

Service Design and Product-Service Systems

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Abstract

Product designers have been the main design competence to be employed in product oriented businesses. When it comes to the design of Product-Service Systems, employing product design competences would be a conservative approach. Design theorist Buchanan identifies design orders spanning from graphic, over product and interaction, to systemic design, explaining important differences in perspectives. Contemporary studies on design disciplines show that differences are significant, and it becomes important to know how to select and direct adequate design work. Methods and tools service designers use are typically service blueprints, customer journeys, prototypes etc, all focused on processes and value-in-use, where product designers focus on form and function. In this paper we show how service designers relate to industrial design in the context of PSS. We review the profile of service designer and compare design disciplines. We conclude that service designers are well suited to deal with PSS design, with their focus on value in use, together with product designers. We also highlight that business need to develop competent judgement and design management to get the appropriate design competence.

Keywords

Service design, design competence, buying design, service innovation, PSS design, design methods

1 INTRODUCTION

For traditional manufacturing oriented businesses the choice of design competence to involve has naturally been a product designer. As businesses turn towards an expanded view of their offering, and product-service-systems come into focus, the competence of designers involved will also need to change.

In the 1980's service design appeared in literature on service marketing [1], and has since developed in different directions in service management, service operations, service engineering and service quality. Within the research area of design, research on product design and related disciplines has a long-standing tradition. The younger discipline digital interaction design started out around 1968 and has since developed into one of the largest research areas within design. The much younger service design discipline developed in the early 1990's [2], [3] and has only recently gained momentum [4], [5]. Some foundational research has been presented lately, developing theoretical frameworks rather than solely focusing on design methods [6]. [7].

Service design is a growing and multidisciplinary area of knowledge, collecting its fundamentals from disciplines such as anthropology, cognitive science, marketing, computer mediated communication, and others. Current research can be found through design conferences such as Nordic Service Design and Service Innovation, Nordic Design Research Conference, European Academy of Design, Design Management Institute, IASDR, and in some books [8][9].

Given the differences often described between a product orientation and a service orientation [10], [11] it would be assumed that there are differences when dealing with the different design objects under the different business orientations.

The aim of this paper is to provide an overview of the differing profiles of design competencies that PSS-oriented businesses might need to use, develop and direct.

2 DESIGN ORDERS

Design and design research has a long history mainly through architecture, and received increased attention through the work of William Morris [12] in the 19th century, and, e.g. in Scandinavia through the work of Paulsson in the early 20th century [13] and the Paulsson's [14] and Hård af Segerstad [15] in the 1950's. During the latter half of the 20th century design research has gained in speed as well as in volume.

By the turn of the century design theorist Buchanan [16] in a seminal article describe and define four different orders of design. Buchanan describes these as representing places "for rethinking and reconceiving the nature of design" [12, p10], moving from 'symbols' and 'things' to 'interactions' and 'environments'.

These design orders describe different foci of attention that designers shift between when working on design tasks. As a consequence these orders elaborate on differences between design disciplines. These differences become visible in terms of differences between the primary design objects and the way these objects are viewed. The design objects are Signs, Products, Actions and Thoughts. In the original paper, the corresponding design disciplines are Graphic Design, Industrial Design, Interaction Design and Environmental Design [12]. Some additional changes need to be made, though.

It is more correct to talk about Product Design as the corresponding discipline, than industrial design. The term "industrial" denotes the conditions under which design is performed. And any design discipline may work under such conditions. An assumption of this paper is that the design of PSS is performed under such industrial conditions.

From time to time there is also confusion with the term "interaction design". In Buchanan's terminology this is not limited to digital interaction design, but includes design of all interactions and actions: 'how human beings relate to other human beings through the mediating influence of products' [12, p11]

It is harder to find an alternative name for “Environmental Design”. The term Environmental is easily misunderstood as inscribed within a sustainability discourse, which it should not be restricted to. Rather, the term should be understood as any environment that is conducive of directing our systems of value, decision making; our thoughts. Alternative terms could be “systemic” or “context” or “strategy” or “policy”. But, these also carry connotations with a risk of reducing the scope of the design order. In Table 1 the terms used in this paper are presented.

| Primary design object | Design discipline |
|-----------------------|--------------------|
| Signs | Graphic design |
| Products | Product design |
| Actions | Interaction design |
| Thoughts | Systemic design |

Table 1: The four design orders as termed in this paper.

