THESIS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

The Significance of Things

Affective User-Artefact relations

VIKTOR HIORT AF ORNÄS

Design & Human Factors
Department of Product and Production Development

CHALMERS UNIVERSITY OF TECHNOLOGY

Gothenburg, Sweden 2010

The Significance of Things
Affective User-Artefact Relations
VIKTOR HIORT AF ORNÄS
ISBN 978-91-7385-443-6

Doktorsavhandlingar vid Chalmers tekniska högskola
Ny serie nr 3124
ISSN 0346-718X

Design & Human Factors
Department of Product and Production Development
Chalmers University of Technology
SE-412 96 Gothenburg
Sweden
Telephone + 46 (0)31-772 1000

Printed by
Chalmers Reproservice
Göteborg, Sweden, 2010

The Significance of Things
Affective User-Artefact Relations

VIKTOR HIORT AF ORNÄS
Design & Human Factors
Department of Product and Production Development
Chalmers University of Technology

Abstract

Products help people act, but also thrill, excite, and elicit fear, joy and anger. Artefacts are a natural part of people's everyday lives, sometimes associated with values, dreams and aspirations. While traditional user-centred approaches have focused on efficiency and effectiveness of use, injury prevention etc. new approaches focusing on product experience have emerged. However, while increased attention is being paid to the experiential side of goods and services there remains a need for knowledge and methodology with which to address experiences with things, especially with regard to elicitation, specification and evaluation of requirements. This project has therefore taken an exploratory qualitative approach, aiming to elucidate what it is that people find *significant* in experiences with products.

159 participants in six different studies have shared descriptions of experiences with things. The studies have come from different perspectives, triangulating data collected in individual and group interviews with self-reports. The analysis indicates that things often matter not in terms of their mere presence or physical properties, but by standing out from expectations, requiring attention or referring to some idea. Often the significance of products lay in the role(s) they play in events, and the perceived impact the thing has on the person's ability to realise motives.

While only a fraction of all experiences with things could be prescribed in product development it is possible to scaffold conditions that increase or decrease their likelihood. Three perspectives that could potentially be addressable in development work are: *significant things and associated meanings, significance in use* and *significance of consequences beyond use*. These imply somewhat different objectives for design and different needs for knowledge. User experience is not a property or quality of an artefact, but a perspective that can to some extent be addressed by enabling developers to identify requirements and align their understanding with what users find significant.

Keywords: User-centred design, User experience, Significant things, Significant use, Significant consequences

Acknowledgements

I would like to acknowledge some issues that have shaped the way I see things. Looking back, I read a lot of nice books addressing design and people from various angles. I talked to a lot of colleagues, friends and strangers about relations between people and things.

My conception evolved over time as did my interests which moved from the somewhat axiomatic perspectives of engineering design, to texts that are more about people as social creatures. I often found the texts I read thrilling, and sometimes very challenging. In some cases I tried to apply the ideas from the texts, often with some insights as only results. Many of these attempts were informal and took place late eves trying to figure out how what I just read applied to empirical material I had already collected. While much of this ended up having no explicit bearing on the final results, these deviations from the track were not necessarily a waste of time. They have helped me see changed how I view the empirical material and other theories, and I hope and expect that my conception will continue to evolve.

I would like to express my gratitude to the many people who have direct impact on this thesis. I especially want to thank my supervisor Marianne Karlsson; Elsa Rosenblad, my supervisor through the first years, and Pontus Engelbrektsson, my supervisor through the last year. Secondly I would like to thank the co-authors of the appended papers; Oskar Rexfelt, Sara Persson, Patrick Jordan, as well Ola Pilerot and Martina Keitsch with whom I wrote papers not included in this dissertation. Furthermore I would like to thank the people who inspired me to start, and those who kept me going, friends, family and colleagues at HIS and Chalmers. I also want to express gratitude to my students, and all those who shared examples in the studies. Finally special thanks goes to the Nordcode community and all those involved in less formal late night discussions about people and things.

Publications

This thesis is based on the work described in the following appended publications:

Paper A: Hjort af Ornäs, Viktor and Marianne Karlsson. N.D. Objects of emotion: Exploring perceived antecedents of emotions with products. Submitted to *Design Studies*

Contribution: Hiort af Ornäs and Karlsson had equal shared responsibility in planning, data collection, and writing. Hiort af Ornäs had main responsibility for the analysis.

Paper B: Hiort af Ornäs, Viktor. 2010. Significant Things & Significant Use- A self report study on objects of experiences with things; *7th Conference on Design & Emotion*. Chicago: IIT Institute of Design

Contribution: Hiort af Ornäs together with another researcher planned instructions for self reports. Hiort af Ornäs analysed material collected in various courses and wrote the paper.

Paper C: Rexfelt, Oskar and Viktor Hiort af Ornäs. 2009. Consumer acceptance of product-service systems: Designing for relative advantages and uncertainty reductions; *Journal of Manufacturing Technology Management* 20; no. 5; pp. 674 – 699

Contribution: Hiort af Ornäs and Rexfelt had equal shared responsibility in planning, data collection, analysis and writing. Hiort af Ornäs focused on analysing the findings in the light of alternative consumer acceptance theories. Rexfelt focused on PSS and service research conducted earlier.

Paper D: Rexfelt, Oskar and Viktor Hiort af Ornäs. 2008. From consumption to use - Consumer requirements in functional sales. *Proceedings of the Seventh International Symposium on Tools and Methods of Competitive Engineering - TMCE 2008,* ed. Horváth, I & Rusák, Z April 21-25, Izmir, Turkey

Contribution: Hiort af Ornäs and Rexfelt had equal shared responsibility in planning, data collection, analyses and writing.

Paper E: Hiort af Ornäs, V., Persson, S. and Jordan, P. W. 2007. Things, constructs and meanings; *Design Semiotics in Use - 6th Nordcode Seminar & Workshop*, UIAH, Helsinki 10-12 June 2007

Contribution: Jordan and Persson planned data collection procedures and conducted interviews with academics (approx. ¼ of participants). Hiort af Ornäs & Persson collected complementary and extended the study to professionals from industry and had equal responsibility for analysis. Hiort af Ornäs wrote the paper.

The following table describes the contributions of different authors to the papers.

	Paper A	Paper B	Paper C	Paper D	Paper E
Research Planning	1	3	1	1	1
Data collection	1		1	1	1
Analysis	2	3	1	1	1
Writing	1	3	1	1	2

1 - Equal contribution with co-researcher, 2 - Main contribution,3 – Sole responsibility

Additional Publications

Hiort af Ornäs, Viktor. 2009. Towards a Typology for Emotional Experiences with Things; *Design Responsibility: Potentials and Pitfalls – The 8th NORDCODE Seminar &Workshop*. Ed. L. Wul, M. Leerberg; Kolding: Designskolen Kolding

Keitsch, Martina, and Viktor Hiort af Ornäs. 2008. Meaning and Interpretation: An analysis of two theoretical perspectives in product design. In *Proceedings from the 6th Conference on Design & Emotion 2008*, ed. Pieter Desmet, SA Tzvetanova, Paul Hekkert, and Loraine Justice. Hong Kong: The Hong Kong Polytechnic University.

Persson, Sara, Viktor Hiort af Ornäs, and Patrick W. Jordan. 2007. Disciplinary Differences of Product Constructs? investigating Human Factors, Engineering and Industrial Design Professionals. *Ergonomics for a future - Proceedings of the Nordic Ergonomics Society conference 2007*. Lysekil

Hiort af Ornäs, Viktor, and Oskar Rexfelt. 2007. *Möjliggöranden, Avlastningar, Tvång och Hinder- Konsumenters resonemang kring praktiska konsekvenser av fyra funktionserbjudanden*. Research series - Department of Product and Production Development. Gothenburg: Chalmers University of Technology

Hiort af Ornäs, Viktor. 2007. *Users, emotions, and meaningful things*, Licentiate thesis. Gothenburg: Chalmers University of Technology

Hiort af Ornäs, Viktor, and Oskar Rexfelt. 2006b. Functional Sales From A Consumer Perspective. *In proceedings of Wondergrund – The 2006 Design Research Society International conference,* ed. Friedman, K., T. Love, E Corte-Real. and C. Rust. Lisbon.

Rexfelt, Oskar and Viktor Hiort af Ornäs. 2007. *Betalning för nytta? : privatkonsumenters resonemang kring tre funktionserbjudanden*. Research series - Department of Product and Production Development. Gothenburg: Chalmers University of Technology

Hiort af Ornäs, Viktor. 2006b. Feelings for products: Sensations, beliefs and emotions. In *Proceedings of the 5th International Conference on Design and Emotion*. Gothenburg: Chalmers University of Technology.

Pilerot, Ola and Viktor Hiort af Ornäs. 2006. Design for Information Literacy - Towards embedded information literacy education for product design engineering students; *Creating Knowledge IV*. Copenhagen

Hiort af Ornäs, Viktor. 2006a. Communicative challenges with dematerialised products. *5th Nordcode Seminar and Workshop*, Oslo: AHO, Arkitektur- & Designhøgskolen i Oslo.

Rexfelt, Oskar and Viktor Hiort af Ornäs. 2006. *Funktionsförsäljning till privatkonsumenter –Resonemang kring fyra funktionserbjudanden*. Research series - Department of Product and Production Development. Gothenburg: Chalmers University of Technology

Hiort af Ornäs, Viktor and Oskar Rexfelt. 2006. *Kundkrav vid funktionsförsäljning - Teoriöversikt och erfarenheter från Göteborg Energi*. Göteborg: Chalmers tekniska högskola; Avdelningen för design, rapport 9; ISSN: 1652-9243

Hiort af Ornäs, Viktor.and MariAnne Karlsson. 2004. Causes of Emotive Response to Artefacts. In *Proceedings of the 4th International Conference on Design and Emotion*. Ankara: METU.

Terminology

Some of the terms used in this thesis are used in a quite specific way. In general they are defined when introduced in the text.

Affective	Concerned with or arousing feelings or emotions; emotional
Antecedent	A preceding event, condition or cause giving rise to something
Appraisal	Conscious or unconscious evaluation of well or woe
Attitudes	Relatively enduring beliefs and predispositions towards specific objects or persons encompassing a cognitive component (beliefs about attitude object), an affective component (valence), and a behavioural or motivational component (stable action tendency towards approach or withdrawal from the object) (Scherer 2005).
Concern	Disposition to desire occurrence or non-occurrence of a given kind of situation (Frijda 1986)
Elicit	To bring forth
Emotions	Brief reactions elicited by the appraised significance of something in relation to concerns.
Experience	Here used to refer to the apprehension of an object, thought or emotion through the senses or mind, i.e. how something is reflected in someone's consciousness. In other contexts also denoting the fact or state of having been affected by or gained knowledge through direct observation or participation
Latent	Existing or present but concealed or inactive
Mediation	Intervening or making possible
Object of experience	That which the experience focuses on
Preferences	Relatively stable evaluative judgements in the sense of liking or disliking a stimulus, or preferring it or not over other objects or stimuli (Scherer 2005).
Product Service System (PSS)	A mix of tangible products and intangible services designed and combined so that they are jointly capable of fulfilling final customer needs (OECD 2000).
Salience	A state or condition of being prominent
Sentiments	Dispositions to habitually appraise given objects or kinds of events in certain ways, or awareness of these dispositions (Frijda 1986)
Significance	The quality of being important
Symbolic	Referring to ideas beyond itself
Tacit	Implied or indicated but not expressed explicitly
Triangulation	The application and combination of several research methodologies in the study of the same phenomenon.
Triggered	Provoked, not spontaneous

Contents

1 Introduction

Underlying this work is a search for understanding of what people look for in products, what they react to, and how this could be addressed within a Product Development[1] (PD) context. The overall aim has been to elucidate the relations between users and things, with the long-term goal of being able to use these insights in the development of products that contribute positively to the well-being of users. In other words, the aim has been to develop an understanding of the experiential side of things.

1.1 Rationale

Product Development is typically described as a process encompassing a number of phases (Roozenburg and Eekels 1995; Pahl and Beitz 1996), such as planning, concept development, system-level design, detail design, testing and refinement, and production ramp up (Ulrich and Eppinger 2000). Ideas for products are in these specified in increasing detail, through a set of activities such as exploration, generation, evaluation and communication (Cross 1994) conducted by actors from different disciplines[2]. Success factors include proper identification of requirements (Pugh 1990) and user or customer focus (Cooper and Kleinschmidt 1987, Griffin and Hauser 1993).

Of many different foci for theories and tools for PD, this thesis is presented in a user[3]-centred product development (UCPD) tradition (e.g. Dahlman 1986; Karlsson 1996; Rosenblad-Wallin 1983), which aims at technological change founded in knowledge about humans. Within the field of UCPD there is a common concern for the relations between people and things[4], and adapting things to their users. This often draws on knowledge from ergonomics (or human factors), which is defined as "the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance" (IEA 2000).

---

1 The term product development is in this text used to refer to the activities leading up to realisation of new goods and services. The term "Design" is instead used in some cases with the intention of emphasising the activities or process of conceiving and specifying solutions rather than the commercial context. Cf. the definition by Archer (1965) of design as "a goal directed problem solving activity", or Herbert Simon's claim that "everyone designs who devises courses of action aimed at changing existing situations into preferred ones" (Simon 1969, p.111)

2 Disciplinary interaction is necessary but poses a challenge (Andreasen and Hein 1987; Persson 2005)

3 A distinction can be made between users (making good of products in order to reach goals), customers (buyers) and consumers (both buying and using products). See also Dahlman (1986) and Karlsson (1996) for elaborations on these roles.

4 The relations between people and things are also addressed within the marketing professions, but with a difference in focus. Marketing is primarily concerned with a commercial perspective, focusing on overall product requirements, segmentation, purchasing decisions etc., while UCPD is typically more concerned with what follows after and precedes sales, i.e. adoption and use and information for development work.

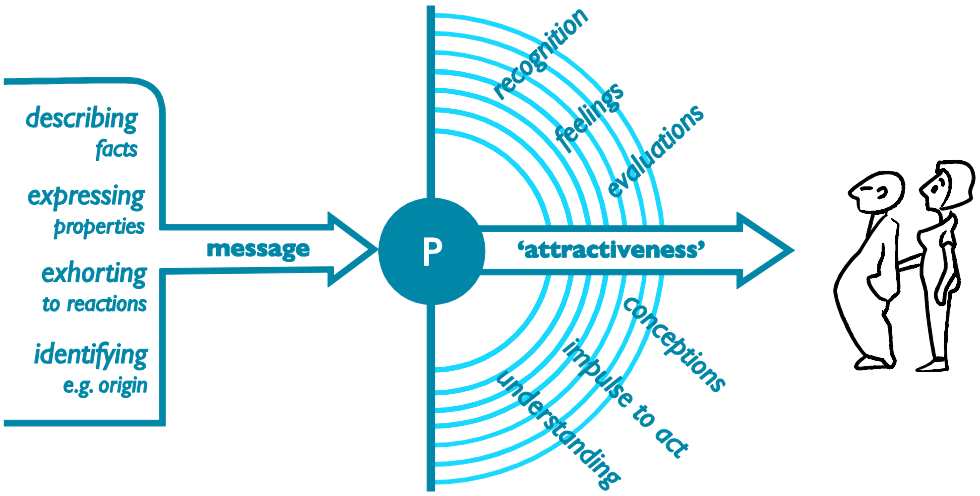


Fig. 1 Producers can address the communicative functions of products, in order to elicit experiences. After Monö (1997).

Developers can actively aim to address the experiences of users by working for example with the communicative functions of products, see Fig. 1. However, products are significant in different ways to different people. Dahlman (1986) described how relations different stakeholders such as manufacturers, buyers and users hold to a product differ in character. Karlsson (1996, p.15) elaborates this, describing among other things a *manufacturer relation* as a process of manufacturing and multiplying products, and a *buyer relation* comprising "the activities of decision making and transaction performed by an individual in order to establish a purchase". The *user relation* is one of applying a product to reach a goal, and may, but need not, involve an ownership relation. These relations between a person and a product may also evolve and change over time, for example by someone normally using a product also at some point in time having a *repair/maintenance* or *destruction/recycling* relation to it.

As the relations users and developers hold to a product differ, there are some challenges aligning their perspectives (Norman 1990; Hassenzahl 2004a). To the developer a thing is significant as something to specify, whereas a user may be more concerned with its application as a tool used to reach goals (Engelbrektsson 2004), see Fig. 2. This implies a need for developers to actively engage in trying to understand things from the users' perspectives.

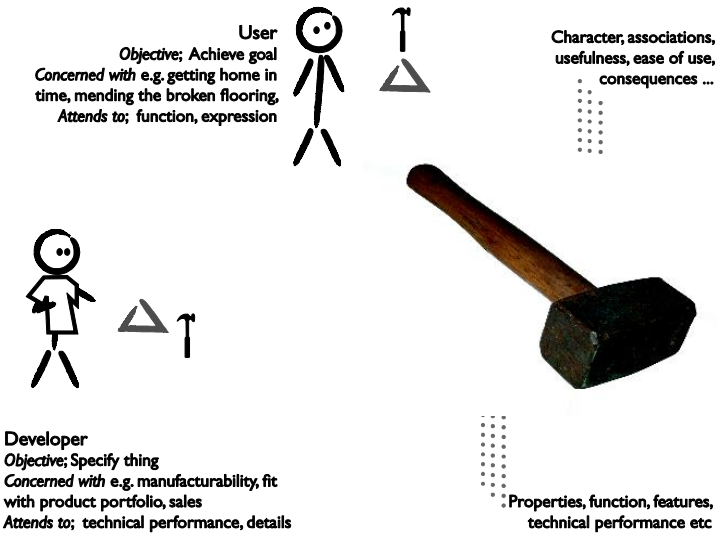


Fig. 2 Users and developers come to focus on different aspects of products. Whereas developers are concerned with specifying properties of a solution, users may to a greater extent focus on the goal of product usage rather than the thing as such.

The specific tradition in which this thesis is presented has aimed at a holistic view of users, and promotes direct contact between developers and users[5] (Kaulio et al. 1999), and how this can be supported in different stages of development processes. In cases where there is an existing solution (or concept) this takes the form of evaluative user studies, aimed at for example identification of use problems and assessment of whether requirements are met. Much attention has also been paid to identifying user requirements for new products. As these requirements may be tacit or latent[6], they are not always readily available for users to share and developers to collect, and may have to be elicited (Karlsson 1996)[7]. Drawing on Kaulio and Karlsson (1998), Engelbrektsson (2004) discussed four methodological aspects of supporting identification of requirements; choice of data collection method, context, participants and mediating objects[8].

