ’communicative pathways’, which are the way in which people communicate through the system i.e. phones, email etc; and ’propagation of representational states’ which refers to how information is transformed across different media such as maps, paper, human memory etcetera […]” (Nilsson, 2010, p. 39)

A designer, or a design team, with their tools and other available material in studios or other locations form cognitive systems. Design locations are often rich with external representations of design ideas and good solutions, that can be further refined or built upon. Hutchins (1995, p. 117) argued that “[t]he representational states are propagated from one medium to another by bringing the states of the media into coordination with one another”. A major part of the work with coordinating the various states is thus done by the external representations being internalised in such a way that they can be re-represented into other states. Working in the distributed cognition vain of cognitive science, David Kirsh explored the different benefits of using external representations, and what can actually be gained by using them.
Among Kirsh’s research projects, several focus on exploring how designers and dancers use their cognition in the creative process, and the role external representations play in this. In “Thinking with external representations” (Kirsh, 2010) many of the findings from those projects were summarised. For Kirsh external representations are the things we humans do outside our heads to help us think, examples are annotating texts, rearranging puzzle pieces and pointing. He found seven reasons for why creating external representation aides thinking:

» **They ease the processing in inferential reasoning**: Take a jigsaw puzzle as an example – solving a puzzle in the real world where you can move around and test if the pieces fit is much easier than trying to solve the same puzzle mentally (imagine having a photo of the puzzle with all the pieces clearly visible).

» **External representations can serve as a shareable object of thought**: “When someone externalizes a structure, they are communicating with themselves, as well as making it possible for others to share with them a common focus.” (Kirsh, 2010, p. 444)

» **They make persistent points of reference**: By writing a thought down we are able to go back to that exact thought in the future, whereas we might forget it or change it unknowingly if it is kept only in mind. Another aspect important for designers is that it makes ideas more susceptible to critique, such as when prototypes are built to test ideas.

» **They facilitate re-representations**: By using various tools it becomes easier to transform representations into new states, states which facilitate understanding and solving the mental task. Kirsh (2010) explains this with help of math problems; it’s much easier to solve $x = \sqrt{2209} - 5$ if one re-represents $\sqrt{2209}$ as 47, thus arriving at $x = 47 - 5$.

» **In comparison with internal representations, external representations are often more natural representations of structure**: Kirsh (2010) explains this point with music as his example. Few (if any) can hear music in the heads the way it sounds outside of their head, “so, for most people, to make sense of music the first thing to do is to play or listen to it” (Kirsh, 2010, p. 450).

» **They make it easier to deal with complex information by using multiple representations**: “Without interacting with *multiple representations* certain discoveries would simply be out of reach. Visual designers who move between pen and paper, 3D mockups and rapid prototypes are familiar with the […] type of process.” (Kirsh, 2010, p. 451)

» **They make it possible to create arbitrarily complex structures**: By building models, we can easily test more complex structures than would be possible using only our minds; for example a functional model over our solar system will easily tell you how other planets align given certain circumstances, whereas trying to figure that out mentally would be extremely difficult.

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The term inferential reasoning is problematic as there is no clear definition as is shown in Streumer's (2007) discussion of inferential and non-inferential reasoning. However, inferential reasoning can be described as reasoning based on facts (through abduction, induction or deduction) rather than beliefs. As shown by Luria (1976), these facts may in reality be culturally constructed.
This list shows the many ways external representations facilitate our understanding and cognition. The next section introduces the most common ways of creating external representations in service design.

**External representations in service design**

An important aspect of design is the ability to make models, sketches, and other representations of existing and future states. These representations are external representations of designers’ thoughts, impressions, interpretations and ideas. External representations are used in all design disciplines, and are valuable for many reasons throughout the design process (Arvola & Artman, 2007), in service design like in older design disciplines. Researchers (Segelström, 2010; Blomkvist, 2011; Kimbell, 2009) and service design organisations (Service Design Network, n.d.) highlight two main types of external representations in service design; visualisations and prototypes. There are no clear cut definitions of the two, and the exact meaning of the words depends on who uses them. However, they can roughly be described as follows.

