

# VISUALIZATIONS AS TOOLS FOR RESEARCH: SERVICE DESIGNERS ON VISUALIZATIONS

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Service design is a relatively new design field not explored in research as extensively as other design disciplines. One of the distinguishing practices is the extensive use of visualization techniques in early stages of the design process. This paper explores what service designers say about how and when visualizations are used in the user research phase of service design projects. Data was collected through 14 interviews with practicing service designers. It was found that all of the interviewees use visualization techniques in their work process, and that these are used extensively in the research phase of service design projects. Visualizations are used in the research phase as tools for translating raw data into insights and as a way to communicate insights. We conclude that service designers use visualization techniques to interpret user research, and that they highlight characteristics of a service-dominant logic.

## INTRODUCTION

In recent years there has been an increase in the interest in design of services. Several objectives are held forward for this, from sustainability over social responsibility to the increased importance of the service sector in developed economies. In design practice, the discipline has earned a whole deal of interest, and a set of design firms specializing in service design have been set up.

Until recently research regarding design with a service perspective as well as services with a design perspective has been scarce. Many fundamental aspects of service design are still unexplored academically.

In contrast, related design fields such as product design and interaction design are well explored and the general design processes are documented thoroughly. The tools and methods involved in the process are well described in literature.

In this paper we set out to explore the role of visualizations within service design. Visualizations were early recognized as working tools within service design, one example being blueprints (as described by Shostack, 1982; 1984). Adaptations of visualization techniques are also given large space in the major consultancies tool kits (as an example eight out of 21 research methods mentioned on Engine's website are visualization techniques (accessed 23/2 2009)). All in all, visualization techniques can be claimed to be one of the fundamentals of service design.

We focus our attention on the use of visualization techniques as a tool in the research phase, supported by the Analysis-Synthesis Bridge Model (Dubberly et al, 2008).

## THEORY

Services have in earnest been a point of focus for design since the early 1990's (Erlhoff, Mager & Manzini, 1997; Manzini, 1993; Mager, 2004). It is common to describe services in contrast to goods. To do that, four concepts are used (Zeithaml, Parasuraman, and Berry, 1990; Edvardsson, Gustafsson, Johnson & Sandén, 2000). Services are *intangible*, meaning that services are activities, deeds or processes and not physical objects. Moreover, mostly they cannot be touched, felt or experienced before they are purchased. Services are *heterogeneous*, meaning that they are hard to standardize and that they are variable in performance, due to their dependence on human judgment and interaction. Service production and consumption are *inseparable*, meaning that a service is not pre-produced and sold off-the-shelf, and that the value of a service is co-created in the service experience by the producer and the consumer. Services are *perishable*, meaning that the service as such cannot be stored or saved after the service experience, even though some of the effects of a service experience might be durable.

This "definition" of the characteristics of design has been criticized, but is still widely used within service operations, marketing and management. The criticism mainly concerns the fact that the definition is old, and that the development of the service sector has advanced immensely, due to higher degrees of standardization, outsourcing, and not the least with all the self-service technology that has emerged (Vargo & Lusch, 2004; Edvardsson, Gustafsson & Roos, 2005; Lovelock & Gummesson, 2004). Some of the criticism concerns the fact that, e.g., service marketing mainly has been interested in the pre-purchase phase (Lovelock & Gummesson, 2004).

Another strand of criticism focuses on how value is created (Vargo & Lusch, 2004), acknowledging, e.g., that services, directly or indirectly can be provided through goods, and that goods are mediating artefacts in service experiences.

With the characteristics of services as a background, the design object for service design needs to be better understood. Holmlid & Evenson (2007) draws on experiences and research from human-centred design, assuming that services, to become real, require products,

performance, and processes co-produced by client(s) and service personnel. In their paper methods for prototyping services are described that are based on performances, narratives, and enactments. Similar suggestions are made by Mager (2004), Evenson (2005), and Moritz (2005).