3 COMPARING DESIGN DISCIPLINES

In a comparison between digital interaction design and product design Edeholt & Löwgren [17] developed a framework of characteristics. The framework was developed to analytically highlight the characters of interaction and product design. The characteristics are grouped in three main areas; Process, Material and Deliverables. Each area then consists of dimensions, which in turn have certain characteristics (see Table 2).

| Area | Dimension | Characteristics |
|-------------|----------------------------|--|
| Process | Design process | Explorative Analytical |
| | Design representation | Depictive Symbolic |
| | Production process | Physical Virtual |
| Material | Material | Tangible Virtual |
| | Dimensionality | Spatial Temporal |
| | Aesthetic | Visual Experiential |
| Deliverable | Scope of deliverable | Product Use |
| | Flexibility of deliverable | Final Customisable |
| | Customer for deliverable | Mass market Organizational support |

Table 2: The comparative framework from [17]

In an expansion on this framework, to include service design, several characteristics were added [18]. The degree to which the different characteristics play a role for the different design disciplines are depicted in Figure 1, 2 and 3, additions summarized in Table 3.

Most of these additions are based on the fact that services, just as interactions, are ongoing processes and activities where the user/customer is part of creating value.

The additions are also consistent with other analyses of how design relates to PSS. For example Morelli [19] identifies three areas that set design of PSS apart from the design of goods; the relationship between users,

designers and service providers; production and consumption times; and the material intensity.

| Area | Dimension | Characteristics |
|-------------|----------------------------|------------------------|
| Process | Design process | |
| | Design representation | Enactive |
| | Production process | Ongoing |
| Material | Material | |
| | Dimensionality | Social |
| | Aesthetic | Active |
| Deliverable | Scope of deliverable | Performance |
| | Flexibility of deliverable | Dynamic |
| | Customer for deliverable | Customer's customer |

Table 3: Additions to the framework summarized [18]

As an example, from the diagrams (Figures 1, 2 and 3) we can see that the digital interaction design process is characterized by a higher degree of being analytic than the service design and product design processes. We can also see that the aesthetic of digital interaction design is characterized by a higher degree of being experiential than service and product design.

3.1 On the area Processes

In direct comparison to product design, service design is judged much higher on Enactive and Symbolic representations.

That is, product design processes rely less on representations that enacts the usage of the product, and relies to a larger extent on Depictive representations [20], [21]. The representation of a PSS requires several of these. An enacted representation often lacks in detail of the tangible product semantics, and a depictive representation of the product is insufficient to capture the scope of its usage and the PSS; such as insurance, service capacities, uptime, etc.

Service design is also judged much higher than product design on Virtual and Ongoing production processes.

What sets services apart the most from the perspective of Edeholt and Löwgren, is that product design and interaction design focus on artefacts. A service is not an artefact in that sense of the word, but a sequence of meaningful actions. The tangible parts of a service often are composed of readymade artefacts, inventory, IT-systems, artefacts produced during the process, etc. Intangible parts are typically the meeting as such, the culture of the actors involved, structures, policies, etc.

For service design the artefacts of the service are produced during the service experience. Sometimes the service experience as such can be viewed as a physical production process, where the client is a co-producer involved in the larger value-creating process through touchpoints. Instead of giving the physical process a wider meaning, this aspect of service design is called an Ongoing production process. This leaves the original concepts untouched [17], that is, that the production processes refer to activities before the usage or consumption. For a PSS this will mean that the physical process will refer to goods and products prepared before the service experience, while the virtual process will refer to software, manuscripts etc, and to the ongoing process of co-creation of value in a service experience.