*Visualisations* of services are depictions of current and/or future states of the service. To visualise services, service designers use techniques that have been adopted from other disciplines such as service marketing, interaction design, and movie making as well as having been developed within the field (Segelström, 2010). Due to their nature of being service depictions, visualisations are primarily used as summarisations of research on a current service or as the deliverable of a project, showing how the new service is suggested to be structured.5

*Prototypes* are used for prototyping, and aim at improving the quality of the ideas and solutions suggested by service design projects through the testing of whole or parts of service ideas. The testing focuses on the customer’s experience as well as the service delivery process. Prototyping is usually an iterative process, where ideas are refined as problems or opportunities in the original idea(s) are discovered. Similar to visualisations, prototypes and prototyping is based on what has been learned by older, related fields but has also been forced to find solutions to new issues which arise when it is services rather than products and interfaces which are prototyped (Blomkvist, 2011).

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5The term visualisation is used in various ways within design, which can be the cause of some confusion. The most common usage is information visualisation (e.g. Tufte (2001); Spence (2007)). Information visualisation focuses on making (quantitative) data accessible through graphic visualisation, whereas the starting point of service visualisations mostly is a qualitative story of the service experience. Furthermore, the word visualisation has also been used to refer to how designers use sketching and similar techniques to help them think and move forward during ideation (Goldschmidt, 1994), whereas service design visualisations are used from user research to project delivery. That is, visualisations in service design encompass more aspects than those contrasted to in this footnote with aspects of both information visualisation and sketching being a part of visualisations for service design.
Visualisations and prototypes are tangible objects produced and used during service design projects. Rephrased into the language use of Kirsh, visualisations and prototypes are external representations of cognitive systems (services). Simultaneously, they are important parts of the cognitive system that is designing the service (a design team, the location and other stakeholders involved in the design work).

Why use external representations?

What external representations are and various perspectives on how to differentiate them is introduced above, but little is said on the motivations for why external representations are used in the first place. Two interview studies (Segelström (2010) and Blomkvist (2011)) have contributed to our knowledge about service designers’ motivations for using visualisations and prototypes respectively.

The study by Segelström (2010) found that there are three main reasons for visualising according to service design practitioners:

> articulate insights
> communicate insights
> maintain empathy

Blomkvist had a somewhat larger focus in his interviews, focusing on the practice of prototyping. His middle bullet point however closely relates to Segelström’s findings. Blomkvist found that for service designers “service prototyping is an activity that is:

> central to their work [..],
> about making services visible, to learn and communicate about services and
> collaborative.” (Blomkvist, 2011, pp. 71-72)

The reasons for prototyping are to learn, through exploration or evaluation of service representations, to communicate, and to collaborate. We thus see that reasons for using external representations that service designers highlight are about easing the communication about services and facilitate learning of new insights about the service’s components. Put together, the reasons found for making external representations in service design are:

> Articulation – as information about stakeholders does not equal (actionable) insights, service designers need to have the skill to transform the information to insights which can be used as design inspiration through analysis of the material. Making external representations aid the analysis.
> Learning – can be divided into explorative and evaluative approaches. Exploring means building something to generate insights and generate ideas, whereas evaluating means building something based on an idea about the intended outcome and then testing how the representation is experienced.
> Collaboration – coordination of activities and externalisations of ideas to make them shareable.
» Communication – using representations to show external stakeholders current or possible future states.

» Maintaining empathy – the use of external representations to remember the insights gained during stakeholder research even as weeks and months have passed.

External representations in design

Many techniques and tools used in service design are used to make external representations that facilitate the design of services. As such, several techniques can be used to depict dynamic flows rather than static conditions. However, any kind of representation can be used to aid designers due to their persistence and material affordance. When discussing design, Kirsh (2010) used the term models to denote a sub-group of external representations that designers use. For instance, he used the examples of scale models, used by architects, to show how external representations aid the design process. He suggested that

» they serve as shared objects of thought that are not tied to the author of the representations, making them intersubjective,

» they enforce consistency in the sense that they prove that the parts of a representation can exist simultaneously, and

» they reveal unanticipated consequences by being persistent and independent, thus allowing different viewpoints and ways of interaction.