In a paper analyzing the design object of service design, Holmlid (2007) compares service design mainly with interaction design, due to their relative similarities, and to industrial design. This is done through using a comparative framework proposed by Edeholt & Löwgren (2003). The framework consists of three areas, Process, Material and Deliverable. Each area is constructed of a set of dimensions with characteristics. Table 1 below introduces these dimensions with their characteristics.

Table 1  
The framework from Holmlid (2007) and Edeholt & Löwgren (2003). Characteristics in italics were added in Holmlid (2007) as a consequence of introducing service design in the comparison.

Area	Dimension	Characteristics
<b>Process</b>	Design process	Explorative Analytical
	Design representation	Depictive Symbolic <i>Enactive</i>
	Production process	Physical Virtual <i>Ongoing</i>
<b>Material</b>	Material	Tangible Virtual
	Dimensionality	Spatial Temporal <i>Social</i>
	Aesthetic	Visual Experiential <i>Active</i>
<b>Deliverable</b>	Scope of deliverable	Product Use <i>Performance</i>
	Flexibility of deliverable	Final Customisable <i>Dynamic</i>
	Customer for deliverable	Mass market Organizational support <i>Customer's customer</i>

Furthermore, Sangiorgi and Pacenti (2008) define three main emerging practices for service design, *service interactions*, *co-creation within complex systems*, and *platforms for participation*. All three carry with them a high degree of complexity, which is a character put forward in several other areas of services research (Hefley & Murphy, 2008).

We view service design as a human-centred design discipline, creating large amounts of user data often captured by ethnographic methods. A service is co-created in interaction between a service producer and a consumer, which directs the focus of attention towards what happens in the service performance, as opposed to an object.

Given this, our focus will be on how service designers make sense of all the collected user data, and how they work with visualizations.

#### THE ANALYSIS-SYNTHESIS BRIDGE MODEL

The Analysis-Synthesis Bridge Model (henceforth ASB model) was suggested by Dubberly et al (2008) as a way of describing the design process. It is a development of several other models and is a means of understanding the design process, as is Jones (1992), or Gedenryd (1998). The goal of the model is to capture the connection between the analysis and synthesis phases in the design process, which the authors felt, were missing in earlier models. Figure 1 outlines the ASB model.

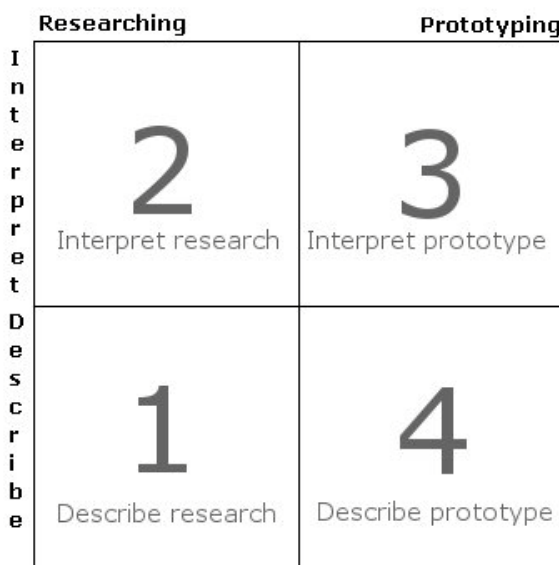


Figure 1  
The Analysis-Synthesis Bridge Model with its four sections numbered according to their placement in the design process.

The model is constructed as a two-by-two matrix where the flow starts in the lower left corner and ends in the

lower right corner. The left hand side is labelled “Researching” and the right hand “Prototyping”. These two labels also correspond to the analysis and synthesis in the name of the model. The top row of the model is labelled “Interpret” and deals with the abstractions of the world which the designer does, whereas the bottom row is labelled “Describe” and deals with the concrete.

The schema Dubberly et al (2008) propose, can be used as a way of structuring visualization techniques. The left column is of most interest to the work presented here, and the move from field 1 to field 2 are described as follows: “We make sense of research by analysis, filtering data we collect to highlight points we decide are important” (Dubberly et al, 2008, p. 57).

#### METHOD

The method section is divided into two subparts, with one describing the process of collecting the data and the other the process of analysing it.