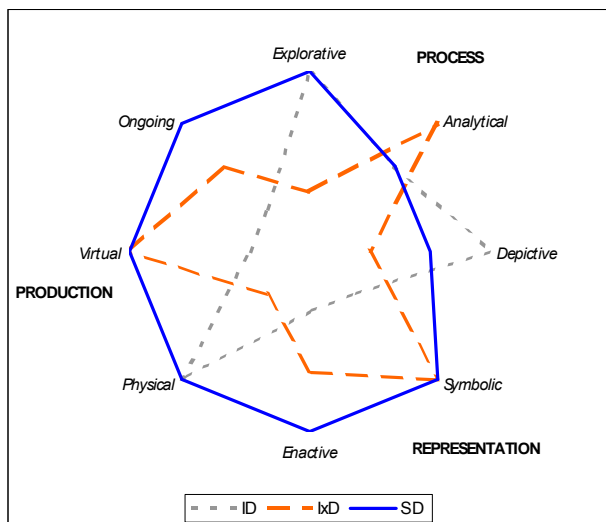


Figure 1: The dimensions of the Process area

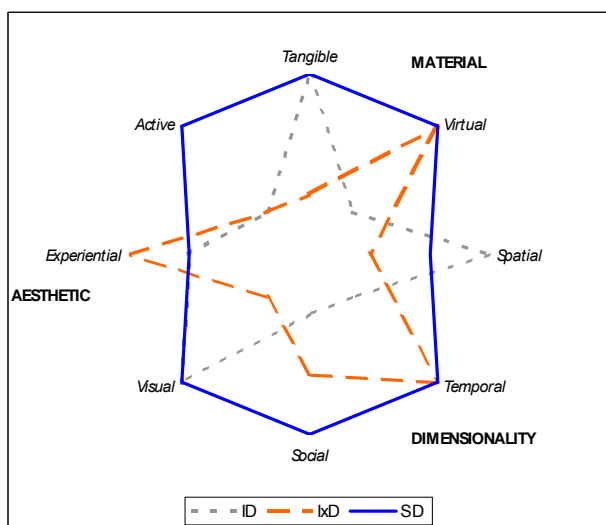


Figure 2: The dimensions of the Material area

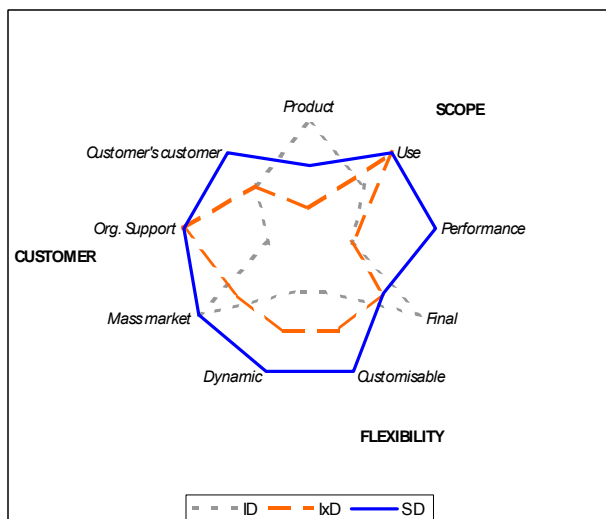


Figure 3: The dimensions of the Deliverable area

3.2 On the area Material

Product design is judged higher than service design on Spatial dimensionality, but much lower on Social and Temporal dimensionality.

A service is always a social construction performed in a physical setting. The inclusion of a social dimension finds support from design theory [14], [15], especially in

relationship to the values produced in use [22]. The spatiality of a service mainly comes from how the physical environment is laid out, but for product design the Spatial dimensionality is the main design object.

Moreover, a service is temporal in its nature. It is hard to imagine a service that does not unfold over time. Diana, Pacenti & Tassi [23] differentiate between diachron and synchron representations of services. That is, from a PSS perspective, a product is a synchron representation of its use; the product is not a sequence in itself. On the other hand, a service is a representation based on time, which is equal to a diachron representation.

Product design is judged lower than service design on Active aesthetics, and equal on Visual and Experiential aesthetics.

A service is mainly experienced as it is co-created between several actors. Thus, the aesthetics of a service is created and re-negotiated as the service unfolds in a co-creative manner. As a consequence the aesthetics of an Activity need to be considered [24], [25]. An aesthetic focus which is active, re-establish the social relationship between the human agents in the service experience. For a product, in comparison, the main aesthetic principles are related to the tangibility of a product and the experiential aspects of the existence of a product [26].

3.3 On the area Deliverable

Product design is judged higher on the Product scope, but lower on the Use and the Performance scope of the deliverable.

The main deliverable of service design is based in a temporal structure where the experience of participation, action and contribution is at centre stage, but there will be artefacts and products embedded in this activity that are central for the experience of the service. This is one consequence of the heterogeneity of services.

The deliverable of a service designer can be regarded as a possibility to act out a Performance, not only by the customer, but also by the customer's customer. In general, product design includes knowledge about users in the pre-produced value of the product. As a contrast the value of a service design relies on the sequenced performance of the service business, its representatives and the customer of the service business.

Product design is judged higher on the Final aspect of flexibility, but lower than service design on being Customisable and being Dynamic.