Rosenblad-Wallin (1983) states that products have both symbolic values established in a socio-cultural context, and functional values realised by material characteristics. However, this tradition has predominantly focused on requirements for use, rather than experiential qualities[9]. Many other approaches within different UCPD traditions

5 The tradition of including users in development processes can be contrasted with approaches that rely primarily on general knowledge. Eason (1999) describe these as "design with users" and "design for users".

6 *Tacit* needs here refer to conscious needs that a participant in a study is not able to verbalise, while *latent* refers to needs that are subconscious (Sanders 1993).

7 Karlsson (1996) describes three types of user requirements; captured requirements (easily available as the subject has already reflected upon them), elicited requirements (possible to identify given that appropriate techniques are used to draw attention to them), and finally requirements that emerge with a new solution.

8 Mediating objects should be seen here in a wide sense, i.e. any material or immaterial aspect that makes possible or increases the ability to conduct a certain act.

9 One exception is Wikström's (2002) work on communicative functions.

have also focused more on specific aspects, such as usability[10] (Jordan 1998; Nielsen 1993; Norman 1990).

There is a strong tradition of addressing requirements related to use, and the UCPD discipline(s) are said to be advocates for the users' perspectives. However, concerns have been raised about usability-oriented approaches tending to encourage a view of users as merely cognitive and physical components of a system (Jordan 2000). Helander and Tham (2003, p.1269) describe how "in the past there were two sets of dependent variables: those related to human performance (time and error) and those related to physical or psychological pain", but claim that functionality, ease-of-use etc. are now taken for granted. Jordan (2000, p.6) argues that there is a third level beyond functionality and usability, one of "products that offer something extra: products that are not merely tools but 'living objects' that people can relate to; products that bring not only functional benefits but also emotional ones". Assuming that the goal of UCPD is holistic understanding contributing to the well-being of users, there is a need to also take experiential aspects into account when developing new products.

There is also a commercial side to this. Schütte et al. (2008) argue that companies need to adopt new ways of positioning themselves on markets, and that there is a trend towards addressing hedonic issues and shifting focus "from functional needs towards affective needs of the customers". A focus on experiential aspects has been argued as important in consumption literature (Jensen 1999; Pine and Gilmore 1999). Hirshman and Holbrook (1982, p.92) use the term hedonic consumption to refer to "those facets of consumer behavior that relate to the multisensory, fantasy and emotive aspects of one's experience with products". Attention has been paid to extraordinary experiences (e.g. Arnould and Price 1993), but also to experiential aspects of everyday products. As an example, Creusen and Schoormans (2005) argue that product appearance fulfils different roles in a consumer choice; contributing to attention drawing and categorisation, describing functional and ergonomic aspects, as well as serving as a basis for aesthetic appreciation and symbolic product associations. Sheth et al. (1991) put forward a model "explaining why consumers choose to buy or not to buy (or use or not to use) one product over the other", proposing that five values influence consumer choice. These consist of the perceived utility acquired from an alternatives "capacity for functional, utilitarian or physical performance" (functional), "association with one or more specific social groups" (social), "capacity to arouse feelings or affective states" (emotional), "arouse curiosity, provide novelty, and/or satisfy a desire for knowledge" (epistemic). Sheth et al. state that some of these occur "as the result of the specific situation or set of circumstances" (conditional). Possessions have also been claimed to contribute to and reflect identities (Dittmar 1992) extending the self by supporting the consumer in having, being and doing (Belk 1988). Csíkszentmihályi and Rochberg-Halton (1981, p.239) found that "things are cherished not because of the material comfort they provide, but for the information they convey about the owner and his ties to others". Similarly,

10 Usability is defined as "The effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environments" (ISO 9241-11 1998).

in studying adolescents Kamptner (1997) found that possessions, in addition to representing utilitarian meaning (most valued by males), were also valued for conveying meaning about interpersonal ties to others (most valued by females), and about self as well as providing enjoyment. Richins (1994) argues that objects are valued for their meanings, and distinguished between *public meanings* assigned to an object by a group and *private meanings* an object has for a particular individual. Richins also lists utilitarian value, enjoyment, representation of interpersonal ties, identity and self-expression as important meaning categories, whereas Schifferstein and Zwartkruis-Pelgrim (2008) found the strength of emotional bonds to products to primarily be a function of memories and enjoyment.

Addressing experiential issues in UCPD would thus potentially be both respectful to users and commercially interesting. Immaterial issues and the experiential qualities of products are gaining increased attention. The role of design has been claimed to change from a focus on physical properties to strategies[11], services[12], and values[13]. During the first decade of the 21st century increasing attention has been paid to the role of experiences in design[14]. However, the availability of methodological support for these issues is limited. Schütte et al. (2008) claim that affective meanings have long been addressed but that this has relied on the experiences and preferences of development staff, and has been more of an art than engineering or science.

1.2 Aim

The overall programmatic aim of this project is to support the development of solutions[15] that support the well-being of users, taking into account the specific experiences specific users may have with specific things in specific situations. The ambition is to elucidate what people find *significant* with products, and the experiences[16] this gives rise to. Significance is defined here as "the quality of being important" (Merriam-Webster 2010).

Looking at knowledge foundations for addressing experiences in Product Development it is possible to draw parallels to other types of development work. Hubka and Eder (1996) structures design science along two major dimensions: prescriptive-descriptive and knowledge concerning the technical system or the process of designing, see Fig. 3. While this conception focuses on technical systems and crisply defined functions, it is possible to draw on its principles in classifying knowledge regarding experiences with products, see Fig. 4.

11 See e.g. Valtonen (2007)
12 See e.g. Rexfelt (2008)
13 See e.g. Karjalainen (2004)
14 One indicator is the conferences on Affective Human Factors Design (e.g. Helander, Khalid, H, and Tham 2001) Design & Emotion (e.g. Overbeeke, and Hekkert 1999; Karlsson, van Eerp, and Desmet 2006) and Designing pleasurable products and interfaces (e.g. Hannington and Forlizzi 2003).
15 This project is concerned with the creation of knowledge *for* Design, in contrast to research *about* or *through* design. Cf. Frayling (1993), Archer (1995), and Cross (1995).
16 The term experience is in this text used to refer to how something is reflected in the consciousness of a specific person.

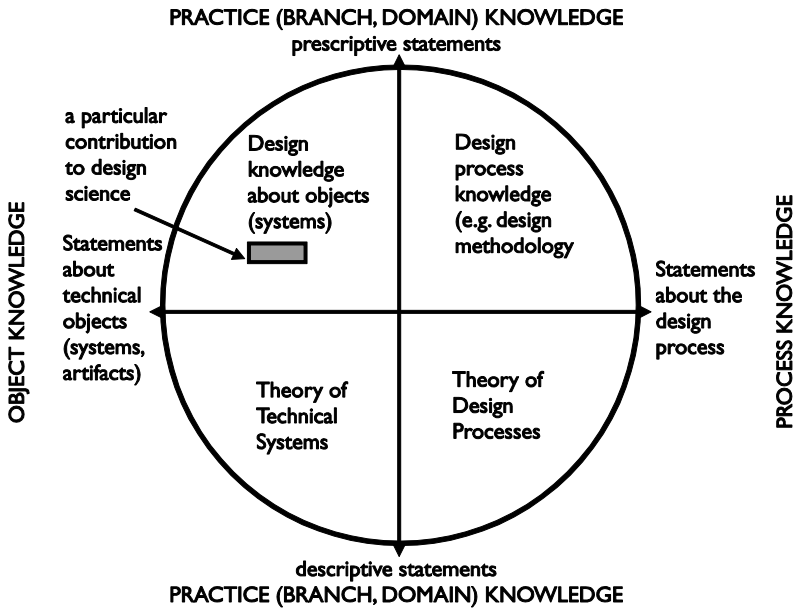


Fig. 3 Main categories of Design Science according to Hubka and Eder (1996), originally from Hubka and Schregenberger (1987).

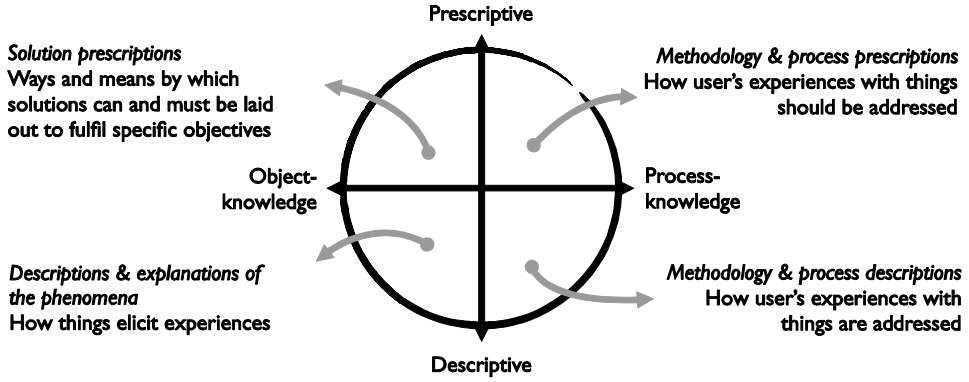


Fig. 4 Re-conception of the Design-Science classification in relation to designing for experiential qualities.

The long-term objective of this work is to arrive at knowledge that can be used in prescriptive work, i.e. methods that support different design activities. Most notably in the context of UCPD, methods that support addressing of the affective relations to things through an understanding of the user group, identification of user requirements and evaluation of the extent to which products or concepts meet these.

However, methodology and process recommendations presuppose understanding of what is to be addressed. A primary objective is hence to first arrive at a satisfactory conception of the phenomena. Taking experiences as an objective for design work implies that they should somehow be specified as requirements, and that *meaningful distinctions are made between different experiences*. Furthermore, there is a need to identify the factors that give rise to these experiences, their *antecedents* as well as how these antecedents elicit the experiences.

2 Knowledge gaps & research questions

Experiences have been discussed from different perspectives in PD and design literature. Attention has been paid to issues such as artefacts adapting to users' affective reactions[17], and emotional relations between different users mediated through artefacts[18]. Of interest here is how the experiences users have with things are conceptualised in relation to design.

While there are frameworks that aim at systematically addressing the emotional relations and reactions people have to things, these are not a collective attempt from an organised body of researchers. The area has therefore been referred to using a range of different terms including "Emotional design" (Norman 2004), "Pleasurable products" (Jordan 1999), "Hedonomics - Affective Human factors design" (Helander and Tham 2003), and "User experience" (e.g. Hassenzahl 2004a). According to Desmet and Hekkert (2007), experiential issues have become of interest to different design disciplines, but customised terminologies and diversity of theory frustrates a common ground for discussion. Furthermore, while different scholars highlight similar reasons for addressing experiences with things, they are sometimes concerned with different phenomena. Forlizzi and Battarbee (2004) exemplify this with experience as a "constant stream of 'self-talk' that happens while we are conscious", and *an* experience as something that can be articulated, is time bound and has a clear beginning and an end.

2.1 Frameworks addressing experiences with things

This section describes some of the more commonly quoted frameworks for addressing users' experiences with things, i.e. the ones put forward by Norman (2004), Desmet (2002), Desmet and Hekkert (2007), Jordan (2000), Hassenzahl (2004a), and Nagamachi (1995), see Table 1. The frameworks are compared with respect to their descriptions and explanations of users' experiences with products as well as any proposed methodology for how experiences with things should be addressed. They frameworks vary in what factors they emphasise, but all to some extent describe some antecedents[19] giving rise to some reaction and in some cases also some mediating processes linking the two, see Fig 5.

17 See e.g. Picard (2004)
18 See e.g. Battarbee (2004)
19 The term antecedent is here used to refer to a preceding event, condition or cause giving rise to something.

Fig. 5 Aspects of descriptions and explanations of how things elicit experiences, used to structure the comparison of different frameworks.

Table 1 Six frameworks addressing experiences with things

	Central ideas	Focus
Kansei Engineering	By evaluating correlations between feelings reported on semantic differentials and categorising product attributes it is possible to model the relations between them.	Product attributes and their relation to affective meaning
Basic model of product emotions	Emotions with products are elicited through appraisals in relation to concerns. Specific emotions are tied to specific patterns of appraisals.	Appraisals and emotion
Framework of product experience	Product experience can be described on three levels: aesthetic experience, experience of meaning, and emotional experience.	Three components of product experience
The emotional design framework	People process information on three levels: a visceral level (an automatic prewired layer), a behavioural level (controlling everyday behaviour) and a reflective level (connected to contemplation).	Different types of information processing
The four pleasures framework	People proceed from seeking functionality to usability and finally to pleasure in products. These can be categorised as Physio-, Socio-, Ideo-, and Psycho-pleasure.	Benefits that have to do with social issues, ideas, physiology or psychological reactions such as emotions
Model of user experience	People perceive a *product's features* and construe its *character* in terms of pragmatic and hedonic attributes, leading to judgements about *consequences.*	Situational experience and character *ascribed* to things. There is a need to distinguish between intended, actual and experienced qualities

2.1.1 Kansei Engineering

Kansei Engineering (e.g. Nagamachi 1995, Schütte 2005) is an empirically driven approach that in its simplest form seeks to identify and model relations between product attributes and ratings of affective meaning.

The *experiences* addressed through Kansei Engineering are referred to by Schütte et al. (2008, p.478) as affective meaning, a "multi-facetted expression that does not have a complete equivalent in the English language". Lee, Harada and Stappers (2002) contrast Kansei against Chisei, roughly translatable as reason. Kansei is said to lead to affects, feelings, emotions whereas Chisei is said to have to do with creating knowledge, through logic, recognition and understanding.

In terms of *explanations,* Schütte et al. (2008, p.478) state that Kansei in the context of PD can be referred to as "the impression somebody gets from a certain artifact, environment or situation using all her senses of vision, hearing, feeling, smell and taste as well as her cognition", and provide a schematic in which properties give rise to an affective flow through different modalities, in turn affecting the user's senses, see Fig. 6. However, Kansei Engineering is less concerned with any specific theoretical explanation in terms of *mental processes*. Instead it seeks to empirically identify patterns between, on the one hand, *antecedents* in terms of product attributes, and on the other experiences, see Fig. 7. The latter are typically described as numerical values on bipolar adjective scales, e.g. ranging from "not exclusive" to "exclusive"[20].

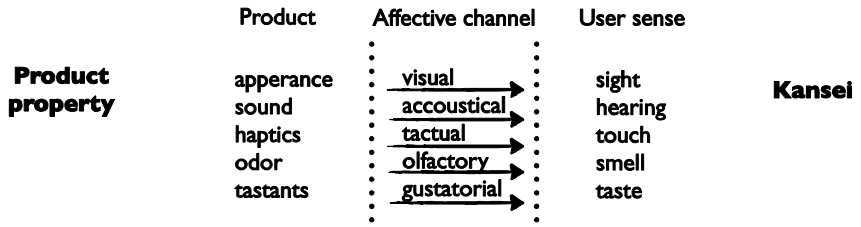


Fig. 6 Affective flow, according to Schütte et al (2008).

20 According to Schütte et al. (2008) the KE methods take as their central pillar the Semantic Differentials of Osgood et al. (1957) originally used for political research.

Schütte et al. (2008) describes Kansei Engineering as providing *methods* particularly specialised in "the translation of affective values into concrete product design parameters" but acknowledge that a limitation with the method is that it is primarily applicable to incremental changes[21] and not radical innovation. Furthermore they describe six different versions of Kansei Engineering relying on more or less advanced statistical techniques, ranging from a breakdown of affective needs in a tree structure to the application of computer systems that draw inferences from databases to make predictions and suggest attributes. Typically, however, affective meaning is in

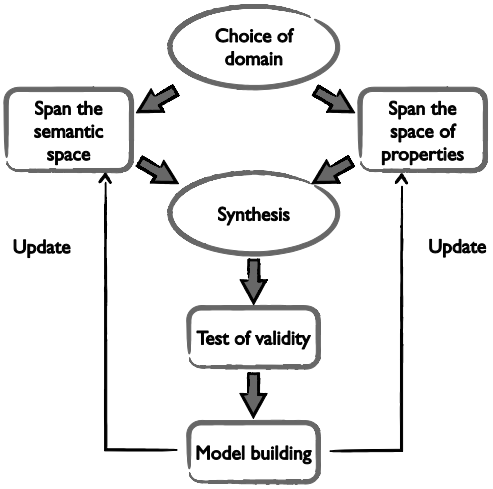


Fig. 7 Model of Kansei Engineering after Schütte et al. (2008).

Kansei Engineering linked to product attributes through mathematical relations by a process that may be roughly described as:

1. Breaking down overall product attributes into components until specific attributes are arrived at,
2. Gathering ratings of subjective experience for a number of products,
3. Analysing how ratings of subjective experience of something co-varies with different product attributes,
4. Development of mathematical models that can be applied prescriptively in determining attributes for new designs.

21 Schütte et al (2008) admit that Kansei engineering can be seen as reductionistic as it builds on procedures in which both semantic descriptions and products are broken down into their essential parts.

2.1.2 The basic model of product emotion

The key idea of the basic model of product emotions (Desmet 2002, p.108) is that a subject's reactions to the appearance of a thing can be explained by its congruency with concerns[22], see Fig. 8.

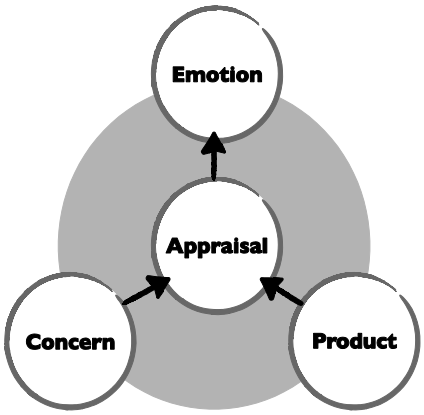


Fig. 8 Basic model of product emotions, after Desmet (2002).

The initial model, consisting of appraisal of the relation between stimuli and concern leading to an emotion was claimed to be applicable to any emotion (Desmet 2002, p.109). Desmet also proposed a particularisation of this applicable to product appearance[23]. In terms of *experiences* Desmet draws on the work of, for example, Arnold (1960) who defined an emotion as "the felt tendency toward anything intuitively appraised as good (beneficial) or away from anything appraised as bad (harmful)". The framework focuses on a specific set of potentially universal emotions such as desire, admiration, inspiration and dissatisfaction[24] that are relevant to products. Desmet (2002, p.106) emphasises that these product emotions are personal, have a temporal component and can be mixed, i.e. someone may experience different emotions towards the same product.