#### DATA COLLECTION

The data used for this study has been collected by interviewing practicing service designers. All agree, that they are doing service design, although a few prefer other professional titles such as “user experience designer”. A total of 14 interviews were conducted. Ten interviews were face-to-face and four were performed over telephone/Skype. 13 of the interviews were conducted by the main author and one by a second interviewer. Most of the interviews were conducted with a single interviewee, but in four interviews there were two persons being interviewed.

The interviews were conducted between the 9th of October 2008 and the 12th of January 2009, with a majority done during the Service Design Network conference week in Amsterdam in late November 2008. The primary workplaces of the interviewees were in seven different countries at the time of the interviews. The companies in which the interviewees worked ranged from world-leading companies to newly started companies; from large design firms to small service design firms; from commercial and public to social innovation firms; some were multi-national and others were national. All interviewees but one worked as consultants.

The overall focus of the interviews was to collect data about service designers attitudes and opinions towards the user research phase of the design process. The interviews were semi-structured (Preece et al, 2002) and

focused on four main themes, with each theme consisting of a number of related questions. Notes were taken during the interviews and 13 of the interviews were recorded and they lasted for a total of 13h and 42 min, with the median being 55 min and 56 sec. The data selected for this paper concerns what the designers say about methods and techniques for visualizations. This information was gathered primarily from a question regarding visualization, but also from their comments on ways of visualising the data in answers to other questions. The more explicit questions were:

- How do you present the results of your data collection? Internally as well as externally?
- Do you visualize the data you have collected? How?
- Do you choose type of visualization depending on the data you have collected or do you look for certain types of data to be able to fit it in to a preferred way of visualizing?

#### ANALYSIS

The analysis was conducted in several steps. The recorded interviews were analysed according to a defined scheme aimed at contributing to the underlying research interest. In the analysis performed here, we were mainly interested in the aggregate knowledge gained from the interviews. The information found was further analysed and placed in a matrix. The data from the matrix was then analyzed to answer the following questions:

1. To what degree are visualization techniques used by service designers and what are they based on?
2. In which stages of the design process do service designers use visualization techniques?
3. What types of visualization techniques are used by service designers?

The first question was answered by quantitatively counting the answers of the interviewees on the direct question “Do you visualize the data you have collected?”. The process of finding what the visualizations are based on was primarily based on responses to one question “Do you choose type of visualization depending on the data you have collected, or do you look for certain types of data to be able to fit it into a preferred way of visualizing?”, and it was complemented by discussions interviewees held based on other questions.

The latter two questions were answered in a two-step process; to answer the second question, all visualization techniques mentioned throughout the interviews were

mapped onto the corresponding section of the ASB Model (Dubberly et al., 2008). The balance between the various segments then provided a visualization of its own, describing in which stages of the design process visualization techniques are used.

The segmentation from the second question was then used as the base for a clustering of the various visualization techniques that are used by service designers. A separate clustering of visualization techniques was done within each section of the ASB Model. The various clusters found were given names based on their characteristics.

#### RESULTS

The results are presented according to the three research questions below.

##### TO WHAT DEGREE ARE VISUALIZATIONS USED?

As a part of the interviews we asked the participants whether they visualize the findings from their user research in any way, and all but one answered that they did. Interestingly enough, the interviewee who claimed that he didn't visualize the findings, at later points actually mentioned various techniques for visualizing data (such as personas) as a part of his regular tool kit. Most respondents seem to perceive visualization as a part of the design process.

When asked what their choice of visualization was influenced by, most interviewees claimed that the nature of the data collected decides how to visualise the findings. Interestingly enough, a few interviewees stress the importance of choosing the visualization technique based on what they perceive as the most effective way to communicate their findings to their client organization. Others have developed ways of co-creating the visualizations with their clients, which they use almost exclusively. No one claimed to try to find data to fit certain preferred ways of visualising. The findings above clearly show that visualization techniques are, if not universally, almost universally used by service designers. There are, however, differences on which criteria these visualizations are based, although the nature of the data play a major role and that they to a large extent are formed by the data that has been collected.