As a consequence of the above the deliverable of a service design is not only possible to customize, but also extremely dynamic, as it will be possible, and sometimes necessary, to change between different performances.

Moreover, designing a service has great influence on how the organization works and views itself. The influence of a product design is limited in this sense.

From a PSS perspective this means that it will be a crucial capacity to develop for a company to differentiate the fixed aspects of a PSS and its dynamic aspects. Moreover, in recognizing this, part of implementing a PSS in an organisation might require extensive training of representatives. The most difficult part of such training programs will deal with attitudes towards customers, ability to identify needs for change and individual and organizational capacity to handle dynamic change and even transformation.

4 DESIGN METHODS AND TOOLS

In product design methods and tools have for a long time been applied and adapted to the conditions of delivering products. Some of these tools and methods are still valid

when developing PSS. On a general level one should also look towards the area of Digital Interaction Design, where the primary design object since the beginning has been the interaction between humans mediated by computing technology [7], [21], [27], [28].

Methods and tools for design of PSS, based on knowledge developed in the service design field, can be viewed at different levels; an operational level that deals with specific design techniques, a tactical level that deals with general processes and models, and a strategic level that deals with strategy, policy, management and organisation. Here these will be presented in the order of tactical, operational and strategic.

4.1 Overall process

At the time being, it is one of the main ideas behind service design, that one should be open to both problem reframing and changing solutions. The service design processes drive and support divergence, convergence as well as selection. Morelli [19] proposes that service design should be viewed in analogue to the concept development phase in the process model suggested by Ulrich and Eppinger. Others have suggested an engineering framework for resolving design conflicts between product and service components of a PSS [29].

Looking at some of the publicly available presentations of projects done by service designers, and especially those that go further than only developing the service concept, Morelli's notion as well as that of Akayama et al puts too tight restrictions on the contributions of and the tools for service design.

In service design there are often emancipatory objectives, for example based on sustainability or transformation. Service design has an intrinsic cooperative approach where all actors are viewed as resourceful. Actors are involved in deep, rich and creative ways, which are demanding in relationship to those participating [7], [30].

4.2 Design techniques

Since Moritz' review of design techniques [20] a set of other studies of design techniques have been performed, e.g. resulting in an online repository [23]. The techniques used by service designers focus on user-involvement processes and value-in-use, whereas product designer's methods and tools focus on specification, form and function.

In a paper summarizing research and practice of user-centered methods in design Holmlid and Evenson [21] highlight the use of service prototyping during user research, modelling and requirements definition. Given the nature of services, prototyping experiences is at centre stage [43], and the use of user-generated props as a means of designing tools and touchpoints is commonplace (Figure 4).

In user research service designers employ different rich and generative research techniques based on ethnographic ideals [31], [33], [32]. One such technique is the design probe [34], often paired with a creative design technique [35]. The aims of these techniques are to get rich and authentic user research data, and to provide rich and qualitative descriptions that create empathy and can be used throughout a development process [36], [37].

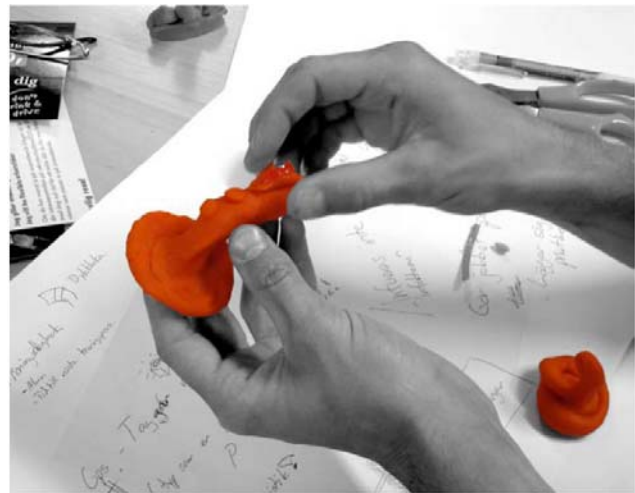


Figure 4: A user creates props for a service prototype

When modelling user research a variety of visualization techniques are used [37] such as blueprints, customer journeys, actor maps, scenarios, etc; see e.g. [38], [39]. In current practice there is a set of basic techniques, but also a long tail of less utilized techniques [40]. Most common is a set of technique referred to as 'journeys', then 'narratives' and 'personas' (see Figure 5 and 6). Even though blueprints often are viewed as a common technique, service designers seem to prefer other techniques, partly due to severe limitations as design tool [41]. A few designers use the blueprinting techniques to support initial research, or to communicate finished design work as a process mapping.