In line with cognitive appraisal models of emotions (e.g. Lazarus 1991; Ortony, Clore, and Collins 1988), the central *explanation* of this framework is *mental processes* through which people appraise[25] things, and the fact that patterns in these appraisals are tied to distinct emotions. Desmet (2003) describes five different types of product emotions; instrumental, aesthetic, social, surprise, and interest emotions. These are linked to four major appraisal types identified in Desmet (2002): motive compliance (tied to goals), appeal (tied to attitudes), legitimacy (tied to standards), and novelty (related to knowledge and expectations).

---

22 Concerns are in accordance with Frijda (1986) defined as "a more or less stable preference for a certain state of the world".

23 Desmet (2002, p.xii) contrasts this perspective to that of consuming, owning or using a product, and defines appearance as "all the product characteristics people can perceive by looking at, touching, hearing, tasting and smelling a product"

24 Desmet (2002, p.110) lists the following emotions; *Pleasant*: desire, fascination, admiration, satisfaction, pleasant surprise, inspiration, amusement *Unpleasant*: contempt, boredom, disgust, indignation, disappointment, dissatisfaction, unpleasant surprise.

25 Appraisals are defined as " a non-intellectual, automatic evaluation of the significance of a stimulus for one's well-being" (Desmet 2002, p.108)

In terms of *antecedents*, the model focuses on appearance. However, Desmet (2002) acknowledges that the object of an emotion need not always be the product as such but can often be an associated agent, object or event.

In terms of *methodology* for design applications, the framework is closely associated with a self-report instrument for measurement of emotions with products called PrEmo[26].

2.1.3 The framework of product experience

The framework of product experience (Desmet and Hekkert 2007) provides an extension of the basic model of product emotions.

Based on Hekkert (2006, p.160), its focus is on three interrelated facets of product *experience*, defined as "the entire set of affects that is elicited by the interaction between a user and a product, including the degree to which all our senses are gratified (aesthetic experience), the meanings we attach to the product (experience of meaning) and the feelings and emotions that are elicited (emotional experience)". The three dimensions together span product experience "used to refer to all affective experiences involved in human-product interaction" (Desmet and Hekkert 2007, p.57) See fig. 9.

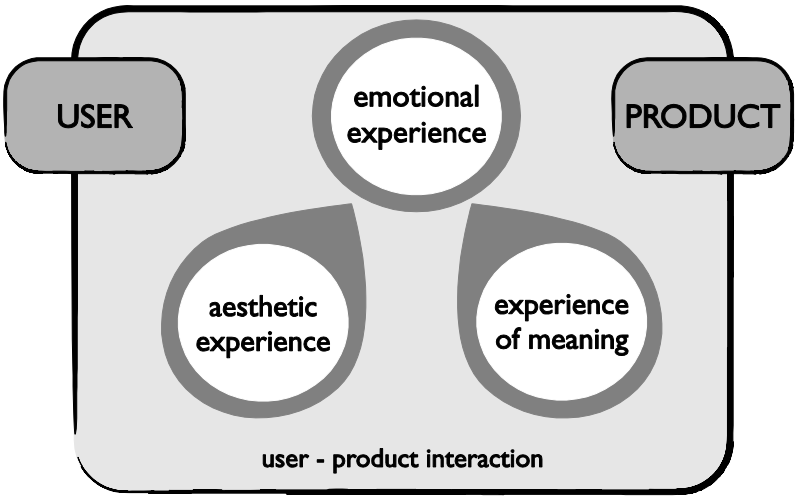


Fig. 9 The framework of product experience , based on Desment and Hekkert (2007).

In terms of *explanations*, the framework highlights a wide range of different theoretical underpinnings from cognitive emotion psychology, aesthetics and psychology. The aesthetic dimension is conceptualised as a product's capacity to delight one or more of the senses, explainable through the evolutionary basis of the perceptual system. The experience of meaning is concerned with cognitions. Desmet and Hekkert (2007, p.60) write that "Through cognitive processes like interpretation, memory retrieval, and associations, we are able to recognize metaphors, assign personality or other expressive characteristics, and assess the personal or symbolic significance of

26 Desmet (2002) also developed a database of examples that could be used as inspiration in design: the "[product & emotion] Navigator".

products". The emotional level in the model encompasses the factors described in the product emotion model above[27].

In terms of *antecedents* the framework is less concerned with highlighting specific product attributes, and instead emphasises the interaction between the user and the product. Interaction is used to refer not only to the aspects of manipulating devices, but non-instrumental ones, described as "the interactions that do not serve a purpose in operating a product, such as playing with or caressing the product" as well as non-physical interaction such as "fantasising about, remembering, or anticipating usage" (Desmet and Hekkert 2007, p.58).

While the framework of product experience highlights dimensions of experience it does not in itself provide *methodology* for PD.

2.1.4 The Emotional design framework

The basic idea of the Emotional design framework is that human information processing occurs at three levels and that each level serves two different functions: "evaluation of the world and what is happening in it – affect; and the interpretation of what is happening in the world – cognition" (Norman, Ortony, and Russell 2003, p.39). This framework was initially discussed in relation to autonomous machines but Norman (2004) presents it as a framework for design.

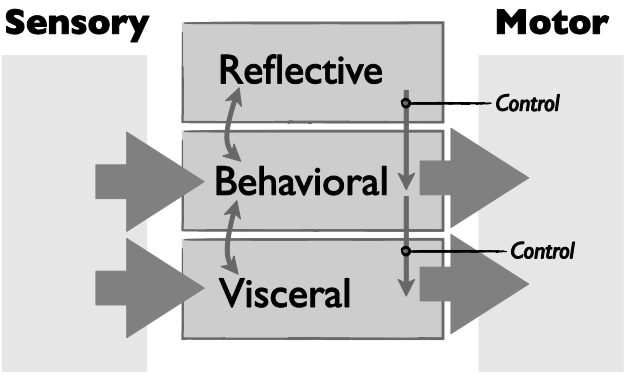


Fig. 10 Three levels of information processing, after Norman (2004).

The framework sees different aspects of design as being able to elicit *experiences* at three levels of *mental processing* linking sensory input to motor control (see Fig. 10): visceral, behavioural and reflective. Norman bases this *explanation* on a conception of evolved brain structures. The visceral level is involved in automatic processing information and is prewired. This equates the information processes that are displayed in very basic organisms, reacting to opportunities and threats. The behavioural level controls everyday behaviour and is capable of making more complex analysis and

27 Desmet and Hekkert (2007) also discuss the relationships between the different levels of product experiences, making the point that the aesthetic experiences are essentially equivalent with the "inherent pleasantness" in some appraisal models. Furthermore they discuss the role between meaning and emotions, quoting e.g. Lazarus (1991) as advocating "relational meaning" as central to the elicitation of emotions.

altering behaviour. Finally, humans have information processing on a more advanced level in which they are capable of reflecting on their behaviour. The three levels according to Norman are linked, with the higher ones being capable of enhancing or inhibiting the lower ones.

Norman and Ortony (2003) describe that designers at best have indirect control over users' experiences but that it may be possible to design opportunities for experience. Furthermore, Norman and Ortony suggest that the designers may have greater opportunities to address visceral and behavioural reactions than reflective ones.

Norman (2004) uses the model to describe different examples of designs, tied to different levels of information processing, but the framework does not claim to be concerned with specific *antecedents*. However, Norman (2004, p.39) presents what he admits to be a simplified schematic, linking the three levels to product characteristics and experiences:

- "Visceral design > Appearance
- Behavioural design > The pleasure and effectiveness of use
- Reflective design > Self image, personal satisfaction, memories".

Norman (2004) provides a wide range of examples of things that evoke memories, contribute to self image, are ascribed personality, play roles in fun and games etc. In this, Norman highlights different phenomena, drawing on theories from various fields. However, this is a broad introduction describing different applications, rather than an attempt at providing *methodological support* for product development.

2.1.5 The Four Pleasures framework

The Four Pleasures model (Jordan 1997) provides a descriptive framework structuring four pleasures beyond what is normally considered functionality or usability.

Jordan categorises different *experiences* based on their origins: Physiological pleasures (related to senses), Ideological pleasures (related to ideas), pleasures that have to do with the relations to others (Socio-pleasures) and pleasures related to people's cognitive and emotional reactions (Psycho-pleasures).

Drawing on the work of anthropologist Tiger (1992), who argues that there are four types of pleasures that universally occur across cultures, the framework seeks its *explanations* in human needs, rather than design attributes.

Jordan argues that addressing functionality and usability is not enough for companies to stay competitive, and that people seek other kinds of benefits in things. In his pleasure hierarchy (see Fig. 11.) Jordan (2000) draws a parallel to Maslow's (1970) hierarchy of needs. Without explicitly accepting or rejecting Maslow's ideas per se, Jordan makes the point that once a certain need is met, the person will move on to looking for something else. This also applies to products.

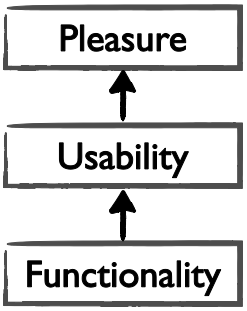


Fig. 11 Pleasure hierarchy, based on Jordan (1997). Jordan argues that addressing pleasures is a natural progression following upon a focus on functionality and usability as companies want to position themselves on a market.

Jordan draws on a wide range of different theories in demonstrating how products may be related to pleasures but does not highlight specific *antecedents* in terms of product attributes. Rather the framework stresses aspects of the person's interactions with the product and people.

In his writings Jordan (2000) introduces a checklist based on the four pleasures framework, but also review *methodology* in terms of a range of more general tools that may be applicable also to addressing product pleasures in development work.

2.1.6 The Model of user experience

The model of user experience proposed by Hassenzahl (2004a) highlights a difference in perspectives between designers and users, where designers emphasise product features resulting in an intended product character. Users, on the other hand, emphasise the products' apparent character and the consequences or implications this may have, see Fig. 12.

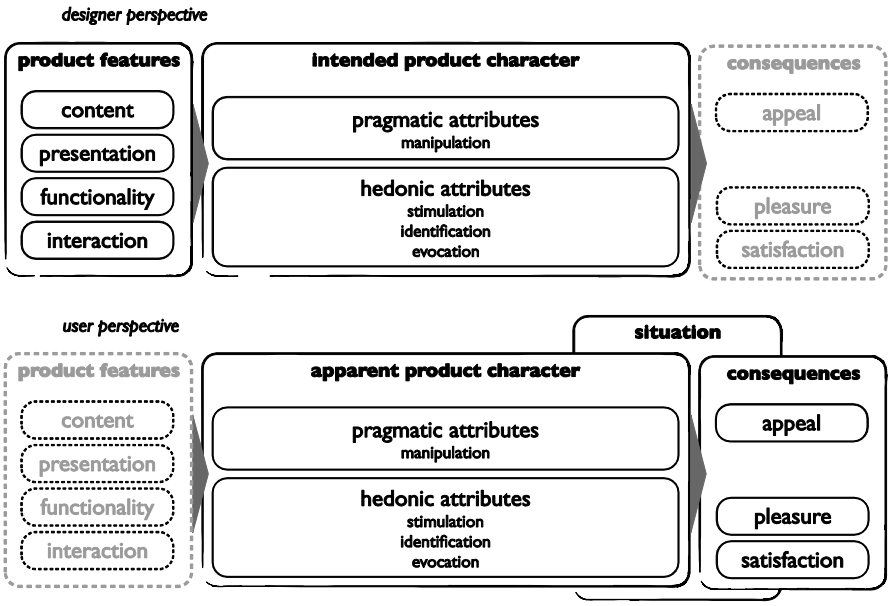


Fig. 12 Key elements of user experience, after Hassenzahl (2004a). Designers and users according to this model adopt different perspectives, emphasising different aspects.

The framework provides *explanations* of user experience by linking product attributes to experiences through a number of steps. According to this model a thing has certain features such as functions, interaction style etc. These have been put together by a designer in order to create a specific character which is a high-level description (gestalt) that is describable through a number of attributes. These product-related *antecedents* together with situational antecedents these give rise to two types of *experiences:* apparent character - roughly what the product is perceived to be, and their consequences - judgements of appeal, pleasure and satisfaction.

Hassenzahl describes "apparent character" as a cognitive structure that introduces inferences beyond what is perceived, emphasising that people attribute meaning to product features, i.e. there are *mediating mental processes*. Product character, according to the model, is comprised of pragmatic and hedonic attributes, and Hassenzahl describes how different products may have different characters emerging from combinations of these[28]. Pragmatic attributes are said to be related to behavioural goals: manipulation, utility, usability etc. Hedonic attributes are said to encompass "all remaining product attributes" (Hassenzahl 2004a), including issues such as stimulation, identification, and evocation of memories, and Hassenzahl links them to the users' conception of self.

While instruments have been developed for example for measuring dimensions of a hedonic and pragmatic character (see, for example, Karapanos, Hassenzahl, and Martens 2008), Hassenzahl's model of user experience is mostly descriptive rather than focusing on *methods* supporting product development.

2.2 Comparison & knowledge gaps

This section aims to compare current frameworks with respect to methods and process prescriptions, as well as descriptions and explanations of how things elicit experiences. Furthermore, it aims to identify needs for further research, see Fig. 13.

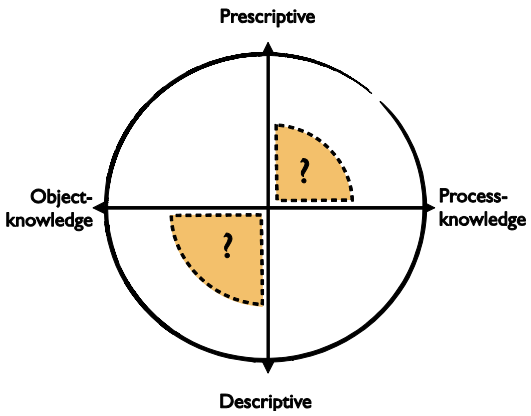


Fig. 13 This section aims to identify knowledge gaps in methodology and explanations of experiences with things.

28 Some products may perform better on one of these dimensions while others perform on both dimensions. The interplay between these dimension, their respective importance (including how it may change over time) has been further addressed, see e.g. Karapanos, Hassenzahl, and Martens (2008), and Hassenzahl (2004c, 2008).

2.2.1 Methodology & Process prescriptions

The reviewed frameworks differ in the extent to which they come with methodology supporting product development activities.

There are instruments for product evaluation and measurement of specific experiences, for example the Product-Emotion model being associated with a tool for collecting self-reports on reactions. Furthermore, there are procedures for modelling relation between reported experience on certain scales and product attributes. Kansei Engineering is explicitly intended for development work and trying to develop procedures for treating the subjective in a more objective manner, also prescribing specific methods for synthesis. An alternative approach is presented in the Four Pleasures framework which advocates a need to understand people holistically, and focuses on categorisation of the sources of pleasures with products while providing some suggestions about how to consider pleasures when applying more general tools.

The frameworks have all been used to describe or explain various experiences with products. However, with the focus on analysis and evaluation they provide limited methodological support for setting requirements or generating solutions. In the majority of cases the frameworks' primary applicability in design work seems to be as support for analysis through categorisations of factors that should not be neglected.

2.2.2 Descriptions & Explanations – Experiences

The frameworks also use different terminologies for experiences and seek different explanations for the elicitation of experiences, see Table 2.

Firstly, the frameworks come with different descriptions of experiences, and all to some extent seem to acknowledge sensations, ideas about things and their consequences etc. as well as reactions. However, there is neither a commonly accepted taxonomy[29], nor agreement on what types of experiences should be addressed. A number of different concepts referring to affective issues have been used, e.g. emotions, feelings, pleasure. These are partly overlapping and in some cases seem to be used interchangeably.

Whether one label or another is used is perhaps of less importance. However, distinctions are desirable as there is potentially a range of different experiences a user may have in relation to a thing and these may have different character; e.g. immediate reactions or long term attachment. The goal for this project is to address experiences that are affective, i.e. contain some judgement of well or woe. Categorical distinctions between different experiences can be based on their origins, their functions, whether or not they involve cognitive processes etc. However, as no consistent classification of experiences could be derived based on the frameworks.

29 The lack of common terminology may at least in part follow from how experiences are discussed in everyday language, where terms like feeling are used to denote a range of issues, including bodily sensations *of* something, motivations (feeling *like* doing something), ideas (feelings *about* something, e.g. a certain car having a 'sporty' feeling) etc., cf. Averill (1994)

There remains a need for knowledge regarding how the experiences people have with things should be described.

Table 2 Experiences, antecedents and mediating processing discussed in the different frameworks.

	Antecedents eliciting the reaction	Processing mediating between antecedents and reactions	Experiences
Kansei Engineering	Product attributes (properties and features rather than functions)	Feelings are linked to product attributes in ways that can be described through mathematical relations	Affective meaning (of things)
Basic model of product emotion	Products, appraisals	People appraise products with respect to their concern congruence	Emotions
Framework of product experience	Products, mental processes, interaction	Aesthetic experience and experience of meaning affect emotional experience (or can be seen as a part thereof)	Aesthetic experience, experience of meaning, Emotional experience
Emotional design framework	Products, Sensory input, cognitions	Experience occurs on different levels of information processing	Affects, Reflection
The Four Pleasures model	Congruency between things and needs	Assumes that, given that conditions are there for realising some benefit, the user will experience pleasure	Pleasures; Sensations, ideas, perceived social and practical, goal congruency
The model of user experience	Situations, product features, attribution of meaning, judgements	Product features are attributed meanings, leading to perception of apparent product character in a particular situation giving rise to ideas about consequences	Apparent product character, consequences (appeal, pleasure, satisfaction)

2.2.3 Descriptions & Explanations – Antecedents

The frameworks typically acknowledge a wide range of antecedents, but there are differences in the scope of factors that are emphasised as central to the elicitation of experiences.

As indicated by Desmet and Hekkert (2007 pp.58), a wide range of factors may have a bearing on the experiences a person has with a thing: "Experience is shaped by the characteristics of the user (e.g. personality, skills, background, cultural values, and motives) and those of the product (e.g. shape, texture, colour, and behaviour). All actions and processes that are involved, such as physical actions and the perceptual and cognitive processes (e.g. perceiving, exploring, using, remembering, comparing, and understanding), will contribute to the experience /.../ In addition, the experience is always influenced by the context (e.g. physical, social, economical) in which the interaction takes place."