These are somewhat different from the reasons mentioned by service designers in the previous section. Kirsh (2010) furthermore suggested that there are three kinds of models “paper sketches—2D; cardboard models, cartoons, and fly-throughs—3D models in space or time; and dynamically changing three-dimensional spatial structures—4D models”. (Kirsh, 2010, p. 448). In this categorisation, 2D models are basic representations that does not change with time or exist in physical space. 3D models either change with time or exist in physical space while 4D models are both dynamic and have physical properties. An additional distinction which can be made is between representations that change based on interaction and those that do not. Representations that are interactive always exist in time but can be either two-dimensional (web interface mock-up), three-dimensional (enactment), or both if techniques such as experience prototyping (Buchenau & Fulton Suri, 2000) or service walkthrough (Arvola et al., 2012) are used.

Service visualisation and prototyping techniques

When discussing service designers’ use of external representations in conjunction with theories on distributed cognition, it is interesting to think about which tools and techniques are used today to represent services. As the goal of this paper is to provide knowledge about how to improve the competence of choosing and using service design tools, we evaluated a number of techniques for representing services. The selection process of which techniques to analyse was as follows: all techniques and tools for service design listed in the most prominent service design textbook to date (Stickdorn & Schneider, 2010) were surveyed. The ones considered suitable to
externally represent dynamic service flows, but that were not considered a category of techniques in itself (e.g. prototyping or storytelling), were selected. Dynamic service flows include techniques which are able to show change over time or interactivity. The list of suitable techniques was then compared to the techniques and tools which had been mentioned in the two sets of interviews (Segelström, 2010; Blomkvist, 2011). In total seven techniques were thus considered suitable for analysis through this process. The description of each technique is based on the descriptions in Stickdorn & Schneider (2010) who utilised a crowdsourcing approach to generate their list of techniques used in service design.

1. Roleplay – making enactments of specific touchpoints or service moments and exploring them, using e.g. theatre methods. Does not require props made for the occasion.

2. Customer journey maps – a depiction of the customer’s journey through a service with a focus on the experience.

3. Blueprints – a depiction of all components, actions and interactions involved in a service delivery from back office procedures to receipts.

4. Design scenarios – a description of a potential service use, used to explore certain aspects of the service.

5. Storyboards – similar to customer journey maps, but focusing on the interactions and actions. The depiction is built in the same fashion as comic stories.

6. Desktop walkthrough – using playdough, small figures, and whatever is available a service location is created and explored.

7. Staging – one or more locations are built, complete with props that support immersion in the service experience. The service is then enacted. Can be done together with external stakeholders.

Results

The reasons for visualising and prototyping identified by Segelström (2010) and Blomkvist (2011) can be matched to Kirsh’s (2010) suggested benefits of using external representations. It should be noted however that Kirsh has used single representations as examples, rather than complex structures like services. The combined findings on why external representations are used were mapped to which benefits of representing externally they correspond the most to. The results of this mapping can be found in Table 1 below.
Table 1 - Kirsh’s suggested benefits of creating external representations matched with the reasons for using them in service design

<table>
<thead>
<tr>
<th>Benefit of external representation</th>
<th>Reason for using external representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source: Kirsh, 2010</td>
<td>Source: Combined interview results</td>
</tr>
<tr>
<td>1. Eased processing in inferential reasoning</td>
<td>Articulation</td>
</tr>
<tr>
<td></td>
<td>Learning</td>
</tr>
<tr>
<td>2. External representations can serve as a shareable object of thought</td>
<td>Communication</td>
</tr>
<tr>
<td></td>
<td>Collaboration</td>
</tr>
<tr>
<td></td>
<td>Maintaining empathy</td>
</tr>
<tr>
<td>3. External representations make persistent points of reference</td>
<td>Learning</td>
</tr>
<tr>
<td></td>
<td>Collaboration</td>
</tr>
<tr>
<td></td>
<td>Maintaining empathy</td>
</tr>
<tr>
<td>4. Facilitation of re-representation</td>
<td>Articulation</td>
</tr>
<tr>
<td></td>
<td>Learning</td>
</tr>
<tr>
<td>5. External representations are often more natural representations of structure than internal representations</td>
<td>Communication</td>
</tr>
<tr>
<td>6. Easier to deal with complex information by using multiple representations</td>
<td>Articulation</td>
</tr>
<tr>
<td></td>
<td>Learning</td>
</tr>
<tr>
<td>7. Possibility to create arbitrarily complex structures</td>
<td>Articulation</td>
</tr>
<tr>
<td></td>
<td>Learning</td>
</tr>
</tbody>
</table>