##### IN WHICH STAGES ARE VISUALIZATIONS USED?

Throughout the interviews, a total of 57 various techniques were mentioned, with 89 instances of a technique being named. Note that only techniques

mentioned by exactly the same name were integrated to one technique. They were mapped into the four sections of the ASB model corresponding to their nature and primary field of use. Figure 2 visualises the results of the mapping.

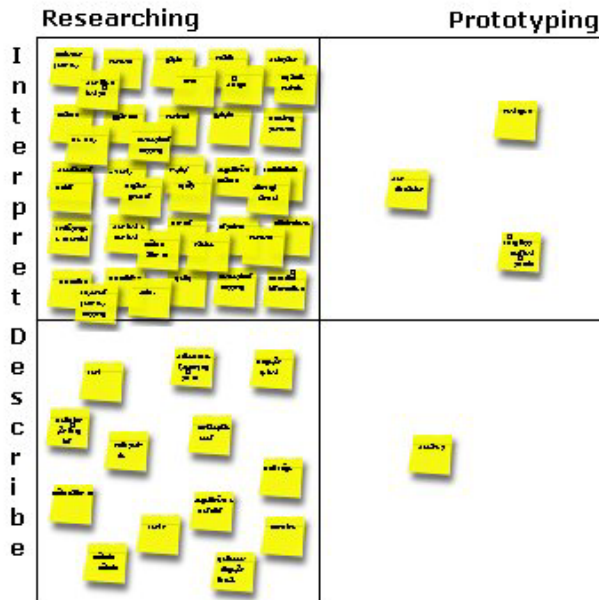


Figure 2  
Visualization of the mentioned techniques inside the ASB model.

The actual numbers for the four sections are shown in Table 2.

Table 2  
Numbers of techniques found spread across the ASB model

	Researching	Prototyping
Interpret	40	3
Describe	13	1

These numbers correspond to the fact that about two thirds of all visualization techniques that have been mentioned are being used to interpret data in some way. This shows that visualizations are very important in the “Interpret research”-phase of the ASB model.

#### TYPES OF VISUALIZATION TECHNIQUES USED

After the methods had been mapped to the four sections in the ASB model, they were grouped together in smaller groups within the sections. This grouping depended on which kind of visualization method they belonged to. A total of 17 groups were found. Table 3 lists the groups found. The numbers refer to the actual instances these methods were named by different interviewees (see Appendix 1 for the full listing of techniques, instances and grouping).

Table 3  
Groups of visualization methods found listed with the sum of instances named ..

Journey (n=17)	Narratives (n=12)
Media (n=10)	Personas (n=10)
Presentation (n=6)	Highlighting (n=5)
Synthesis (n=4)	Compiling (n=4)
Co-creation (n=2)	Material (n=3)
Drama (n=3)	Sensitizing (n=2)
Process (n=2)	Props (n=2)
Pre-modelling (n=2)	Prototype (n=2)
Testing (n=1)	

Among the 17 groups one was excluded from further analysis; Media. The reason for this was that the characters of the mentioned techniques under this heading either are so general that they can be used to represent several different things, or are to be considered as vehicles for presentation of visualizations and not visualizations of their own. The position of the remaining 16 groups in the ASB model are visualised in Figure 3, where the size of the bubbles indicate the number of methods included in the group.

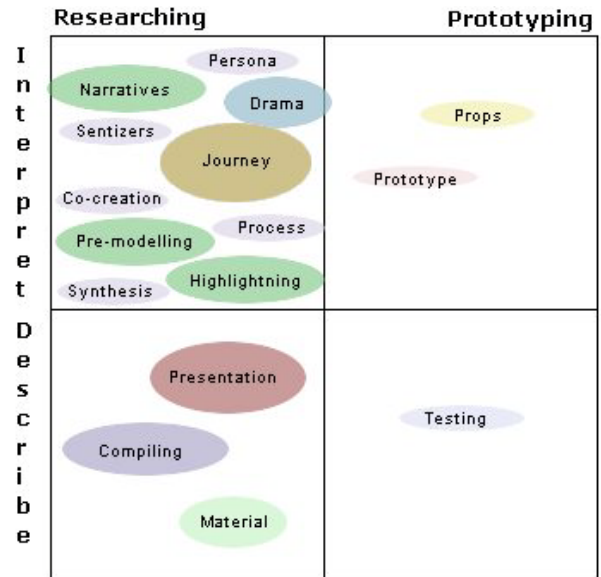


Figure 3  
Types of visualizations. The size of the bubble indicates the number of mentioned techniques included in it.