None of the frameworks deny that factors on a macro level (e.g. culture) or a micro level (e.g. neurology) play a role in the elicitation of experiences. In the Four Pleasures model, the focus is on *the person*, and a range of needs beyond what has traditionally been considered functional. This perspective emphasises a holistic understanding of users who sometimes seek distraction, social relations and so on. Other frameworks seek explanations primarily in *products*. As an example, Kansei Engineering is concerned with reactions to properties or the meanings they stand for. The model of product emotions, on the other hand, concerns itself with product appearance, whereas the user experience framework list features and functions as important product-related antecedents.

While the frameworks acknowledge a range of antecedents, they in many cases focus on products and reactions, seeking links between experiences and things or properties, see Fig. 14. As an example several of the frameworks list interaction between a person and a product as a potential explanation of experiences with things. This is however in many of the frameworks treated as an issue of products giving rise to sensations, or perception occurring over different sensory channels. From a user-centred product development perspective the models' preoccupation with stimuli–response-like explanations is problematic as this means that use would be neglected, or at least seen as peripheral, whereas its issues of stimulating interaction may very well be central to the elicitation of some experiences, as argued for example by the model of user experience[30].

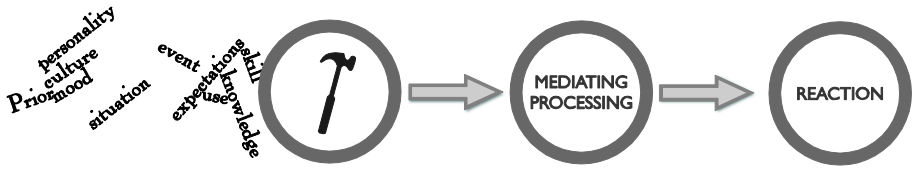


Fig. 14 The frameworks acknowledge a range of antecedents but emphasise products as eliciting reactions.

The frameworks elucidate how things matter to people primarily on theoretical grounds. The models have all, to some extent, been applied in empirical studies, but these tend to be controlled experiments, highlighting the very factors the researchers were looking for. Many studies purposefully use approaches that make certain cues and phenomena especially salient, allowing identification of reactions that may otherwise have been subtle[31] by presenting participants in studies with product representations, using certain instruments to capture emotions etc. However, it is not

30 There is reason to expect that use is central to the elicitation of experiences; "Qualities such as enjoyment, fulfilment and fun are not properties of technology. They are better thought of as outcomes of certain experiences with or through technology. So if we are to understand what might make a particular product or design more pleasing or enjoyable to use, it would seem sensible to begin by trying to analyse experience of use" (Wright, McCarthy, and Meekison 2004, p.43). As an example: progress towards goals has been discussed as central to the elicitation of some experiences by e.g. Csikzentmihalyi (1990) and Lazarus (1991).

31 This may sometimes be necessary in a PD context as it allows for identification of specific information, cf. requirements elicitation.

certain that the factors brought up under such conditions are in fact the same as the ones a subject would experience in an everyday situation. Concerns can be raised as to whether they are limited to certain types of experiences elicited under certain conditions, or are applicable to the experiences with everyday things in a variety of circumstances[32].

As argued by Jordan (2000, p.8) there is a need to look at the relationship between people and products in a more holistic manner: "In order to find a way into the wider issues of people-product relationships, it is necessary not only to have an understanding of how people use products, but also of the wider role that products play in people's lives". Furthermore, there is a shortage of studies on the experiences people have with everyday things in everyday situations. There is a shortage of empirical material in the field, which "impedes theoretical advancement and restricts our understanding of [User Experience]" (Hassenzahl and Tractinsky 2006, p.91).

No consistent set of explanatory factors explaining experiences with things could be derived based on the frameworks. Explanations seem to span from culture to individual concerns, unconscious information processing and neurology. However, the extent to which different aspects are at the core of the elicitation of experiences depends on the perspective taken. The frameworks do not rest on a commonly accepted unit of analysis, and take different antecedents into account. Either they introduce a wide range of factors in broad terms, highlight no specific factors or take specific factors as a starting point.

There is thus a need for knowledge regarding what people find significant in eliciting experiences with things.

32 Arguments have been presented for considering situational aspects of the relations between people, their needs and products. As an example Lai (1991) stressed the importance of the consumption situation for adoption of new products. Furthermore, Fournier and Mick (1999, p.5) criticised limitations of consumer satisfaction paradigms, as focusing on satisfaction as static evaluation and instead promotes seeing satisfaction as an active holistic context-dependent process in which "cognitions, emotions and meanings embedded in a sociocultural setting" blend. In studying what she refers to as the buying and selling of emotions in experiences such as white-water rafting, Holyfield (1999) argues for analysis of the process of emotional exchange and the relationships between *situated* cues and felt arousal.

2.3 Research questions

The actual experience a person has with a product is likely to be multifaceted and involve a range of different relations. Ideally it would have been possible to choose a framework that highlights the factors and explanations that are of greatest importance to this project, or synthesise a more comprehensive one. However, even within the six frameworks that all focus on how things elicit valenced experiences, explanations are scattered and incoherent.

There is a shortage of knowledge concerning what elicits experiences with everyday things and what people react to in experiences with products. From a holistic UCPD perspective there is a need for understanding regarding what affective relations people in fact hold to everyday products as well as the relative importance of different factors in these relations. The aim of this project is to identify factors that contribute positively or negatively to people's affective relations to everyday things, and as far as possible to identify implications for PD. Ideally it would be possible to *prescribe* factors that would affect user experience, and *predict* the elicitation of specific experiences. However, the objective of creating knowledge applicable in PD implies that results should support design understanding. This work is therefore aimed at *describing* and *explaining* affective relation to things.

Among the perspectives adopted in the user centred tradition underlying this thesis, one is more important than any other - that of the people affected by things. There is a need for more knowledge on *what* people seek in products and what they react to.
RQ1 - *What do people focus on when describing experiences with products?*

To identify what information is needed in developing a holistic understanding and specifying requirements, there is a need for knowledge on *how* these aspects are significant, and what may have a bearing on them. There is a need to consider the explanations people share when reflecting on experiences with products.
RQ2 - *How do people explain the significant aspects when describing experiences with products?*

More knowledge is also needed on what experiences are elicited in everyday product encounters. Distinctions are needed in order to separate issues that are predominantly caused by factors that are beyond the influence of product development from those that can be addressed. It is hence desirable to identify dimensions by which different types of experiences can be distinguished.
RQ3 - *How can the experiences with products people report be described?*

3 Overall approach

This chapter introduces the overall approach taken in this PhD-project. The ambition has been to through a number of studies elucidate the significance of things from different perspectives, using slightly different approaches, but always drawing on participants' own descriptions and explanations of experiences with things.

3.1 Starting points: limitations & assumptions

In light of the identified knowledge gaps and research questions, I believe it appropriate to start from the phenomena without choosing a theoretical explanation in advance and the studies hence take descriptions people provide about experiences with everyday things as a starting point.

While certain types of products are clearly closely associated with, or even developed with a focus on experiences, an assumption made here is that there is a greater contribution to be made in relation to the products people encounter in everyday situations. An alternative would have been to focus on particularly strong experiences such as awe of great works of art, or how something may convey emotions of its creator. However, the underlying reason for this work is to contribute to a more holistic understanding of people's relations to products in a UCPD context.

Arriving at an "objective truth" is somewhat problematic when the questions raised concern someone's perspectives, and how things are reflected in the consciousness of users. As outcomes are likely to be coloured by interpretations of material collected, it is fair to also acknowledge some assumptions made in terms of the world-view held by the researcher, i.e. me.

I assume the existence of an objective reality. If nothing else, doubting it would make any enquiry into it utterly useless. I do not, however, believe reality to be directly accessible, but something that different actors will form their own interpretations of at different points in time. Furthermore I assume that people have free will, and in most cases are, within certain limits, free to act in accordance with it, and hence also shape the reality.

Scientific theories are constructs that are more or less useful for describing or making predictions about the world within certain boundaries. I do not adhere to the idea of any scientific paradigm to actually be true. That said, they can have more or less truthfulness to them, and can be more or less instrumental for a specific purpose. From my perspective, I can hold a conviction and apply a theory as long as it proves useful for rendering insights. I believe different theories could be used to shed light on a phenomenon from different perspectives, as this would highlight some problems in the extent to which we could take one theory or another to be true.

Different approaches can only be evaluated in light of their respective goals. There is many a ways of approaching research, or, in the words of Lazarus (1991, p.15) *"Any field of inquiry that seeks programmatically to reason about its phenomena, and to build and evaluate*

understanding through observation, is a science. It uses multiple methods of research, whatever may be available to get at its phenomena, and tries to conceptualize about its structure and process within a coherent and self-consistent framework of logical thought".

It is sometimes appropriate to aim for cumulative refinement of how a certain phenomenon is conceptualised, but I do not reject the idea of sometimes making bold conjectures that are then put to test. For most problems a range of different methods could be applicable, but just like theories methods also imply certain framing. This does not, however, imply that anything goes. Rather it implies that there is a need to actively reflect on one's doings, test the applicability of one's concepts and so on.

The task of the researcher is to construct meaningful propositions about the phenomenon at hand. The thoughts put forward in this thesis are my interpretations of descriptions of experiences shared by everyday people and I trust them to have communicated them to the best of their ability. I, on the other hand, take it as my responsibility to try to stay truthful to the material, while acknowledging that different researchers come to different interpretations and that someone else would have found other aspects in the material I have studied.

3.2 An exploratory qualitative triangulating research approach

The project can be described as taking an *exploratory*, *qualitative*, *triangulating* approach.

One alternative for approaching reduce would be to aim to reduce researcher bias, e.g. by abstraction from the material, building towards a cumulatively refined body of knowledge coined in discrete observational terms, controlling all factors but the ones to be researched. Such an approach would have allowed for hypothesis testing through attempts at falsification. However, science does not always move in small cumulative steps[33]. Based on the reviewed frameworks in chapter two, it was not possible to identify a clear knowledge frontier from which a next step using controlled experiments would clearly lead to a contribution. There is seemingly a lack of basic empirical data with respect to the significance of different aspects in eliciting experiences. Controlling for various factors and de-contextualising relations between people and things, it would be difficult to say anything about the boundary conditions under which results could would apply to other settings. This makes it appropriate to take an *exploratory* approach in order to identify themes that emerge in the type(s) of explanations people put forward when describing experiences with things.

Understanding significance by exploring it from the perspective of the people who have experiences with things, has implications for what data should be collected and how it is to be analysed. To gain an understanding of perspectives there is a need for contextualised information which implies that, at least initially, a *qualitative* approach is relevant.

33 Cf. Kuhn (1996).

What information can be derived from studies is not only a function of the phenomena, but also of how studies are framed and there is reason to expect that outcomes are highly dependent on methodological choices. The ambition has been to find similarities and differences, comparing and contrasting factors that emerge under different conditions. The strategy taken *to elucidate affective relations to things* in this project has hence been to employ *triangulation*[34].

The origin of triangulation as a research strategy has been attributed to Webb et al. (1966) who, according to Bryman and Bell (2007), put forward arguments about the use of more than one way of measuring as a way of increasing confidence in findings. Its widespread application is, however, typically referenced to Denzin (1970), who identified four types of triangulations: data triangulation (sampling of data from different sources), investigator triangulation, theoretical triangulation (using more than one theory as a foundation for interpretations), and finally methodological triangulation (using more than one method to gather data). Flick (1992) describes how triangulation was originally proposed to support validity, but states that this later came to be questioned by Fielding and Fielding (1986). Central to this criticism was that the arguments promoting triangulation to too great an extent emphasised an objective truth, while the real benefits of contributing to depth and breadth of insights had been somewhat neglected. Bazeley (2004) describes how Denzin also changed his ideas about the value of triangulation as a means to gaining an in-depth understanding rather than truth.

According to Mathison (1988), triangulations have in many cases been discussed as a way of using multiple methods and sources to approach a single proposition. When studies yield converging results, this is taken to indicate robustness. However, in Mathison's view different studies are likely to give different, often diverging[35], insights. Different methods are likely to yield information of different characters. As an example, Morgan (1998) describes how individual interviews and focus groups may lead to information that reflects private and public ideas respectively. Different methods may also lead to results on different issues.

In the context of UCPD, triangulation of data collection methods has been advocated by Sanders (1993) as way of identifying a wider range of needs. Furthermore, Kaulio and Karlsson (1998) describe how triangulations of location, knowledge and method can be used as strategies in investigations of user requirements.

In the specific project, triangulation is used to support an understanding of affective relations to things, adding breadth or depth of analysis, as well as questioning the framing of the phenomena and reducing bias towards certain issues due to methodological choices. The project rests on an overall triangulation of perspectives,

34 I use the term triangulation to refer to the application and combination of several research methodologies in the study of the same phenomenon.

35 Differences may stem from different levels of analysis, as well as actual discrepancies in the phenomena being studied. Taking one perspective, some issues may come to be neglected as they are not made visible. Divergence may be relevant to driving a field forward to the extent that it allows dissociation of different phenomena previously treated as one, hence refining the understanding of the topic at hand.

as well as triangulation of some other aspects, as described in the following two sections.

3.2.1 The studies

Altogether six studies have contributed to the project. However, rather than returning to the same questions with one recursively evolved model from one perspective, the approach taken has been to address the topic from a number of different angles, using various methods. The specific studies were not predetermined but followed from available research collaborations and a set of insights that have grown over time. The studies have come from three perspectives[36], see Fig. 15, and employed different methodological choices, see Table 3.

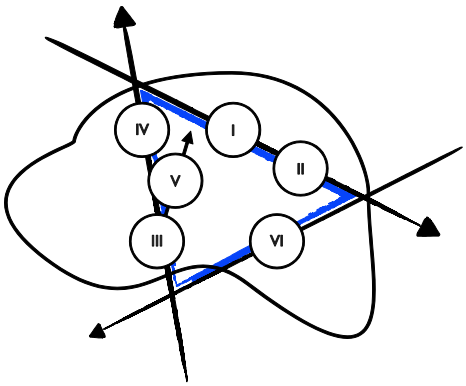


Fig. 15 Relation between studies. The different studies were done taking different perspectives as starting points resulting in an overall data triangulation. However, there is also a relation between studies, in that the outcomes for example of Studies (I) and (III) affected the design of subsequent studies.

Studies (I) and (II) were broad explorations of experiences with physical products covering how users describe their relation to things, what they find significant in products and how they describe things they experience to be positive/negative. Study (II) relied on self-reports in which participants were instructed to document products and situations eliciting experiences. The instructions were in part based on factors that had been identified in the prior study.

Studies (III)-(V) result from a project addressing the conditions for acceptance of Product-Service systems (PSS). The basic idea in PSS is charging for function rather than selling solutions[37]. However, consumers seek a wide range of benefits in products, and it is not necessarily easy to specify one specific function of a thing. These studies elaborated on factors affecting user acceptance of such solutions, and aimed to identify challenges, support requirements elicitation and early stages of PSS development. Outcomes from study (III) fed into studies (IV) and (V).

36 Some of the studies (III-VI) have, in addition to what is presented here, also had other aims. These and the corresponding results are briefly introduced here, but I have emphasised results that have a bearing on this thesis. For more details on the particular results, the reader is referred to the referenced writings.

37 More general information about PSS can be found in the appended paper C, and in the descriptions of studies (III-V) in Chapter 4.

Study (VI) focused on meanings attributed to goods, and featured a methodology for construct elicitation normally used in connection with repertory grids. This methodology has been promoted as particularly suitable for enabling participants to express otherwise tacit knowledge without forcing the use of predetermined concepts.

Table 3 Some details about the studies.

	(I)	(II)	(III)	(IV)	(V)	(VI)
Theme	Descriptions & explanations of emotions with things.		Interpretation and personal significance of hypothetical PSS offers Anticipations of a future with them and comparisons to present product use			Constructs used to distinguish between different products
Data collection method	Focus Groups	Self reports	Focus Groups	Semi-structured interviews	Focus Groups	Triadic construct elicitation
#Participants	22	53	15	7	13	49

The material was analysed with respect to each study throughout the project. Finally an analysis *across* and *between* the studies was also made, see Figs 16 and 17.

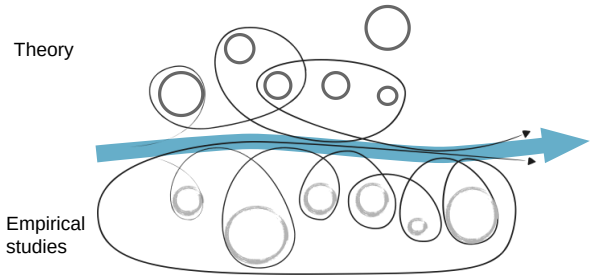


Fig. 17 My conception of the problem has evolved throughout the research process. It was partly shaped by analysing the empirical material study by study (smaller loops at the bottom half, and finally an analysis across the studies (larger loop). In addition, it has been influenced by miscellaneous theories throughout the project, some of which I have been enthusiastic about at certain points of time, only to later realise that they were less applicable to the subject than I had at first thought.

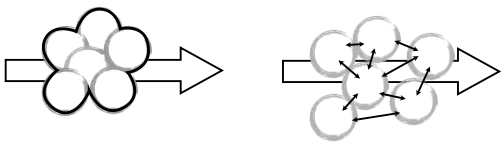


Fig. 16 The final analysis was made with respect to the material as a whole (left) as well as in terms of differences in results between studies (right).

3.2.2 Triangulations in the project

Three overarching perspectives (explorations of experiences with goods, conditions for consumer acceptance of PSS, and constructs used applied to distinguish between products) have been triangulated. In addition to these the project has also featured various other triangulations[38]. It involved a range of participants with various backgrounds discussing various experiences with products, providing foundations for *data triangulation*. Furthermore, the studies featured a range of different data collection methods, for example focus groups, semi-structured individual interviews and self reports and in some cases also different methodological choices within one and the same study. As an example, the instructions for the self-report study asked questions both openly about general explanations and on a more detailed level concerning predetermined factors. As a consequence there is also some degree of both *within-method* and *between-method triangulation*.

A central methodological triangulation in the project concerns the extent that participants shared information on something that had in fact happened in their everyday life, or something that occurred in relation to product representations used to elicit information, see Fig. 18.