Table 1 reveals some interesting aspects of the purposes for creating external representations; the close matching of purpose for articulating insights and learning indicates similarities in the motivations for using external representations to reach those goals. Similarly, collaboration and maintaining empathy have the largest benefit from the same reasons identified by Kirsh; getting shareable objects of thought and creating persistent points of reference. Interesting for both the identified pairs is that one member stems from the prototyping interviews and one from the visualisation ones. The one reason identified in both interviews, communication, is the only one which benefits from the more natural structure of external representation. Moreover, communication benefits from external representations being shareable objects of thought.

In total, five of the benefits support the reason of learning, four support the articulation of insights, and two for each of collaboration, communication, and keeping empathy. In the
Interview studies, the most strongly associated reasons for prototyping and visualising were also learning and articulating insights respectively.

Having explored how Kirsh’s arguments for using external representations correspond to the reasons service designers say they use external representations for, we now turn the attention to specific techniques. A mapping was done by the authors, based on a thorough examination of Kirsh (2010). Most externalisations have all benefits to some degree, but for some techniques the benefits are more prevalent and have thus been plotted in the matrix. The matrix can be found in Table 2 below.

Table 2 - Mapping of service design techniques which serve as external representations to Kirsh's motivations for using external representations

<table>
<thead>
<tr>
<th>Representation function</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technique</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roleplay</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer journey maps</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blueprints</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design scenarios</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storyboards</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desktop walkthrough</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service staging</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows a pattern that creates two groups in the data; Roleplay, Desktop Walkthrough and Service Staging on the one hand, and Customer Journey Maps, Blueprints, Design Scenarios and Storyboards on the other. The analysis also shows that none of the techniques represent complex information by using multiple representations and that most techniques also do not support the creation of arbitrarily complex structures, or at least not highly complex structures. The tables will be further discussed in the discussion.
Discussion

The investigation of Table 1 above showed that there was a linkage between reasons for visualising and prototyping and the main benefits of using external representation. One such pair were the activities of learning and articulating insights, which is both supported by the same aspects of external representations, namely techniques which help designers improve inferential reasoning, facilitate re-representation, create arbitrarily complex structures, and deal with complex information by using multiple representations. Common to these benefits are their relation to active manipulation, at least in the case of benefit 4, 6 and 7. Unlike the other benefits suggested by Kirsh, they come into play by creating, using, and re-representing external representations and are thus more suited for activities in design such as articulating insights or learning. Benefit 1 – eased processing in inferential reasoning – supports learning and articulation by making it possible to easily rearrange the representation, which in turn makes it easier to understand a service.

Among the benefits relating to more permanent benefits, we find that the activities of collaborating and maintaining empathy pair up in regard to how they relate to external representations. They both mainly make use of the persistency in point of reference and the shareable object of thought. The strength of being shareable objects also benefits communication about the service, just like the fact that external representations often are more natural representations than representations in people’s heads. We thus see that being shareable objects of thought is one of the main benefits of external representations once they have been created and are stable in their form.

Two groups of techniques emerge when you look at Table 2 comparing the service design techniques with the benefits of externalising. What differentiates these two groups is their level of inherent interaction. One group does not offer any possibilities to interact with the external representation whereas the other does. The groups and their key traits are listed in Table 3 below.