As can be seen in Figure 3, the majority of the groups found are located in the “Interpret Research” section of the ASB model. As the names indicate, the various groups in this section have a somewhat different nature – some are tools for translating raw data into more accessible data and some aim to communicate insights.

## DISCUSSION

Throughout our interviews we found that practicing service designers depend largely on various visualization techniques in their practice.

### VISUALIZATION TO SUPPORT RESEARCH

Our findings show that service designers tend to start using visualization techniques in an early phase of the design process. The analysis shows that visualization techniques are used almost exclusively in the research phase (53/57 listed techniques are in the research phase). This needs to be interpreted in the light of the questions asked and not be taken as a fact.

The questions all focused on the user research phase of the design process, just like the larger context they were asked within. This does not explicitly exclude answers regarding prototyping, but on the other hand implicitly puts a focus on the left-hand side of the ASB model. As the analysis of the interviews needs to be done within the same context as the questions were asked, we focused our analysis on the role of visualization techniques in the research phase of the design process. In the left-hand side of the ASB-model, we find most techniques in the interpret-research area, 75% (40/53) of the techniques. The techniques found in the describe-research phase are either raw user data (such as video-material) or abstract descriptions of the current state of the service (such as blueprints).

There are two aspects of the visualizations used in the interpret-research phase, as visualizations are either used as tools for translating raw data into insights (such as conceptual mapping) or as a way of communicating insights (such as customer journeys). Both these aspects heavily connect back to the data collected throughout the user research. They both serve as a bridge between user research and the actual design work. That is, the visualization techniques suggested by the designers are not used as simple tools to map and describe what is, but rather serve the purpose of interpretation and understanding.

### THE CHARACTER OF SERVICES

Based on the results presented here, it seems to be almost a necessity to visualize services during research. We suggest that there is a connection between the characteristics of services - intangibility, heterogeneity, inseparability and perishability - and the fact that the designers name a large amount of visualization techniques used during the describe-research part of the ASB-model.

Visualizations are one way to document and present the things that perished, and keep them as the meaningful events they were, surrounding the more easily collected physical evidence.

Visualizations serve as a powerful technique to express assumptions about the collected material. We can only participate in a service performance, and not view it from a distance, or grasp and touch it afterwards.

Visualizations, by generating and transforming common ground in a team, tangibilize the service performance, and serve as a mean to highlight and question assumptions.

Creating visualizations based on research material requires a great amount of work. This in turn has the effect that the heterogeneity of the material will be discovered, and incorporated into design decisions. In that sense visualization is similar to a thick description. The research phase is about (re)framing and understanding. Assumptions and features need to be made clear. For these purposes, together with the characters of services, visualizations seem to be a necessary tool for a service designer.

### THE CHARACTER OF THE DESIGN OBJECT

The visualizations named in the interviews also reveal what the designers perceive as their design object. The data reveals their design object both in terms of what they regard as being the phenomena, artefacts and events they should attend to, and what they regard should be the results of the design process. In the former case, the visualizations the designers refer to, play a role in creating insights into problems they want to work with, and not necessarily the problems they were asked to solve. In the latter, the visualizations they refer to are used as a way of modelling the understanding of what the results of the design process should be. In the discussion here we will focus on the latter.

The categories *journey*, *drama*, *narrative*, *process* and *co-creation* all visualize a service process, and highlight the time-based nature of services. In Holmlid (2007) the design representations in service design are said to be highly enactive, and the material highly temporal. In Holmlid & Evenson (2007) several of the human-centred methods mentioned have a clear character of enactments and performances.