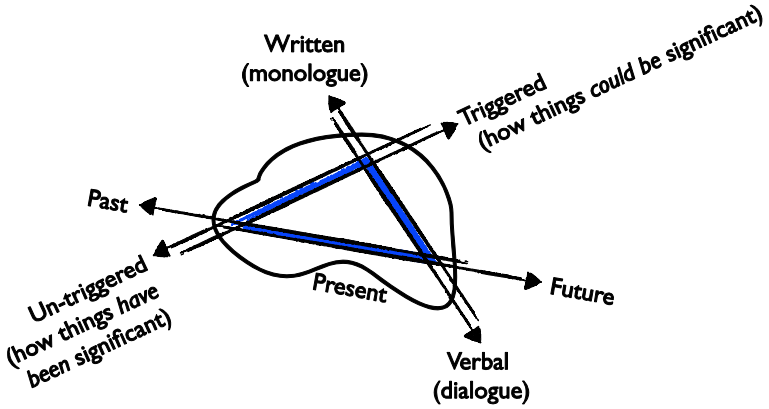


Fig. 18 Some different perspectives by which the studies featured methodological triangulation used for exploration.

For the purpose of this thesis it information has been collected on participants' actual relations to everyday things, the way these occur in their everyday life. Literature on qualitative research methods typically stresses the importance of not influencing the informants in interviews. However, the extreme of leaving the informants completely free to talk about whatever they choose to is not necessarily fruitful.

38 In addition to the triangulations described in this section, the empirical material has been exposed to analysis by different researchers. Furthermore the study designs and data collection are a result of cooperation with colleagues. Both these factors can be seen as a form of *investigator triangulation*.

In addition to *untriggered* information, some affective relations may become foregrounded by actively creating conditions for participants in studies to share information by *eliciting* and *triggering*[39]. As an example, a product representation can be used as a starting point for collecting information about opinions about the product displayed in the representation, or reflections on memories of similar products.

What information is given is also to a great extent governed by what questions participants are asked and how information is collected. For instance the descriptions given in *written* self-report may potentially differ from the *verbal* statements made in dialogue.

An interview situation is a purposeful interaction between an informant and the interviewer in which the interviewer directs a conversation towards issues of interest (Kvale 1996)[40]. The focus of questions, for example whether they focus on memories, something in the present or future, will affect the dialogue and the information given by participants.

The degree to which participants are given scope to elaborate on different themes, the extent to which there is a dialogue between participants (for example in a focus group), how much an interviewer is probing[41] etc. all contribute to the degree to which the dialogue between actors becomes more or less *open* or *constrained*.

In the studies, these aspects were used in various ways to capture information on affective relations to things from different perspectives, see Table 4.

39 The term *untriggered* is used here to refer to issues that participants face in their everyday lives. This can be contrasted with the somewhat artificial setting in which many studies take place. I use the term *triggered* to refer to reactions and judgements in relation to something *in* the study, and *elicited* for something that the participant is made aware of through some methodological aspect.

40 The degree of direction may vary, ranging from open to semi-structured and structured. See for example Lantz (1993)

41 The term *probing* is here used to refer to the act of interviewers asking follow-up questions in order to collect more in depth information.

Table 4 Some methodological differences between the studies

<table>
<tr><th></th><th>(I)</th><th>(II)</th><th>(III)</th><th>(IV)</th><th>(V)</th><th>(VI)</th></tr>
<tr><td>Untriggered /triggered</td><td rowspan="2">Participants shared some untriggered experiences Visual product represent-tations and some tangible products were used to start discussion and act as triggers</td><td rowspan="2">Untriggered. Participants were encouraged to share descriptions of strong experiences with things</td><td>Participants shared untriggered accounts on experiences with product rental</td><td>Participants shared untriggered accounts on experiences with product rental and their present product use</td><td>Participants shared untriggered accounts on experiences with product rental</td><td rowspan="2">Triggered with triads of photographs</td></tr>
<tr><td colspan="3">Hypothetical PSS offers were used to trigger discussions</td></tr>
<tr><td>Collected data</td><td>Transcripts of group discussions</td><td>Self reports on predetermin ed aspects</td><td>Transcripts of group discussions</td><td>Transcripts of interviews</td><td>Transcripts of group discussions</td><td>Protocols of bipolar constructs</td></tr>
<tr><td>Temporal focus</td><td>Past / Present</td><td>Past</td><td colspan="3">Present - Future</td><td>Present</td></tr>
</table>

4 The studies

This chapter describes key findings from the six studies.

4.1 Study (I) Experiences with things - Focus Groups

Study (I) aimed to identify what people perceive to cause experiences with products, including what they react to or judge (the objects[42] of their experiences), as well as how some things are significant. The narrower goal was to identify how participants in Focus Group sessions discuss experiences with things.

4.1.1 Method

Participants with diverse backgrounds elaborated feelings with products in three Focus Group sessions held in a seminar room on a university campus, each lasting approximately two hours. The twenty-two participants[43] were recruited among volunteers for studies on the relation between users and technology.

The sessions were structured around a number of questions that drew on participants' prior experiences with things as well as products presented to them. To create a common reference, and focus statements on emotions rather than other feelings, participants were shown photographs depicting facial expressions[44]. They were then asked to describe examples of products that had elicited strong experiences, followed by them verbalising their immediate responses to a set of visual stimuli depicting a range of products. The product representations included prototypical sketches, photographs of products in context as well as on a white background, and were presented either using a projector or postcard-sized printouts. The purpose of presenting participants with products was partly to collect comments on the portrayed artefacts, but primarily to trigger discussion. Finally the sessions ended with summarising discussions of factors affecting the elicitation of feelings with products.

The interviews were recorded and fully transcribed. Transcripts were then reduced, and the material was coded for content analysis with respect to sources of emotional experiences.

4.1.2 Key findings

Many different aspects may serve as objects for experiences, and the sources of emotions and feelings must be sought well beyond the product.

---

42 Objects here refer to what an (intentional) experience is directed at, for example the expression of a thing being the object of judgements of beauty.
43 12M, 10F ages 24-81
44 There is a direct relation between at some basic emotions and distinct facial expressions, see e.g. Ekman (1982)

Participants in some cases described experiences that focused on products. However, a large proportion of the comments did not focus on material aspects of products, but on how products had, or could have, an impact on use.

With the exception of details that clearly deviated from what participants would expect to see in such a product, physical attributes, features etc. were rarely central to the accounts. More frequently the products' technical and communicative functions were discussed as significant. Most characteristically, participants discussed interaction and use, and shared descriptions of how products had an impact on doing something. Many negative comments came in relation to products that were difficult to understand or handle whereas positive comments were often made in relation to products as tools for achieving some result.

When passing judgement on the products presented to them, the participants' comments ranged from concrete aspects to generalisations about products, for example in terms of a product representing a larger category. As an example, a picture of a deck of cards elicited not only comments about its design, but also about the idea of cards in general and gambling. Ideas about more general categories in some cases coloured judgements about specific products. As an example a participant commenting on a pair of pliers depicted in a photograph described them as a hand tool, then moved on to stating that hand tools are good, and then expressing a liking for the specific product.

In many cases comments were made on ideas the products represented. When freely discussing products of their own choice, the participants often made reference to memories of situations where the product had implications for what they were doing. They also discussed associations and ideas beyond products as such, for example wristwatches representing an obsession with time in an ever faster-moving society. In a few cases participants made remarks about the way products were presented in the stimuli used to trigger discussions. In the first of the Focus Groups participants commented on the context in which some of the products were portrayed. In the following sessions products were instead presented on a white background. However, this also seems sometimes to have coloured how participants attributed the product meaning. As an example, participants made explicit remarks about the white background on which a knife was presented, giving associations of evidence material.

Looking at why certain things were significant to participants, explanations included both practical consequences and associations. There was a tendency towards products applied in voluntary activities (e.g. recreation) being perceived as more positive, and products associated with chores being perceived as negative. Furthermore, comments were frequently more diverse for complex products, often appreciated for their functionality, but perceived as negative when they failed to live up to expectations. Participants discussed issues such as social aspects (i.e. norms), the product's potential for helping the user carry out some action (i.e. functionality and usability), and frequently personal goals and values such as being in control.

While participants in study (I) were asked to report *emotions* with products, they described a range of different types of feelings. Rather than using terms referring to

basic emotions they talked in more general terms about issues such as good versus bad etc. Furthermore, the reported experiences covered dispositional preferences for certain types of products (for example likes and dislikes for computers) as well as more acute states (for example being infuriated by a malfunctioning product).

Results from this study have also been reported in Paper A, and in Hiort af Ornäs and Karlsson (2004).

4.2 Study (II) Experiences with things – Self reports

Study (II) aimed to identify what people perceive to cause experiences with products, including what they react to or judge (the objects of experiences), as well as how some things are significant. The overarching aim was therefore to identify what people perceive to cause emotions with products and more narrowly how participants describe experiences with things in written self-reports.

4.2.1 Method

Fifty-one participants taking various courses and workshops on design for emotional experience were, after being given basic introductions to emotion psychology, asked to submit self-reports describing emotional experiences with things. Participants came from various cultural backgrounds (US, India, Sweden) and either worked in the automotive industry or were taking a programme on Product Design Engineering.

The instructions asked for written descriptions of situations in which products had played a central role in the elicitation of positive and negative emotions. Participants were instructed to document the product, the experience, the situation and their own explanation for what may have caused the experience. They were, within certain time limits, free to complete the assignment when and where convenient to them.

The submitted material was analysed with respect to what participants focused on as being significant. The full material first anonymised, and used to develop coding categories. Of the submitted 298 self-reports 50 accounts were then randomly selected for double coding by independent researchers, agreeing on 46/50, i.e. 92% of the accounts. The categories were then used to code the material top-down.

4.2.2 Key findings

Participants brought up a range of different products, including consumables, clothing and accessories, electronics and machines, products used in leisure activities, automotive products, but also architecture and living things.

More complex products sometimes came with more diverse comments but based on the participants' examples it does not seem as though a specific category of products elicits emotions.

The submitted accounts were often rich, concerning a range of different, sometimes related, issues such as a product performing well and being useful in realising some

goal. In some cases the participants' examples focused on products as such, for example in terms of having certain functionality or performance. Physical characteristics such as dimensions, material etc. were sometimes mentioned but as in study (I) they were rarely in focus for the examples. More frequently, the participants' reports focused on visual expression, technical functionality etc. Participants also in many cases focused on ideas beyond the product as such, for example on past experiences with the product.

As in the prior study, participants frequently focused on use, what the product was for, how well it performed, how easy it was to interact with etc. Furthermore, situational antecedents and episodes surrounding the product encounter seem in many cases to have influenced the experience. Sometimes these concerned the state of a product. More frequently, however, the significance seemed to lay in events, for example the participant coming home and finding the bed untidy.

Changes in a course of events were often in focus for participants' examples for example things being encountered when doing something else, or breaking down when being used.

Also the explanations for why the experiences were elicited were similar to those in study one. Participants provided a range of different explanations for, including characteristics of things, events and use. In some cases they passed judgements on products, commenting on issues such as functions, technical performance etc. These judgements were frequently tied to some expectations, for example with products failing due to quality problems, eliciting disappointment.

Often, the reported examples emphasised the role(s) of products in context and use. A reoccurring theme in participants' explanations of experiences with things was the degree to which products support, or get in the way of, the person in doing something. The participants' examples sometimes concerned memories of events in which they *had* or had not realised goals. In other cases they focused on things' *potential* to support use and meeting goals, i.e. issues of utility and usability such as what the product is used for, how well it performs with respect to this, and how easy it is to get it to perform. Products were in many cases described as being good or bad because of being associated with desirable activities (for example hobbies) or compulsory ones such as chores. Participants also commented on less instrumental aspects of interaction i.e. being intrinsically pleasant or unpleasant. Furthermore, comments were also made about goals that would perhaps not typically be considered in relation to products' functionality and usability, for example feeling good about being able to perform well, products affecting relations to other people etc.

Sometimes participants focused on situations rather than products. In other cases a product was in focus, but contextual factors coloured elicitation and characteristics of the experience. Some examples concerned changes in a course of events that in some way deviated from the persons' expectations. Furthermore, participants described a range of different types of activities in which they could be expected to focus on a product to varying degrees for example in considering the product when shopping, coming across it when doing something else, using it and so on.

Although participants had been given some basic introduction to concepts and theories relating to emotions, participants described a range of different experiences. As with study (I) their reports often covered issues that would not be regarded as emotions as they were to do with bodily states, beliefs about something, or more stable preferences rather than brief states. Furthermore, in many cases participants' reports listed not one single emotion but several different experiences occurring in parallel or in sequence.

While study (II) used a different methodology than study (I), the range of factors discussed by participants is similar, and both studies highlight a need to look beyond the product for factors explaining experiences with things. While some experiences are oriented towards products, situations were in many cases central to the submitted reports.

Results from this study have also been reported in Paper B, and in Hiort af Ornäs (2006b, 2009).

Display 1- Product Service Systems

Product Service Systems (PSS) are combinations of tangible goods and intangible services developed in such a way that the combination can meet some customer need (Goedkoop et al. 1999). A basic assumption is that "function is the key to customer's satisfaction, not products per se" (Mont 2002, p.238). The ideas are typically put forward resting on two foundations: a focus on final functionality or satisfaction rather than specific solutions realising this, and a green mindset rather than current company practices (Tukker and Tischner 2006). As described by Manzini et al. (2001) "the consumer's need is met by selling utility instead of providing a product". From a UCD perspective these ideas are interesting, as they imply a shift in perspectives from a focus on creation and sale of goods to need fulfilment. Commonly owned products are replaced by a mix of products and services without ownership being transferred to the customer (Manzini et al. 2001). Due to the focus on providing functions, the ideas have also come to be known as functional sales (see for example Ölundh 2003).

An increasing interest in PSS can be seen in the light of societal trends (Cooper and Evans 2000) for example from mass production to flexible production, dematerialisation (Heiskanen et al. 2001) and servicification (OECD 2000). Services and goods have their own differing characteristics (see Table 5), among the more notable ones being that while goods can be produced for the shelf, services are produced and consumed at the same time, and are essentially about processes (Grönroos 2001).

Table 5 Some differences between services and goods based economies. Adapted after Bhamra et al. (2001).

	SALE OF PERFORMANCE (service economy)	**SALE OF PRODUCT (industrial economy)**
Performance	Performance, customer satisfaction, results	The object of a sale is a product
Seller liability	Seller is liable for the quality of the performance (usefulness)	Seller is liable for manufacturing quality (defects)
Payment	Payment if and when the performance is delivered (no fun, no money)	Payments for and at transfer of the property rights (P-O-S transaction)
Work	Work in situ (service), around the clock, no storage or exchange possible	Work centrally/ globally (production), products can be stored re-sold, exchanged
Rights	No transfer of rights and liability to user	Rights and liability transferred to the buyer
User advantages	Flexibility in utilisation Cost guarantee per unit Zero risk Status value as performance	Rights to increase in value status symbol as product
User disadvantages	No right to increase in value	Zero flexibility in utilisation, no cost guarantee, full risk for operation and disposal
Marketing strategy	Customer service	Publicity, sponsoring
Notion of value	Utilisation over long-term period	High short term exchange value at point-of-sale

Most if not all products can be seen as combinations of services and goods. However, the respective size of these components differs, see Fig 19. It is possible to draw a distinction between different PSS based on their constituents, see Table 6.

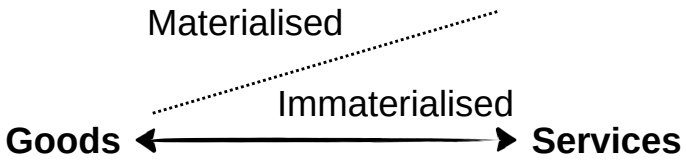


Fig. 19 Goods-Service continuum, adapted after Zaring (2001). Products may to a varying degree be constituted by goods and services, ranging from purely materialised (goods) to immaterialised (services).

Table 6 Classification of PSS, after Hockerts (1999)

	Description	**Example**
Product-oriented	Products are sold with additional services	Cars sold with service agreements
Use-oriented	The use of (or the access to) products are sold	Car rentals
Result-oriented	The customer pays for a guarantee of certain functions or results	Transportation

PSS are typically advocated from an environmental perspective due to the possibility of shared use of one and the same product (see e.g. Meijkamp 2000), and increased incentives for developing durable goods as ownership remains with producers (Mont 2002).

The commercial examples of PSS are more frequently found on producer than consumer markets (Mont 2004; Schrader 1999). Furthermore the B2C examples that exist are frequently discussed from an environmental rather than functional perspective. A potential challenge, or obstacle, for PSS to private consumers is whether they would be prepared to give up on ownership, as this may contribute to security, control, prestige, status etc. (Mont and Lindhqvist 2002; White et al. 1999; Ölundh 2003). However, there is a shortage of studies addressing PSS from a consumer perspective (Mont and Plepys 2003). A more extensive background to PSS is provided in Paper C. See also Hiort af Ornäs and Rexfelt (2006a).

4.3 Study (III) Product Service Systems – Focus Groups

Studies (III) – (V) addressed what people seek in products through a series of explorations on Product Service Systems (PSS).

The idea that consumers seek functions rather than technical solutions has been used to advocate a functional society; which "*optimizes the use (or function) of goods and services and thus the management of existing wealth (goods, knowledge, and nature). The economic objective of the functional economy is to create the highest possible use value for the longest possible time while consuming as few material resources and as little energy as possible. This functional economy is therefore considerably more sustainable, or dematerialized, than the present economy, which is focused on production and related material flows as its principal means to create wealth*" (Stahel 1997). An attempt at approaching this is Functional Sales in which customers pay for utility rather than ownership of products. The actual solutions are not necessarily determined in advance, and may be realised by combinations of goods and services in what has come to be known as Product-Service Systems (PSS), see Display 1.

Studies (III)-(V) took hypothetical PSS solutions as a starting point for identification of what a transition to PSS might mean for private consumers, the implications they may have, and for exploring what people seek in things. More specifically, Study (III) aimed to explore issues affecting consumer acceptance of PSS solutions, and how private consumers[45] reason when presented with such offers. Furthermore, it aimed to elucidate differences between a traditional product and an offer in a functional sale, seen from a consumer perspective.

4.3.1 Method

Participants discussed four hypothetical PSS offers and more general attitudes to services such as product rental in two Focus Group sessions. These were held in a seminar room on a university campus, each lasting approximately two hours. Participants (5M, 10F, age 22-64) had diverse backgrounds, and were recruited among volunteers for studies on the relation between users and technology.

The Focus Group sessions started with participants sharing examples of products they had rented. To trigger discussion, participants were then presented with four hypothetical PSS solutions[46] (see Table 7) focusing on consumption without ownership: car rental, clothing, energy services, and TV on demand. These were presented in ad-like descriptions written in a selling tone. The hypothetical PSS were chosen to be fairly close to solutions that already exist with the ambition of making them easy to comprehend. Participants were asked to envisage usage of the respective hypothetical PSS and discuss the offers. Finally, a summary discussion was held about

45 I here use the term consumer to highlight the role they assume (in contrast to that of users)

46 The offers are more extensively described in Rexfelt and Hiort af Ornäs (2006).

the feasibility of PSS in general. The interviews were recorded, fully transcribed, and exposed to content analysis by two researchers negotiating interpretations.