In the transition between 'what is' and 'what could be' a method often employed in design is to use exemplary artifacts. This also functions as a means to communicate and to build common ground in a design team. Product designers use other products as exemplars, but service designers tend to use exemplars describing processes and events, such as narratives [42].

4.3 Relationship to strategy and policy

Another focus of service design activities is the policy and strategy level [44], [45]. Often service designers employ a transformative approach where they help businesses transform from a non-user oriented business to a user-appreciative organisation [46].

Recent studies highlight that an organisation developing PSS in order to have a coordinated design management might need to rethink the way that design competencies are configured throughout the organisation [47], [48], [49], [50].

Other aspects that are relevant here are organisational culture and other systemic and structural perspectives.



Greta, 76

Figure 5: The portrait of a persona in home-health care

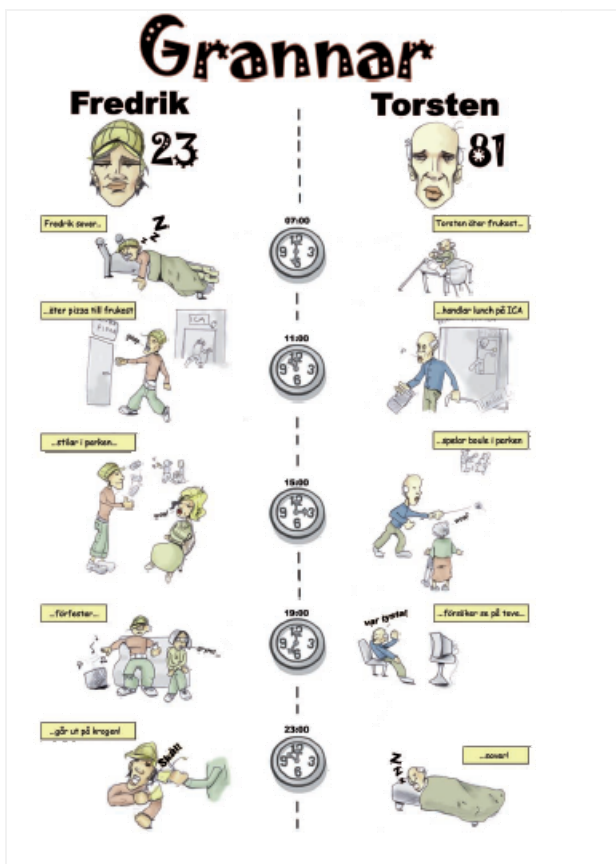


Figure 6: A narrative describing asynchronous life

5 DESIGN CONSEQUENCES

In order to work competently with design of PSS, one need to make sure that design is part of the innovation and development teams. It follows the same logic as the logic behind PSS; if adding a service at the end of a product development process is not sufficient to say that one is working with PSS, adding design at the end of a PSS development process is not sufficient to claim that the PSS is well designed.

5.1 Involving design competence

Managing design in non-product organisations requires attention to the fact that the object that is designed is the operations of the core business of the organisation [49], [50]. In a product developing organisation this is not the

case, design is performed prior to production and sales. In an organisation with its focus on PSS, with a mix between products and services, the management of design resources should be performed as if the company was mainly a service organisation.

For many companies it might be a new direction, to involve designers in strategy work and in the fuzzy front end of innovation and PSS development.

5.2 Designers and PSS

Service designers are well suited to deal with PSS design, with their focus on value in use. In general it is not sufficient with a product designer, as their main concern is not the value-in-use but the value of the artefact in terms of form and function. Product designers, as well as graphic and interaction designers, on the other hand are needed to align product design with the overall design of PSS.

6 CONCLUSIONS

In this paper we have provided an overview of design disciplines involved in the development of product-service systems. We have showed how service designers relate to industrial design in the context of PSS. We reviewed the profile of service designer and compared design disciplines. We conclude that businesses need to develop competent judgement and design management to get the appropriate design competence for the design of product-service systems.