The categories *persona*, *drama* and *co-creation* all include the idea that services are co-creation of value between people and highlight the human-based nature of services. In the analysis of the production process in Holmlid (2007), the production process in services is

characterised as on-going.

The categories *co-creation*, *drama* and *journeys* highlight stakeholders and the relationships between them and the individuals that represent the stakeholders. In Holmlid (2007) this is expressed as the characteristic social dimensionality of the design material.

Even though several of the visualization techniques include goods, it-systems etc. few of them specifically focus on these, such as *props* and *testing*. In most of the visualization techniques they are regarded as subordinate to the service performance.

Given this, we argue that service designers view their design object as events and performances in interaction and co-creation between humans, supported by other means.

## FUTURE RESEARCH

We have showed that visualizations, on one hand, are common practice among service designers and mapped out how and when they are used to support user research. On the other hand, the data only implicitly suggests answers for what reasons. A continued study is planned to explore this question further.

Most of the interviewed designers claim to base their visualizations on data that has been collected, as opposed to collecting data that can be visualized in a specific manner. What we only can infer from their statements is that the visualizations actually are based on collected user-data. In order to understand better how these visualization techniques are grounded in user-data, a study of the techniques used for collecting user-data will be performed.

Another study to be made is to look into what the designers actually do, not only what they say they do. What visualization techniques are used in projects, based on what data, for what purposes and by whom?

## CONCLUSION

In the study presented here, we have reported on an interview study with service designers and analyzed the visualization techniques these designers state they use with the ASB Model. Service designers use visualization techniques extensively in the stage of interpreting user research, and thus visualizations become early models of understanding both the problem space and the solution space. The visualization techniques of the service designers carry with them characteristics of service logic or product-service systems, in the sense that they highlight enactive, temporal, on-going as well as social aspects of the

design object.

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## APPENDIX 1

The tabulation of all visualization techniques mentioned, and the corresponding grouping. For each technique, the number of designers mentioning the technique, is reported as the number of instances.

Group	Technique	Instances
<b>Co-creation</b>	Interactive story	1
$\Sigma 2$	Interactive session	1
<b>Drama</b>	Acting	1
$\Sigma 3$	Enacting personas	1
	Role play	1
<b>Highlighting</b>	Critical service moments	1
$\Sigma 5$	Opportunity map	1
	Vignette	1
	One-liners / Quotes	2
<b>Journey</b>	Illustrations	1
$\Sigma 17$	Customer journey	6
	Experience journey	1
	Stakeholder journey	1
	Journey mapping	1
	Layered journey mapping	1
	Scenario	4
	User scenario	1
	Sketches	1
<b>Media</b>	Film	6
$\Sigma 10$	Photo	2
	Sounds	1
	Websites	1
<b>Narratives</b>	Story	3
$\Sigma 12$	Comics	1
	Narrative	1
	Posters	1
	Storyboard	4
	Pictures+text	2
<b>Personas</b>	Persona	9
$\Sigma 10$	Portrait	1
<b>Pre-modelling</b>	Preparing tools for workshops	1
$\Sigma 2$	Metaphors	1
<b>Process</b>	Use-cases	1
$\Sigma 2$	Process map	1
<b>Sensitizing</b>	Moodboard	1
$\Sigma 2$	Coffee table books	1
<b>Synthesis</b>	Conceptual mapping	1
$\Sigma 4$	Frameworks	1
	Post-its in project rooms	1
	Synthesis of observations	1

<b>Presentation</b>	Diagrams	1
$\Sigma 6$	Schemes	1
	Functional analysis	1
	Data clustering	1
	Tree structures	1
	Blueprint	1
<b>Props</b>	Actionable artefacts	1
$\Sigma 2$	Tangibles	1
<b>Testing</b>	Mock-up	1
$\Sigma 1$		
<b>Material</b>	Video from research	1
$\Sigma 3$	Photo from research	1
	Sounds from research	1
<b>Prototype</b>	Prototype	2
$\Sigma 2$		
<b>Compiling</b>	De-brief documents	1
$\Sigma 4$	Video blog	1
	Blog	1
	'Normal research rapport'	1