Table 7 Descriptions of the hypothetical PSS offers used to trigger discussions in study (III) and (IV)

Key idea	Service type
Car: A car supplied by one of the world's leading car companies, presented with three alternatives; "Alpha: You buy the car the traditional way. [...] Beta: You pay a fixed monthly fee of 3 000 kr per month but do not own the car, instead a lease for 5 years. Thereby you avoid responsibility for service, repairs, etc. Gamma: You pay a fixed monthly cost of 1 800 kr/month but do not own the car; instead you sign a lease for two years where you get access to a car of the same type as in the other offers 14 days per month".	Predominantly access, some product extension through increased service in alternatives beta and gamma.
TV: A service where the consumer can order TV programmes at any time and avoid unwanted TV programmes and commercials. The offer was presented as coming from a number of cable TV suppliers and containing thousands of TV series, movies, documentaries, events, etc.	Predominantly access, some product extension through access to a wider selection of programmes.
Energy: An energy supplier takes over the operation of the customer's heating system and promises to provide an agreed indoor temperature at a fixed price that is lower than what the customer pays today, regardless of what happens on the energy market. The producer claims to be able to achieve this through saving energy by adjustments to the system. The terms of this deal are that the customer must agree not to change the producer's adjustments to the system, and not to subject the system to loads beyond what is normal.	Result-oriented
Clothing: Subscribers can borrow clothing from a 1,342 square metre wardrobe for a monthly fee. The only limitation is that they cannot have more than ten items at a time. The wardrobe is said to contain accessories and most types of clothing apart from underwear. The offer comes with the possibility of consulting the company's professional stylists. The company claims to continuously replenish the wardrobe and every month stock up on "the latest".	Predominantly access, some product extension through the company's stylist.

4.3.2 Key findings

Participants discussed the conditions of the PSS, for example financial and behavioural commitments, as well as anticipated implications and conditions under which they would find the offers appealing (for example if the service was recommended by friends). In addition, they also discussed factors to do with the description of the PSS solutions, and their interpretations of the service including beliefs about the service provider.

In some cases they commented on how the offers were described, for example phrasings, spelling mistakes etc. but also the style in which the offers were presented. Participants also made remarks about "small print" clauses regulating consumer and producer responsibilities. This is noteworthy as they were not part of the PSS descriptions, but something participants read into them.

In a few cases participants also raised concerns about the physical components of the PSS, asking for example about the aesthetics of technology providing the TV on-demand service and the style of the clothes in the clothing offer.

Participants frequently commented and raised questions about the service supplier, and the company's ability and intention to deliver what was promised in the PSS descriptions. They questioned whether the actual services would match up to what was described or if the descriptions should be seen as sales pitches making promises that would not be fulfilled. Furthermore they described how companies in their view normally had the objective of making money at their customers' expense. Participants showed considerable distrust of producers, in many cases drawing parallels to "package deals", cases where companies add bells and whistles to an offer by adding extra products etc.

Many comments concerned behavioural implications. A main driver for product rental stated by participants was freedom from fuss and responsibilities. With rented products, participants did not have to worry about maintenance etc. to the same degree. Participants discussed practical consequences of the PSS if adopted, describable in terms of changes in what the person can and must do, for example *being able to* access wide content in the TV on demand offer, possibly *having to* make bookings in the car leasing offer but at the same time being *relieved* of having to worry about maintenance, but *not being able to* use the car as a storage space for CDs.

The idea of delivering an unspecified solution that meets a specific user need is, at face value, appealing but participants raised concerns indicating that this may not be as easy as it first sounds. It would assume that there are explicit goals that can be specified. However, participants described a range of different reasons for their product use. As an example, one participant described how keeping up to date with TV programmes was not only intrinsically important, but something that had consequences, as much of the lunchroom conversations at work revolved around these. Furthermore, as pointed out by one of the participants in relation to the car-lease offer, a car is not just a way of getting from A to B; it is something that enables you to go to the coast on a sunny day - even if you choose not to.

In many cases it seems as though the primary significance of the solutions to participants was through behavioural consequences, but that these may be difficult to anticipate. What is presented in a service description is a "promise" from a producer to exhibit certain behaviour. When judging the desirability of such an offer, the consumer has to make predictions concerning issues such as the likelihood that the producer actually describes honest intentions, has the capability of fulfilling these etc.

Both the interpretations and evaluations made by participants seem to have come with considerable uncertainties. Participants discussed what the characteristics of the PSS would in fact be, often drawing on associations with other solutions. In forming an interpretation of what the solutions would in fact be, participants raised concerns regarding *trust* in the competency and motivation of the service provider to live up to the described benefits. Participants also discussed the rigidness of the offers i.e. the potential to customise the service either in advance or with changing needs. *Freedom*

from commitments in many cases seemed important, potentially because of problems anticipating consequences.

Participants discussed the desirability of the PSS offers, in many cases in terms of new solutions' behavioural implications, expanding or constraining the possibility of meeting various goals by being able to and or having to do something.

Results from this study have also been reported in Paper C as well as in Hiort af Ornäs and Rexfelt (2006b) and Hiort af Ornäs (2006a).

4.4 Study (IV) Product Service Systems – Individual interviews

Study (IV) aimed to complement the earlier study with richer data from individuals, and explore changes in activities introduced by PSS solutions. Study (III) had indicated that behavioural consequences were central to participants. However, the focus group format does not lend itself well to following up on the behavioural consequences for a specific person. Study (IV) hence explored issues affecting consumer acceptance of PSS solutions in individual interviews. As participants in the earlier study had raised concerns about whether solutions would actually live up to expectations, the study also aimed to further elaborate what people consider when interpreting and evaluating PSS offers.

4.4.1 Method

Participants in semi-structured interviews were asked to elaborate on one or more of the offers from Study III[47]. The interviews lasted 1-2 hours, and were held at a location convenient for the interviewee, for example at their home, workplace etc.

The participants (4M, 3F, ages 22-62) were presented with the same hypothetical PSS as in Study (III), focusing on ownershipless consumption. In order to obtain comments on something significant to participants, they were asked to choose one or two of the offers to discuss. Participants were asked to elaborate on the present situation: what they used, what they sought in that product, what they had to do in order to meet those goals etc. The interviews proceeded with elaborations on what participants would expect a future with the PSS offer to be like, what they would have to do, what changes it would introduce etc. When participants made remarks about the way the PSS was described, these were followed up by encouraging the participant to elaborate on what in the description caught their attention.

The interviews were recorded, fully transcribed, and subjected to content analysis. The material was analysed by two coders, first reducing the material to the general categories: *interpretation* (focusing on the offers design and the participants description of it), and *evaluation*. The information was further condensed to descriptions of current situation (habits, preferences etc.) and anticipated changes the offer would

47 See also Hiort af Ornäs and Rexfelt (2007).

imply for the different participants. For the solutions that were commented on by several participants, recurring changes and questions raised were then identified.

4.4.2 Key findings

The participants shared rich descriptions about their current situation, and potential changes with the offer. Furthermore, they raised a range of questions reflecting needs for information in order to make evaluations. Participants commented on the PSS descriptions, their interpretations of the solutions, their current practices, as well as anticipated futures with the solutions and the changes this would imply.

Also in study (IV) the way the PSS were presented attracted some attention, and participants' interpretations in many cases seemed coloured by associations with other products. Furthermore, participants in some cases expressed that they felt that the offers did not target them due to stylistic aspects of how the PSS were described.

Participants also commented on the solution, in relation to what they were using today, including specific benefits such as access to a stylist with the clothing offer or a wider content with the TV offer.

The participants discussed personal products that they were reluctant to replace with a service. However, their comments indicated that it is not ownership as such that is important, but the practical implications it comes with in terms of clothes being worn in to give a certain fit, for example, or being free to customise products and meet various needs associated with the activities surrounding the product. In other cases their comments concerned activities they had to engage in to use a solution, for example booking a car, getting to a clothing shop etc., or in terms of the consequences of using the new solution. Many comments were made in relation to behavioural consequences, in terms of participants being able to or having to do something in a future with the solution, or what they would no longer have to or be able to do.

As with study (III), insecurity about what to read into the offers was also notable in this study. Participants commented that companies often exaggerate benefits in their market communication. However, compared to study (III) participants were a little less suspicious, potentially because they were given more time to understand the underlying explanations. In addition to the description of the PSS, participants' comments also revolved around the line of business of the producer, opportunities to take part of experiences of peers with the service etc.

General attitudes for example to TV-watching or consumption were discussed, and participants in many cases commented on the opinions of others and social relations as important. In most cases, however, the evaluation of significance concerned fairly practical implications, described in terms of what they would do today and the desirability of changes that would come with the PSS. In some cases the PSS were perceived as impacting on some end state, for example cutting costs with the energy service. In other cases participants to a greater degree focused on the use of products and services, e.g. the TV on-demand service being a means of reducing the amount of aimless watching of TV programmes that they were not interested in. Participants

commented on the solutions being significant in several ways. Consider, for example, "Peter", who did not own a television. Peter currently watches movies that he sometimes buys from abroad, meaning that he somehow needs to work around regional coding. Peter misses out on some broadcasts such as live sports events, but solves this by watching those events he does not want to miss at friends' homes, or at the local bar. While the TV on-demand service would enable him to watch sports programmes at home, he would then potentially miss out on some opportunities for social interaction etc.

The desirability of the services varied depending on what alternatives the participant had. Looking across the different participants, there were many individual differences with respect to the consequences the solutions would have and what the participants valued. With the energy offer one participant found her energy consumption difficult to overview, and believed the PSS to be a good way of gaining control. Another participant, however, described how he takes great interest in his energy consumption. A few years earlier he had built a fireplace by which he heated his house, and since then he had kept track of his consumption of electricity in different weathers etc. With pride, he described how he had had someone come to assess the house from an energy-consumption perspective and suggest improvements, only to find that he had already taken the measures concerned. Both these participants sought being in control, but their respective interests and the amount of effort they were prepared to put into their energy consumption differed.

The comments made about the different solutions varied not only in to what extent different participants found a certain PSS appealing or not appealing, but also in terms what aspects they gave attention to. Some participants seem to have mostly focused on the results the PSS were to realise, whereas others saw activities such as shopping or trying to control one's energy consumption as either desirable or something they would rather avoid.

As in Study (III), the experiences reported by participants in this study primarily concerned interpretations of the PSS offers, and anticipations of what a future with the PSS solutions might entail. Participants in some cases raised concerns about uncertainties, among other things about their own future needs. When judging the implications of a PSS, a person must make a number of more or less uncertain appraisals about the future. The consumer must pass judgement on whether the offer is at all interesting, i.e. utility in relation to alternatives. Furthermore she/he will also have to anticipate whether the promises will be delivered based on ideas about producer motives and competency. The person making the judgement will also have to appraise any negative consequences, in terms of both the risk of their realisation and how extensive the implications are.

Results from this study have also been reported in Paper C and Paper D, as well as in Hiort af Ornäs and Rexfelt (2007).

4.5 Study (V) Product Service Systems – Focus Groups

The overarching aim of study (V) was to explore issues affecting consumer acceptance of PSS solutions, but this time with result-oriented rather than access-oriented solutions.

The offers presented to participants in studies (III) and (IV) would change the conditions for need fulfilment, but were based on use-oriented services, charging consumers for access to products rather than actual goal fulfilment. From a consumer perspective, result-oriented services are potentially more interesting, but may at the same be more difficult to relate to as they have greater implications changes. In addition, to further elaborate what factors participants judge when considering PSS offers, study (V) hence aimed to further explore challenges in consumers' comprehension of such PSS, whether they could relate to implications, as well as any differences to the prior studies

4.5.1 Method

Participants discussed hypothetical PSS offers, and more general attitudes to services such as product rental in two Focus Group sessions held in a seminar room at a university campus, each lasting approximately 2h. Participants (6M, 7F, ages 22-64) had diverse backgrounds, and were recruited among volunteers for studies on the relation between users and technology.

The questioning route was similar to that of study (III), starting with initial discussions about participants prior experiences with product rental. Participants were then presented with three hypothetical PSS solutions charging for utility, see Table 8[48]. Finally, a summary discussion was held about patterns in the discussions and the feasibility of PSS in general. The interviews were recorded, fully transcribed, and exposed to content analysis by two researchers negotiating interpretations.

Table 8 Descriptions of hypothetical PSS offers used to trigger discussions in study (V)

Key idea	Service type
Money: A service provider offering advice on domestic economy but also acting as a broker for insurance, electricity, etc. with the sales point that negotiating for many clients gives advantages. The service provider charges the clients 20 per cent of what they manage to save.	Result-oriented
Time: The service provider offers to help the client find time by helping out with domestic chores, craft such as carpentering, painting, etc. The customer is charged not for the service but the time the service saves.	Result-oriented
Job: An employment agency providing clients with support for writing résumés, training for interviews, etc. as well as finding potential positions through a network of contacts. The individual customer is charged per interview and a fee to be paid once the service has resulted in employment based on what the person earns at the new job.	Result-oriented

48 The offers are more extensively described in Rexfelt and Hiort af Ornäs (2007)

4.5.2 Key findings

Participants commented on the descriptions of the services, the PSS, thereby associated ideas, the service supplier and to some extent also personal implications.

When discussing product rental, participants described how this may occur due to financial reasons but also as a way of securing performance. Participants commented that goods today often are optimised with respect to life time, making it difficult to anticipate how well, and for how long, something will perform. Product rental was from this perspective seen as a way of guaranteeing avoidance of malfunctioning and having to deal with maintenance.

As in studies (III) and (IV), participants in some cases commented on the description of the offers, e.g. identifying misspellings etc. Participants were in some cases sceptical to whether the services would be realised and questioned producer motives and competence. They seemingly assume that companies want to maximise profit at the expense of the customer and found it hard to believe in the idea of mutual benefits. Furthermore, ideas and similar services were in many cases commented, especially in relation to the employment and leisure time offers.

The discussions also moved from participants judging the offers' desirability for them as consumers, to judgements about the offers from a business perspective. Towards the end of the sessions participants were asked to engage in a discussion about the idea of functional sales. However, the idea in itself seemed to be difficult to relate to. Participants saw payment for function as something positive - but meant that it would take some time to get used to the idea. However, the participants were not for or against functional sales but judged each offer separately.

Participants commented also on social norms. In some cases the PSS were associated with ideas, and sometimes the participants' attention turned to these rather than personal implications. The employment- and the leisure time- offer seem to have been associated with ideas that were somewhat controversial. At the time of the study there had been a considerable debate in politics and media about tax reductions for home services. In addition to being a somewhat politically loaded subject, home services seemed to elicit mixed responses with participants, appreciating being relieved from chores, but in many cases also considering these as associated with spending time with family, and somewhat private.

Evaluating the PSS, participants made more remarks about overall utility, and to a lesser degree compared to study (III) discussed practical consequences. When anticipating outcomes and behavioural consequences, participants' judgements of utility frequently seem to have been made relative to the alternatives. In many cases this was the current situation, but sometimes another good or service, as with the "career service" offer which was compared to the Swedish public employment agency.

Like the prior studies, participants commented on practical consequences, losses and gains. However, the degree to which they did so differed considerably with what PSS was discussed. With the employment offer much is at stake for participants in terms of a potential gain, however the risks are fairly small as the offer does not imply much

aversive effects unless benefits are also realised. The third offer however, focusing on "spare time" could imply much more implications for activities. Participants however clearly had problems relating to this offer. Even if the participants appreciate the idea of having more time they did not seem to conceptualise it as an explicit goal. This offer could have implications for a range of different goals, and participants focused on issues such as being relieved of specific chores rather than "free time".

Participants passed judgement on their interpretations of the services and also expressed some more general attitudes, towards ideas about servants, about unemployment etc. To a lesser degree than in the prior studies they also discussed anticipated behavioural consequences. They demonstrated that they in most cases understood what was presented to them, but were often sceptical to whether it would be delivered, and had some problems relating to the ideas and judging personal implications.

There were large differences in to what extent participants were able to relate to the offerings, and the degree to which they found them to be relevant. As an example, participants who had recently been unemployed showed a greater interest in the employment offer. Differences in perceived relevance were also noticeable between participants with different skills. With the economy offer, the dominant concern seemed to be one of being in control over ones economy. However, this took different forms for different participants. For those who today worked actively with choosing suppliers and reducing costs, the offer was threatening as letting someone else handle these issues implied a *loss of control*. However, other participants found the task of having to actively choose overwhelming and welcomed the offer as a way of *gaining control*.

Results from this study are also reported in paper C, and in Rexfelt and Hiort af Ornäs (2007).

Display 2. Product Semiotics

Products have symbolic qualities (Krippendorff and Butter 1984). This has in the design community been addressed as product semiotics treating things as signs, or sign systems. From this perspective products can be seen as vehicles for communications between a designer and a user or consumer (see e.g. Coates 2003; Monö 1997).

Monö (1997, p.62) draws on Morris (1946) in dividing semiotics ("The study of signs") into Semantics ("The study of the sign's message"), Syntax ("The study of the sign's relations [to other signs] and the way it interacts in compilations of signs"), and Pragmatics ("The study of the sign's use [in different culture and contexts]").

Explaining the meaning of signs scholars such as Vihma (1995) has drawn on Peirce (1894) sign triad, see Fig 20.

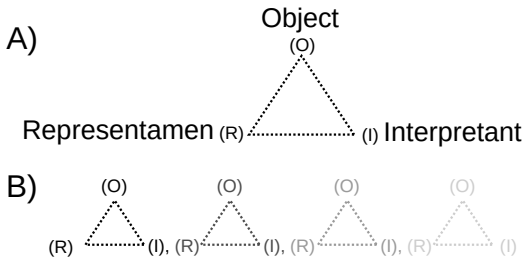


Fig. 20 A) Nöth (1995) describes Peirce's conception of a sign as having three constituents; representamen (the perceptible object), object (that which the object represents) and interpretant (the meaning/interpretation of the sign). Peirce identified three different relations between object and representamen index (physical connection), icons (connection by likeness), and symbols (connection by learnt association). B) Peirce (1894) described how the interpretant form a new representamen, leading to new interpretations in an unlimited semiosis[49].