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8 REFERENCES

- [1] Shostack, L. (1984) Designing Services That Deliver," Harvard Business Review, January-February, 133-9.
- [2] Manzini, E. (1993). Il Design dei Servizi. La Progettazione del Prodotto-Servizio. Design Management 4 (1993): 7-12
- [3] Mager, B. (2004). Service design: A review. KISD, Köln.
- [4] Holmlid, S., Evenson, S. (2008). Bringing Service Design to Service Sciences, Management and Engineering. In Hefley, B., Murphy, W. (eds) Service Science, Management and Engineering: Education for the 21st Century, Springer Verlag, pp 341-345.
- [5] Sangiorgi, D., Holmlid, S. (2009). Rigor in Service Design Research. Special Session at IASDR, Rigor and Relevance in Design, 2009, Seoul.
- [6] Sangiorgi, D. (2009). Building Up a Framework for Service Design Research. 8th European Academy Of Design Conference, (pp. 415-420). Aberdeen, Scotland.
- [7] Holmlid, S. (2009). Participative, co-operative, emancipatory: From participatory design to service design. DeThinking Design, ReThinking Services – First Nordic Conference on Service Design and Service Innovation, 2009, Oslo.
- [8] Miettinen, S., Koivisto, M. (2009) Designing services with innovative methods. TAIK, Helsinki, Finland
- [9] Meroni, A., Sangiorgi, D. (2010) Design for Services. Gower Publishing.