Table 3 - Two groups of external representations for service design

<table>
<thead>
<tr>
<th>Group type</th>
<th>Interactive</th>
<th>Static</th>
</tr>
</thead>
<tbody>
<tr>
<td>Techniques</td>
<td>Roleplay, Desktop Walkthrough and Service Staging</td>
<td>Customer Journey, Blueprint, Design Scenarios and Storyboards</td>
</tr>
</tbody>
</table>
| Key traits | - Support inferential reasoning  
- Shareable objects of thought 
- Facilitating re-representation 
- Provide a more natural representation of structure than internal representations | - Shareable object of thought 
- Facilitating re-representation 
- Persistent points of reference |
These two groups are very similar internally in regard to which traits they correspond to. In fact the only thing which breaks the pattern is that the blueprint technique can be used to create arbitrarily complex structures due to its highly formalised and abstract nature.

Also, Table 2 shows that the externalisation techniques cover the reasons quite well and most techniques can probably be used both to visualise something existing as well as ideas and thoughts about future services (prototyping). It might seem counterintuitive that the prototyping techniques do not support collaboration. However, this is not an evaluation of the techniques in themselves, roleplaying e.g. is highly collaborative, but rather an evaluation of whether the representations of services used in the techniques can be used for certain purposes. The service representation of roleplaying is highly situated and thus cannot be used to collaborate in the sense of making persistent points of reference.

Dealing with complex information by using multiple representations

Being shareable objects of thought and facilitating re-representation are benefits associated with all the tools, while none of them deal with complex information by using multiple representations. Multiple representations can be incorporated in many of the techniques but are not explicitly part of anyone. In service design you might for instance combine a scenario, a storyboard and a persona to understand the current service offering. Using multiple representations like that helps designers think and understand the current situation better. Designers combine techniques and representations, and move between them in an action context (Arvola & Artman, 2007), to understand design situations from different perspectives (Binder et al., 2011). “Visual designers who move between pen and paper, 3D mockups and rapid prototypes are familiar with this process” (Kirsh, 2010, p.451). However, techniques that support this way of working in themselves are scarce.

One technique that does support multiple representations is sketching. Sketching is an activity used within all design disciplines to support both exploration and ideation at early stages of ideation (Buxton, 2007; Arvola & Artman, 2007; Goldschmidt, 1994). It is also a useful form of external representation as it is easy to produce, and provides talkback (Schön, 1987) about the situation. By sketching out an idea, the designer gets quick feedback on its feasibility and can share it with others. Despite its apparent good match with the objectives of service design, sketching was not mentioned in Stickdorn & Schneider (2010), nor in the interviews conducted by Segelström (2010) and Blomkvist (2011). Thus sketching seems to have been neglected this far, as an potentially important tool for service design, and could be one of the basic service design techniques.

For prototyping purposes there is no established technique that can be immediately applied in service design that support multiple, simultaneous representations. Even though studies have shown that parallel prototypes have some associated positive effects (Dow et al., 2009), this is not exactly what is meant by supporting multiple representations. Instead it would be interesting to
explore ways of combining and/or adding elements of different techniques to support e.g. an understanding of both very detailed parts of services (touchpoints or service moments) at the same time as it allows manipulation of higher level service sequences and experiences.

Conclusions

Regardless of when representations are made and what they are called they help designers think. Two categories of representations were identified in this research, static and interactive. The value of making persistent, static representations that are not only tied to the current situation but can be saved, used, and referenced was highlighted by this analysis. Without static representations, collaboration is more difficult. Thus, only using the interactive techniques; roleplay, desktop walkthroughs, and enactments, as they do not result in persistent points of reference, is not advisable. The strengths of the interactive representation techniques lies in their flexibility and their support for making choices based on natural and shared service representations. Only service blueprinting supports representation of complex structures sufficiently and no techniques utilises the benefit of multiple representations. This opens up for new techniques, or the adoption of techniques from other fields that complement the existing service design toolbox.

The findings presented here should benefit service design educators in planning their teaching efforts. It is not just about recognising a number of techniques; it is also about knowing how and why they should be used in specific contexts. This is something we should teach students of design in general and service design in particular. As static and interactive external representations support different aspects of the design process, teaching should be planned in such a way that students are familiar with both. Moreover, the importance of sketching for service design has been shown, meaning students should get ample practice in sketching service systems.

Works Cited