The idea of addressing a product's appearance as signs has also been addressed from the perspective of what functions the signs fulfil. Monö (1997, p.81) describes four types of communicative functions: "*to describe*: purpose, mode of operation; *to express*: properties; *to exhort:* reactions; *to identify*: a product, its origin, kinship, location, nature or category". These have been further elaborated by e.g. Wikström (2002) who did as series of studies addressing Monö's semantic functions in relation to use and Warell (2001), addressing amongst other things analysis of re-occurring design features supporting brand *identification.* The brand perspective has also been elaborated by Karjalainen (2004) who addressed how a company's strategic intentions can be actualised through the use of visual communications, e.g. through explicit and implicit cues used in products. A classification for products' communicative functions has also been addressed in the Theory of Product Language, see Fig 21.

49 In Hiort af Ornäs (2006a) Pierce's sign triad was used to explain some of associations participants had with the PSS offers in study (III).

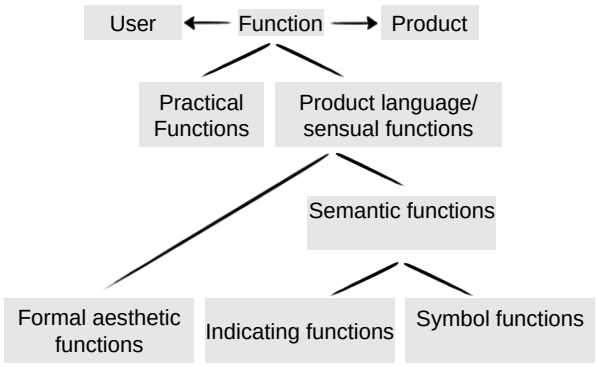


Fig. 21 Classification of product functions in the Offenbach Theory of Product Language, based on Steffen (2007; 2009)[50]. Formal aesthetic functions are in the framework considered those that can be observed irrespective of content or meaning e.g. order and complexity. Indicating functions may identify the product as a member of a category (e.g. as a coat or a pair of trousers), as having certain functions etc. Symbol functions refer to associations and conceptions a person has with the product e.g. in terms of the product having a certain style.

Applications of frameworks addressing communicative aspects of products typically use conceptions of signs such as that of Peirce for *explaining* meaning ascribed to things. For evaluation of how strongly a certain product is associated with certain ideas, ratings are typically collected on some verbal scale, often drawing on Osgood et al.'s (1957) dimensional view of meaning. The bipolar adjectives used in such an approach are in some cases brand values, in other cases something derived from a company's advertising material or from qualitative studies.

The quantitative approaches come with some challenges in that they rely on scales that participants *have to* apply. While often acknowledging the persons' prior knowledge as a central explanation, frameworks addressing semiotics and semantics tend to emphasise products as signifiers, and study patterns across groups. While such approaches have benefits, they also have limitations in that they come to ignore certain aspects of meanings with things. In the extreme case the quantitative approaches may come with some adverse effects, emphasising quasi-causal relations between object and meaning and treating meaning as embedded in artefacts, rather than in culture (see e.g. Keitsch and Hiort af Ornäs 2008). Focusing on the meanings as a function of design features may imply that situational and contextual factors are ignored[51], and the range of different meanings a person may ascribe a thing being reduced to an average across a group. The quantitative approaches hence have limitations in that they capture a specific component of meaning with things, while potentially missing out on other issues.

It is also possible to take the person's cognitions as a starting point to get at meanings with things. Among the possible alternatives is the Personal Construct Psychology of Kelly (1955), emphasising meaning as a function not only of the person, but of how he or she chooses to construe one interpretation out of several possible ones.

50 Steffen references the model to Gros (1976)

51 In study (I) participants commented meaning as highly dependent on the context in which the product was presented- e.g. a living room sofa seemingly standing outdoors, a teddy bear in an armchair implying the absence of a child, a knife presented on white background being commented as evidence material and so on.

Display 3. Personal Construct Psychology

The Personal Construct Psychology (PCP) of George Kelly (1955) paralleled people with scientists continuously refining theories of the world and putting them to the test. According to PCP people are shaped by their experiences and evolve construct systems which are used to prepare the person to respond to the environment. Kelly presents his position as one of *constructive alternativism* in which alternative understandings are collected piecewise (Kelly 2003).

The theory is summarised in a basic postulate according to which "*A person's processes are psychologically channelized by the way in which he anticipates events"* (Kelly 2003, p.7), and a number of corollaries;

Construction Corollary: "*A person anticipates events by construing their replications*".

Individuality Corollary: "*Persons differ from each other in their constructions of events*".

Organization Corollary: "*Each person characteristically evolves, for his convenience in anticipating events, a construction system embracing ordinal relationships between constructs*".

Dichotomy Corollary: "*A person's construction system is composed of a finite number of dichotomous constructs*".

Choice Corollary: "*A person chooses for himself that alternative in a dichotomized construct through which he anticipates the greater possibility for the elaboration of his system*".

Range Corollary: "*A construct is convenient for the anticipation of a finite range of events only*".

Experience Corollary: "*A person's construction system varies as he successively construes the replications of events*".

Modulation Corollary: "*The variation in a person's construction system is limited by the permeability of the constructs within whose ranges of convenience the variants lie*".

Fragmentation Corollary: "*A person may successively employ a variety of construction subsystems which are inferentially incompatible with each other*".

Commonality Corollary: "*To the extent that one person employs a construction of experience which is similar to that employed by another, his processes are psychologically similar to those of the other person*".

Sociality Corollary: "*To the extent that one person construes the construction processes of another, he may play a role in a social process involving the other person*".

From this perspective, people do not merely perceive and interpret stimuli. Rather, a person tries to make sense of the world by applying his or her models derived from prior experiences (construction corollary). In relation to the significance of things, the theory has implications in emphasising meaning as occurring in distinctions along bipolar reference dimensions (dichotomy corollary). The bipolarity emphasises that concepts are only useful to the extent that they help the person make distinctions; there is little point in talking about hot unless there is also cold, heavy unless there is also light and so on. Furthermore, the theory implies some challenges for multidisciplinary development work as the interaction between professionals with different backgrounds in as the success of their interaction depend on the extent they share and understand construct systems.

PCP is closely associated with a technique for data-collection known as the Repertory Grid Technique (RGT) (2000). This has been widely used for clinical purposes, as well as in more product -oriented applications such as capturing brand associations (Caldwell and Coshall 2002), components of subjective meaning in marketing research (Marsden and Littler 2000a; Marsden and Littler

2000b). It has also been applied in relation to questions more closely tied to product development, such as discovering requirements for computer systems (Niu and Easterbrook 2006), identifying factors underlying fabric perception (Moody et al. 2001), sensory analysis of juices (Carbonell et al. 2007), perception of wine packaging (Rocchi and Stefani 2006), exploration of cultural values (Tomico et al. 2009) etc.

The technique may be especially suitable for addressing user experience as it emphasises the persons' constructs, and provides elicitation procedures that allow for direction of attention without relying on predetermined constructs. Furthermore it has also been claimed to capture tacit knowledge (Jankowicz 2001; Stewart and Stewart 1981). While PCP sees constructs as dichotomous providing a dimension between two poles, descriptions such as "warm" – "cold" are labels rather than the poles themselves. PCP considers a person to be able to hold and apply constructs on different levels of cognitive awareness, with some constructs being *preverbal.* While some constructs may be unavailable, the procedures emphasise the perspective of the interviewee. It allows the person to describe the constructs in their own terms and describe also what may be difficult to define in precise terms, and hence addressing issues that may otherwise have remained tacit. For applications in relation to user experience see e.g. Fällman (2003), Hassenzahl and Wessler (2000), Karapanos, Hassenzahl, & Martens (2008).

4.6 Study (VI) Experience of things - Triadic construct elicitation

Study (VI) addressed meanings ascribed to things (see display 2) by using a specific methodology for eliciting constructs (see display 3).

People's thoughts about things often remain tacit as there is little reason to make them explicit, but also in some cases because they are difficult to verbalise. In development work this may have adverse consequences as there is often a need for different stakeholders such as engineers, designers etc. to understand each other and users. Study (VI) applied construct elicitation that have been claimed to be especially suitable for capturing issues that are difficult to verbalise in order to identify dimensions of meanings ascribed to artefacts, and to investigate whether the constructs applied to a specific set of products vary with disciplinary belonging.

4.6.1 Method

Forty-nine participants from academia and an automotive company were interviewed using triadic construct elicitation procedures. Participants in both academia and industry were recruited to represent the disciplines of engineering design, human factors, and industrial design.

Participants were individually shown a series of 9 triads of photographs of products. To identify bi-polar constructs, participants were instructed to for each of the triads share descriptions of how two of the products had something in common (commonality pole) setting them apart from the third (contrast pole)[52]. These procedures draw on the role construct test (Kelly 1955), and have been widely applied in a range of different applications (See Display 3). Each interview lasted roughly 15-20 minutes.

The 357 collected constructs were anonymised and analysed using Jankowicz's (2004) procedures for content analysis of repertory grids. For reliability purposes the constructs were coded by two independent coders, grouping similar constructs that were similar in a bottom-up analysis. Fine grained categories were then merged, and the categorisations made by the different coders were compared. Where differences between coders occurred, the categorisations were negotiated and agreed upon.

4.6.2 Key findings

Participants used various constructs in making distinctions between the products displayed in the triads.

In commenting on the triads participants treated the products differently, sometimes focusing on what the product was used for, an overall application area. In other cases they focused on specific characteristics of the products e.g. their functionality or

52 As the study focused on dominant constructs, participants were asked to use the first construct that came to mind.

expression. Furthermore, participants shared descriptive statements about the portrayed products, their behaviour etc. as well as more evaluative constructs.

The descriptive constructs were oriented towards something, a *focus or object*. In some cases this was a product, in other cases they the activities in which the products would be applied. Furthermore they also have a theme e.g. technology or styling. The bottom-up content analysis led to the following overarching categories[53];

- Aesthetics (37%); Constructs such as "Boring - nice design", and "Cheap copy, no specific expression - Distinct expression" focusing on form, visual expression, style (e.g. old-fashioned, American), visual effects (e.g. floating, dynamic) etc.
- Usage (25%); Constructs such as "Active interaction - On/off", and "Practical, useful - Toys" having to do with what the product was used for, how it was interacted with etc. As in studies (I) and (II) participants distinguished leisure time activities from compulsory ones/chores. They also in some cases associated things with experiences of use, commenting on issues such as the wind in ones face when riding an MC etc.
- Technology (17%); Constructs such as "Lowtech - Hightech", "Mechanical - Electronic" etc. focusing on issues such as product functionality and physical structure.
- Commercial issues (11%); constructs such as "Everyday product - Premium product", and "Expensive - Cheaper" focusing on issues such as whether the product was targeting a particular group of buyers.
- Miscellaneous (8%)

While what construct a person chooses to apply relates to the product being commented, it also depends on a *syntactical* dimension. When comparing things with different main functions participants used other types of constructs than when discussing products of the same type. When distinguishing, for example, between three coffee brewers, participants used constructs focusing on details, expression etc. When commenting on triads portraying different products, as when comparing a TV, an electric toothbrush and a washing machine, their comments in many cases concerned ideas about general product types[54], see Fig 22.

53 The percentages apply to the whole group of participants. However, different participants applied different constructs to one and the same product and what they focused on tended to vary with disciplinary belonging, which is explored in Persson, Hiort af Ornäs, and Jordan (2007)

54 This is hardly surprising, and could be expected from Kelly's Personal construct psychology. However it raises an interesting methodological question concerning what a study participant in fact comment on when presented with pictures depicting a single product.

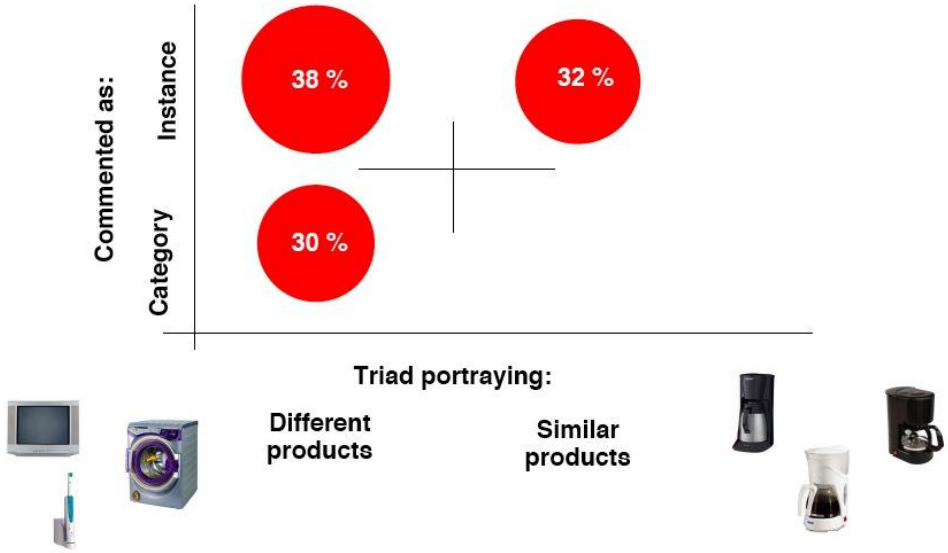


Fig. 22 When presented with triads portraying similar products participants tended to focus on details, whereas with products with different main functions led to categorical comments.

Some of the evaluative constructs used by participants concerned the products qualities in relation to a particular person (*I* like -dislike, it is good for *young people* etc.*)*. Most constructs, however, did not make explicit reference to groups of people, but concerned intrinsic qualities (it is good-it is bad). Many of the evaluative comments were not absolute but relative judgements (e.g. better-worse *than*) or had to do with some expectations and products providing something "extra" (high-tech – low-tech etc.).

In some cases different participant used same label to refer to one of the poles of different constructs. This was the case for example with "design"; used as a contrast to ugly and unrefined, as well as an opposite of genuine and practical.

The constructs reported by participants reflect beliefs about products. More specifically these beliefs are describable as encompassing a focus or object (that which the comment refers to), a theme (e.g. styling, functionality etc.), and in the case of evaluative constructs also referring to a person, and an explanation type (for example being relevant for a goal, being intrinsically good, or being good in comparison to some standard).

Results from the study are also reported in Paper E and in Persson, Hiort af Ornäs and Jordan (2007).

5 Analysis across studies

This chapter is concerned with how participants in the different studies described products as being significant. It aims to identify patterns in the material as a whole, and highlight major deviations from these. The analysis is structured around the same concepts as the comparison of frameworks in Chapter 2, i.e. antecedents, mediating processing and reactions, see Fig. 23. The first part of the analysis (Sections 5.1 and 5.2) is concerned with the antecedents and objects of experiences brought up by informants in the studies. It hence focuses on *what* they describe as significant, in some cases aspects of products as such, in other cases use or specific events. The second part (Section 5.3), is concerned with the experiences brought up in the studies, here taken to encompass both mediating processing and reactions. This analysis focuses on *how* participants comment and the experiences they describe, and moves beyond the content to the character of their statements. Furthermore, it compares the outcomes of the studies to the factors covered by the frameworks for affective design reviewed in Chapter 2.

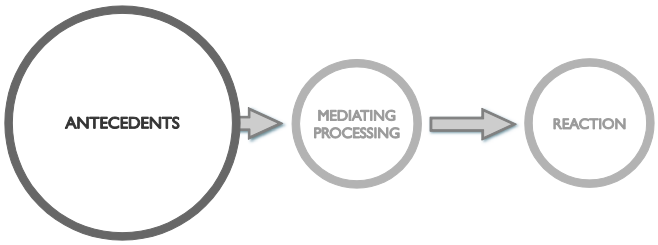


Fig. 23 The first part of the chapter addresses what participants focused on in their statements, and what they described as eliciting their experiences.

5.1 Products as antecedents of experiences

What are the products that were significant to participants and in what respect were they significant?

5.1.1 Products as objects of experiences

It does not seem as though specific *categories of products* are more central to the elicitation of experiences in general. When participants shared thoughts about things of their own choice, in the untriggered accounts in Studies (I) & (II), they brought up examples from a wide range of different product categories: from foods and hygiene products to books, electronics and pets as well as architecture and places. While a few examples concerned products that were clearly geared specifically to eliciting experiences, see Fig. 24, the majority of accounts concerned everyday things. When participants discussed categories of products as more or less positively or negatively charged, this was often done in relation to associations with some activity in which they were used.

Product: Roller Coaster

Description: This is a Roller Coaster at an amusement park. The roller coaster is a ride that has many slopes that go from low to high and low to high.

Emotional Response: Fear

Situation: I have never been a fan of heights. So when I go to amusement parks I am there mostly for food but sometimes I do get on some of the rides. For example, when I went to Disney World MGM I got on this ride that is set up in the elevator about 30 stories high and the car going to drop down to the bottom at 90 mph. So before the ride started I was already scared and screaming.

Fig. 24 Excerpt from self-report submitted by a participant in Study (II)

Likewise, there does not seem to be a specific category of product attributes that is more significant to participants' experiences in general. When comments were made in relation to specific properties such as dimensions, materials etc., these came in most cases in relation to aspects that had a bearing on more complex qualities, such as certain form features having a bearing on product expression, rather than distinct measurements, colours etc. as significant in themselves. Participants in Studies (I) and (II) in many cases discussed things in terms of their use, styling, technology and performance etc. When participants in Study (VI) commented on products presented to them in triads, they distinguished between them on similar dimensions, but also to a greater degree used constructs classifying products in terms of commercial aspects, for example the degree to which a product would be considered a premium product or not[55].

5.1.2 Associations as objects of experiences

The ideas a product comes to stand for were frequently commented on as more significant than the product as a physical thing. Participants in all studies commented on ideas associated with products. In a few cases in Studies (I) and (II) these concerned bodily experiences that were closely associated with certain products, see Fig 25. More frequently, participants' statements focused on beliefs about things, for example the qualities of products, their expression etc.

Frequently products were commented on as *members of more general categories*, e.g. as being of a certain brand or having a certain area of use. As an example, a picture of a pair of pliers in Study (I) triggered comments both about specific details (rust) indicating heritage, and about hand tools in general. In some cases the connotations of a general category of products were discussed as negative. This was the case, for example, with a deck of cards which was associated with gambling etc. and elicited "mixed feelings" in a participant who enjoyed playing cards, but who had grown up in a strictly religious context where such activities were at best frowned upon. Other products came with positive connotations, as with a hammock described as being strongly associated with summer and relaxation.

55 These comments were made in relation to a very specific set of products (presented in a certain way) and the distribution in comments is not necessarily representative of how significant different aspects are to users in general.