- [10] Vargo, S. L., & Lusch, R. F. (2004). Evolving to a new dominant logic for marketing. *Journal of Marketing*, 68 (January), 1-17.
- [11] Vargo, S., L. & Lusch, R., F. (2008). Service-dominant logic: continuing the evolution. *Journal of the Academy of Marketing Science*, 36(1):1-10.
- [12] Morris, W. (1892). *News from nowhere: or, An epoch of rest : being some chapters from a utopian romance*. 3. ed. London: Reeves & Turner
- [13] Paulsson, G. (1919). *Vackrare vardagsvara*. Edited by the Swedish Society of Arts and Crafts, Stockholm. [More Beautiful Things for Everyday Use]
- [14] Paulsson, G., Paulsson, N. (1957). *Tingens bruk och prägel*. Stockholm: Kooperativa förbundets bokförlag. [The use and qualities of things]
- [15] Hård af Segerstad, U. (1957). *Tingen och vi*. Stockholm: Nordisk rotogravyr. [The things and us]
- [16] Buchanan, R. (2001) Designing research and the new learning. *Design Issues*, 17(4):3-23.
- [17] Edeholt, H., Löwgren, J. (2003). Industrial design in a post-industrial society: A framework for understanding the relationship between industrial design and interaction design. In *Proc 5th Conf. European Academy of Design*, Barcelona.
- [18] Holmlid, S. (2007) *Interaction Design and Service Design: A Comparison of Design Disciplines*. Nordic Design Conference 2007.
- [19] Morelli, N. (2002). Designing product/service systems: A methodological exploration. *Design Issues*, 18(3):3-17.
- [20] Moritz, S. (2005). *Service design: Practical access to an evolving field*. MSc thesis, KISD.
- [21] Holmlid, S., & Evenson, S. (2007). Prototyping and enacting services: Lessons learned from human-centered methods. In *proceedings from the 10th Quality in Services conference, QUIS 10*, Orlando, June.
- [22] Pacenti, E. (1998). *La Progettazione dei Servizi tra Qualità Ambientale e Qualità Sociale*. Di Tec Milano, Politecnico di Milano.
- [23] Diana, C., Pacenti, E., Tassi, R. (2009). *Visualtiles – communication tools for (service) design*. DeThinking Design, ReThinking Services – First Nordic Conference on Service Design and Service Innovation, 2009, Oslo.
- [24] Maffei, S., Mager, B., Sangiorgi, D. (2005). *Innovation through Service Design: From research and theory to a network of practice. A user's driven perspective*. Paper presented at EAD 06, Joining forces, Helsinki.
- [25] Holmlid, S. (2002). *Adapting users: Towards a theory of use quality*. Linköping Studies in Science and Technology Dissertation No. 765. Linköpings universitet, Sweden.
- [26] Hallnäs, L., Redström, J. (2002). From use to presence: On the expressions and aesthetics of everyday computational thing. *Transactions on Computer Human Interaction*, 9(2):106-124.
- [27] Sangiorgi, D., & Clark, B. (2004). *Toward a participatory design approach to service design. Artful Integration. Interweaving Media, Materials and Practices*, Participatory Design Conference. Toronto, 27-31 July.
- [28] Holmlid, S. (2005). *Service Design methods and UCD practice*. Presented at workshop on User involvement in e-government development projects at Interact 2005, Rome. Available at http://www.effin.org/egovworkshop_proceedings.html
- [29] Akiyama, Y., Shimomura, Y., & Arai, T. (2009). *A Method of Supporting Conflict Resolution for Designing Services*. 1st CIRP Industrial Product-Service Systems (IPSS) Conference, 1-2 April 2009 (ss. 54-61). Cranfield: Cranfield university.
- [30] Holmlid, S., Montaño, F. C., & Johansson, K. (2006). *Gender and design: Issues in design processes*. In *Proceedings from Women in information technology*, University of Salford.
- [31] Segelström, F., Holmlid, S., Alm, B. (2009). *Back to the Roots: A Case for a New Ideal for Ethnographic Research for Design*. Accepted to IASDR 2009, Rigor and Relevance in Design, Seoul.
- [32] Rajmakers, B., Gaver, W., W., Bishay, J. (2006). *Design documentaries: Inspiring design research through documentary film*. DIS 2006, University Park, Pennsylvania.
- [33] Segelström, F., Rajmakers, B., Holmlid, S. (2009). *Thinking and Doing Ethnography in Service Design*. Accepted to Special Session on Rigor in Service Design Research at IASDR 2009, Rigor and Relevance in Design, Seoul.
- [34] Mattelmäki, T (2006). *Design Probes*. University of Art and Design Helsinki, Helsinki.
- [35] Wentzel, J., Holmlid, S. (2009). *Speed sketching with designers: User inspired brainstorming*. In *Proceedings from Designing Pleasurable Products and Interfaces 2009, DPPI 09*, Compiègne, France.
- [36] Sleeswijk Visser, F. (2009). *Bringing the Everyday Life of People into Design*. Delft: Technische Universiteit Delft.
- [37] Segelström, F., Holmlid, S. (2009). *Visualization as tools for research: Service designers on visualizations*. Nordes, Nordic Design Research Conference, 2009, Oslo.
- [38] Kolterjahn, E., Adolfsson, Å., Holmlid, S. (2009). *The journey through the care system as mentally disabled*. *Touchpoint*, 1(2):94-97.
- [39] Kolterjahn, E., Adolfsson, Å., Holmlid, S. (2009). *The dilemma of the care recipient*. *Touchpoint*, 1(2):90-93.
- [40] Segelström, F (2009) *Communicating through Visualizations: Service Designers on Visualizing User Research*. DeThinking Design, ReThinking Services – First Nordic Conference on Service Design and Service Innovation, 2009, Oslo.
- [41] Arnell, O., González, N., Mårtensson, I., Wreiner, T., Holmlid, S., Segelström, F. (2009). *Designing for a car park operator*. Nordic Conference on Service Design and Innovation, Oslo 2009.
- [42] Blomkvist, J., & Holmlid, S. (2009). *Exemplars in Service Design*. DeThinking Service, ReThinking Design: The First Nordic Conference on Service Design and Service Innovation. Oslo..
- [43] Buchenau, M., Fulton Suri, J. (2000). *Experience prototyping*. DIS 2000, ACM.
- [44] Junginger, S. (2007). *Designing Change and Changing By Design: Thoughts on Drifters, Accommodators and Transformers*. DRS Wonderground conference, Lisbon.
- [45] Junginger, S., Sangiorgi, D. (2009). *Service Design and Organizational Change: Bridging the Gap Between Rigour and Relevance*. IASDR 2009, Seoul.

- [46] Parker, S. and Heapy, J. (2006) *The journey to the interface: How public service design can connect users to reform*. London: Demos. ISBN 1-84180-164-X. Available at: www.demos.co.uk.
- [47] Holmlid, S. (2008). Towards an understanding of the challenges for design management and service design. Design Management Conference, Paris.
- [48] Holmlid, S. (2006). Interaction design and design management: Challenges for industrial interaction design in software and system development. Wonderground, Design Research Society International Conference, november 2006, Lisbon.
- [49] Holmlid, S. (2009). Implications for strategic arena design: Integrating digital interaction design and service design. Design Research Journal, 2: 34-39.
- [50] Holmlid, S. (2009). Managing interaction design and business innovation: Understanding interaction design as a key activity of the operating core. Aesthesis, International journal of art and aesthetic in management and organizational life, 2(3):99-105