Product: Syringes

Emotional Response: Negative: Pain, Fear

Situation in which the emotion was elicited: Every time I get a shot or blood drawn

Aspects that elicited the emotional response: Ever since I was a little kid I have hated needles and syringes. Now that I am older I'm more comfortable around them but I still despise the design. Their very image projects pain and discomfort. The long protruding needle that has no other purpose that into inflict pain on the patients it is used on.

Product: Vegemite

Emotional Response: Negative: Discomfort, foul taste

Situation in which the emotional was elicited: When I first went to Australia and had some.

Aspects that elicited the emotional response: I went to Australia for the first time when I was about 15 years old. I tried everything I was given including vegemite and that was a terrible idea. I especially didn't like the texture of the stuff, which made me almost feel sick to my stomach. Now every time I see a can of the stuff I can't help but remember that foul taste and feel uncomfortable.

Fig. 25 Excerpt from self-report submitted by a participant in Study (II) focusing on products associated with bodily experiences.

Participants also throughout the studies shared statements where the focus was on *ideas beyond the product*, see Fig. 26. Frequently significance seemed to be anchored in earlier experiences with the specific thing or a similar product. This was often the case in the accounts of personal products in Studies (I) and (II) but also noticeable in the individual interviews in Study (IV). Sometimes the specific memories become the object of the experience and in many cases seeing the product may be enough to call back these memories, see Fig. 27.

Product: Maui Time Michigan License Plate

Emotional Response: Positive: Happiness, Peacefulness, Belonging

Situation in which the emotion was elicited: I saw this license plate when I was eating in a restaurant in Maui last summer.

Aspects that elicited the emotional response: The design of the license plate itself is pretty boring, however the words engraved on it have a special meaning for me because I am from Michigan. Seeing this plate so far from home made me feel instantly welcome in the restaurant where I was eating. I felt happy to see something that reminded me of home while I was on vacation that was so perfectly placed in the area. It didn't feel like some cheesy tourist attraction.

Fig. 26 Excerpt from self-report submitted by a participant in study (II) focusing on idea beyond the product.

Product: Marshmallows

Emotional Response: It breaks my heart every time I see or smell a bag of marshmallows.

Situation in which the emotion was elicited At one time I was in a long-term relationship and my girlfriend from the time loved the smell of marshmallows. The breakup was a rough time in my life filled with loneliness and heartache.

Aspects that elicited the emotional response: Sometimes you expect life events to go a certain way and in an instance things can change. Several life events happened at the same time including the loss of a loved one in my life. A bag of marshmallows reminds me of some good times but most of all it reminds me of the end of the relationship.

Fig. 27 Excerpt from self-report submitted by a participant in Study (II) focusing on memory.

With the triggered accounts, participants discussed not only the things portrayed in pictures, but also memories, similar products etc. While it was possible in most cases to identify what their statements referred to, some of their associations were of a more personal nature, and statements were also made in relation to seemingly unrelated issues, as when a participant in Study (I) commented on a sketch of a vacuum cleaner: "Dixon had a vacuum cleaner at Tjolöholm - and he had it on a horse cart and they pulled the hose through the window".

Products are sometimes significant by referring to ideas. Some of these may be closely associated with products, whereas others are likely to be highly personal.

5.2 Products in use - Antecedents beyond things

Things were frequently discussed as significant in being instrumental for meeting some goal, or somehow altering a course of events. In all the studies remarks were often made in relation to aspects such as functions, performance and usability. With the exception of Study (VI)[56] participants in the studies discussed not only general ideas about the potential of things to be used, but the roles they play in actual events, and consequences in specific situations.

For the purpose of analysis it is desirable to go beyond use as an overarching concept and identify how things were significant in the specific situations described in the examples. While this section was initially driven by a bottom-up analysis, it therefore draws on some central concepts from Activity Theory, see Display 4.

56 As study (VI) focused on meanings ascribed to things, it is not included in the analysis of use unless explicitly mentioned.

Display 4. Activity theory

Developments founded in the cultural-historical psychology of Vygotsky (1978) and Leont'ev (1978) has become widely applied in UCPD (see e.g. Bødker 1991; Ehn 1988; Karlsson 1996), partly because of its focus on artefacts mediating human experience (Nardi 1996a).

According to Activity Theory (AT) human behaviour is characterised by being intentional, mediated, and occurring in a system where the actor has relations to other people (Leont'ev 1981). An activity in its simplest form consists of a subject acting on something (object) to transform it into a desirable outcome, by applying some tool, or mediating object, see Fig 28. The idea of mediation is not limited to physical activity but can also be mental; thought is in itself mediated by language (Vygotsky 1978). Likewise the concept of mediating tool should be understood widely, as anything that may support the transformation of an object into an outcome including ideas.

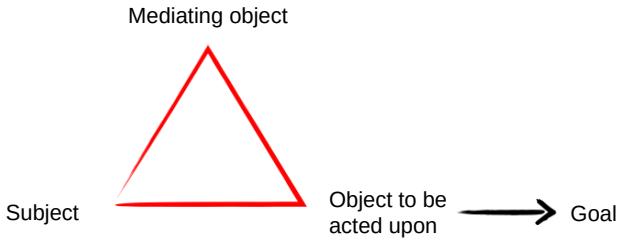


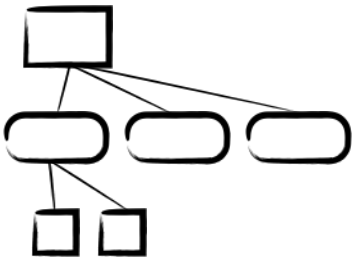
Fig. 28 A simple activity system, based on Kuutti (1996, p.28).

Activities connect humans to what surrounds them, both in terms of social and material factors (Hydén 1981), and human abilities are acquired through a process of internalisation in which actions move from being inter-personal to intra-personal. AT does not see consciousness as disembodied cognitive acts, but locates it in everyday practice where a person is part of a social matrix (Nardi 1996b), and cognition is in AT considered to be inseparable from everyday activity. Drawing on Luria (1971), Ratner (1996, p.7) writes "Cognitive processes (such as perception and memory, abstraction and generalization, reasoning and problem-solving) are not independent and unchanging 'abilities' or 'functions' of human consciousness; they are processes occurring in concrete, practical activities and are formed within the limits of this activity".

There is a reciprocal relation between people and tools, in which the subject transforms the object, but properties of the object also shape the subject (Bannon 1991). Tools shape how people act but are themselves shaped by culture and influence mental development (Kaptelenin 1996). Leont'ev describes tools as connecting humans to the world of objects, but also to other people. Activity assimilates the experience of mankind and "humans' mental processes are tied to the sociohistorically formed means and methods transmitted to them by others in the process of cooperative labor and social interaction" (Leont'ev 1978, p.56).

AT conceptualises human behaviour as hierarchical, occurring on different levels (Leont'ev 1981): activities, actions and operations (see Fig. 29). At an overarching level *activities* are oriented towards one or several material or ideal motives. These activities can be realised by different actions, and their motives are not necessarily conscious. Deliberate *actions*, on the other hand, are always oriented towards an explicit objective but may contribute to a range of different activities at the same time. Actions in turn are realised by *operations*; automated responses directed at, and triggered by, concrete conditions. Leont'ev exemplified operations with shifting gears, which is initially subordinate to a goal and later included in another complex action "such as changing the speed of the automobile. At this point, shifting gears becomes one of the methods for carrying out this action. It is no longer carried out as a special goal-directed process. The driver does not distinguish its goal. So far as the driver's conscious processes are concerned, it is as if shifting gears under normal

conditions does not exist. He/she is doing something else: he/she is driving the automobile from place to place, driving up steep inclines and across level expanses, bringing it to stop in certain places, etc." (Leont'ev 1981, p.64).



	Example
An **activity** is oriented to motives and realised through a series of …	Driving a car from A to B, going on an excursion
... **actions** oriented to concrete goals, in their turn realised by ...	Starting the car, stopping at a red light
...automated **operations** triggered by the actual material conditions.	Changing gear, steering

Fig. 29 Hierarchical structure of the individual activity

An action may evolve into an operation. A planning phase, orientation, normally precedes the execution of an action (Kuutti 1996). However, with practice this will fade away, and the action becomes automated into an operation while new actions form which encompass what is now an operation. Operations can also break down. Bødker (1989) describes what she refers to as conceptualisation where a person reflects on what was formerly an operation implying a shift in focus from the goal to how it is to be achieved. A special case here is referred to as breakdowns (Bødker 1991; Karlsson 1996) occurring when "some unarticulated conflict occurs between the assumed conditions for the operations on the one hand, and the actual conditions on the other" (Bødker 1991, p.27). These situations imply a shift in perspective in which the artefact can no longer be handled through operations but becomes the object for actions. The role of a product in relation to an activity may hence shift. Hasu and Engeström (2000, p.361) write: "There is nothing in the material makeup of an artifact as such that would determine which one it is: object or tool. The constellation of the activity at any given moment determines the place and meaning of the artefact".

Activities always change and develop (Kuutti 1996) as skills increase and new operations form. Breakdowns may provide openings for new learning (Bødker 1989, p.174), for example, deliberately reorienting actions, and a person's "repertoire of actions and operations is evolving continuously and is based on the experiences that we gain as individuals and as groups within our social and material environment". Imbalance between the different elements of an activity system leads to contradictions which in turn lead to activities continuously developing (Engeström 1987).

According to AT, studies of human behaviour in laboratories can only provide limited information. As actions always take place in a context it is necessary to include a minimum meaningful context in the unit of analysis (Kuutti 1996; Vygotsky 1978). Furthermore, AT researchers often promote longitudinal studies (Kuutti 1996).

5.2.1 Using things – Goals as objects for experience

Across the studies, participants frequently discussed the significance of goals and outcomes of activities.

The perhaps most important role of a thing in the context of UCPD is to serve as a mediating tool. Participants in Studies (I) and (II) frequently discussed use and how a product can enable someone to meet goals. Many examples focused on the application of specific products, but in Study (I) also on whole categories of products.

While different participants in the studies came to appreciate or dislike the same thing, the use of things was a central recurring theme across the studies. Commenting on hand tools, one participant in Study (I) described how he has used them to complete several building projects. Another participant remarked that she dislikes for them as she finds them difficult to use. The two participants focused on different issues, and their respective reactions have different objects. In one case the product refers to achievements and is associated with accomplishing goals. In the other case the product refers to unpleasant memories of unpleasant interaction and a lack of mediation leading to struggle and a sense of personal failure.

Most of what is normally considered use with a product is about a person applying some tool in a concrete situation to change the physical reality she faces. However, participants also shared examples where the significance of products related to other goals and motives. In some cases the object of the activity is to enhance the self, increasing one's potency in terms of skills, or physical strength as exemplified by a participant in Study (II), who describes how, coming across some weights lying under his bag, he feels like exercising. In other cases the motives were social. An example brought up in Study (II) described how a fishing trip may contribute to relaxation but also enable socialising with one's father-in-law.

A product may also have consequences that extend beyond the situation of use. One of the participants in Study (III) described her viewing of soap operas on television. This activity could potentially be intrinsically pleasant. However, its real significance seems to be as the dominant topic for conversation in the lunch room at work, and she was afraid that without it she would not have anything to talk to her colleagues about.

In addition to describing use related to the physical characteristics of products, participants in some cases also describe the symbolism of products as mediating, see Fig. 30.

Product: College ring

Emotional response: This ring brings me a sense of pride because it symbolizes a huge accomplishment in my life.

Situation in which emotion was elicited: Walking up on stage to get my diploma and attending the ring ceremony was the moment when reality struck.

Aspects that elicited the emotional response: The benefits of all the years of hard work grinding through school were finally surfacing. I felt a great sense of pride because there were a few individuals that thought I would never complete my undergraduate studies. My self-satisfaction was met when I proved them wrong and wearing the ring gives me a sense of pride and confidence.

Fig. 30 Excerpt from self-report submitted by a participant in study focusing on past achievement and acting in relation to other people.

A product may in some cases be used as a tool for dreaming away or contemplation, see Fig 31. A person may use a thing to think about something beyond the current situation, and the product may mediate a dislocation in time, or even refer to some fantasies.

Product: Skateboard

Emotional Response: The carefree feeling is brought to me when I see my skateboard.

Situation in which emotion was elicited: There was a skateboard next to me at all times during my teenage years. This point in my life was carefree and I had minimal responsibility.

Aspects that elicited the emotional response: I will never forget going around town on my skateboard trying new tricks and hanging out with my friends. The people I affiliated myself with and perspective of life I grew during this time period in my life has shaped a part of who I am today.

Fig. 31 Excerpt from self-report submitted by a participant in study (II) focusing on past experiences and self.

Product: Computer game

Emotional Response: My emotional responses associated with this product are eagerness, excitement and satisfaction. I know that I was very eager to obtain this product, excited because it was very much fun to play and satisfied that it met all of my expectations. The labels that I would choose for this product are eagerness, excitement and satisfaction.

Situation in which emotion was elicited: I remember that I couldn't wait until the game came out because of how much fun I experienced playing the previous games in the series. Not only do I enjoy escaping real life once in a while on the computer, it also gives me a chance to both use my mind and relax at the same time. /.../

Aspects that elicited the emotional response: the aspects that elicited my emotional responses are the bright orange box and the outstanding game play. Seeing the orange box online and in stores only made me want it more. I knew some of my friends already had it and I knew that I would own it shortly as well. Knowing the past quality of the Half-Life game series, I was assured that this product would be well worth the wait. /.../

Fig. 32 Excerpt from self-report submitted by a participant in Study (II) focusing on product focusing on a product enabling escape from reality.

A person may make use of some product to change the physical reality, to position him or herself relative a group[57] or just for the fun of it. People act on the material world but also on the social world and themselves, using both physical tools and thereby associated ideas.

Goals may be objects of experience, and products sometimes play a significant role in enabling them.

5.2.2 Activities as objects of experiences

In some cases participants focused on the activity as such, rather than its outcomes. Activities as such may become objects of experience. Participants discussed some activities as being associated with pleasure, others with pain or seemingly meaningless effort.

Comments about intrinsically pleasant interaction were often made in relation to things that led to products that supported the participants in extending their capabilities, as exemplified by a participant in Study (II) *"Realizing how much faster I can ride with aero bars, and also how much more comfortable for my hands the aero position on the bike is, was pure joy on the road"*. Among the activities brought up as being less pleasant by participants in all studies were various chores: cleaning, vacuuming, maintenance, repairs etc. Similarly, some participants also discuss work and study as unpleasant. It seems as though participants appreciate voluntary action over musts.

57 Dittmar (1992) distinguishes between "instrumental meanings" tied to the functional use of a product aimed at direct control over the environment, from "symbolic meanings" tied to the expression of who someone is in terms of individuality or group belongingness. From an Activity Theory perspective these activities are oriented to different goals, but both uses are instrumental.

In many cases participants' comments focus on the potential of a product to support a certain action or activity. The idea of *being able to* seems to be important to them. In fact, in some cases the idea of being able to is seemingly even more important than actually doing. One of the participants in Study (III) described how owning a car gives him to opportunity to go to the coast whenever he wants to, while when probed about how often this happens describes it as very rare.

Another central issue to participants was *being in control*. Many negative comments concerned the poor usability of complex products. Participants expressed frustration over things that malfunctioned or in some other respect prevented them from making progress towards goals in specific situations. Being in control was also commented on at a more general level, for example in relation to phone contracts, electricity supply contracts etc. being complex and difficult to understand. In many cases participants found that decisions on these could have great consequences, but that they had little opportunity to make informed decisions.

Activities may be appreciated for instrumental reasons but also for their intrinsic value. Voluntary action and being in control seems to be central to the pleasantness of activities.

5.2.3 Roles of things in activities

The typical conception of use focuses on *products as mediating tools*, supporting the user in meeting some goal, see Fig. 33. However, participants also reported situations in which the product assumed a different role in relation to what she or he was doing, indicating that products could take other positions in the activity system in Fig. 28. In some examples informants treated *products as goals* for activities, i.e. as something to acquire, potentially with a hope of future use, see Fig. 34. In other cases participants described how *products external to the activity* came into focus, e.g. by interfering with what they the person was doing, or suddenly being encountered, see Fig. 35. Furthermore some accounts also concerned *products as objects to be acted upon*, for example when things malfunctioned, requiring attention, care or maintenance, see Fig. 36.

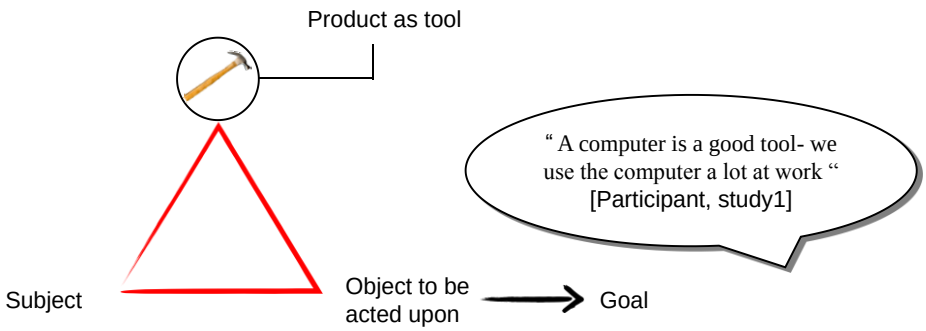


Fig. 33 *Products as tools*.

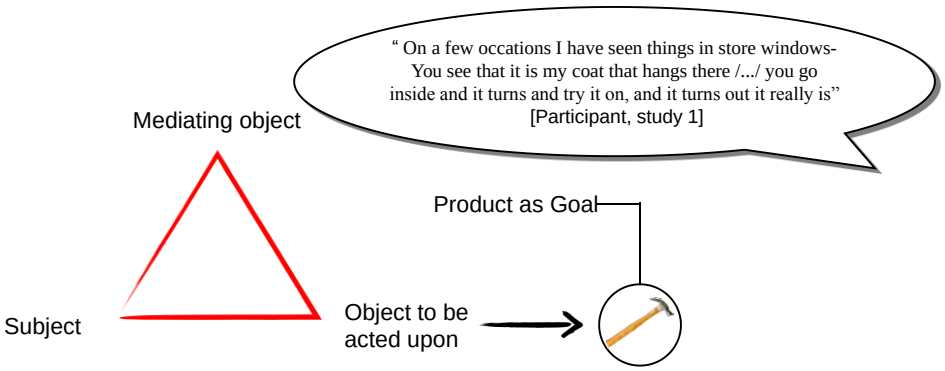


Fig. 34 *Products as goals*. Participants in some cases described events in which products became goals for activities, for example shopping. Participants here act on the situation in order to acquire the product.

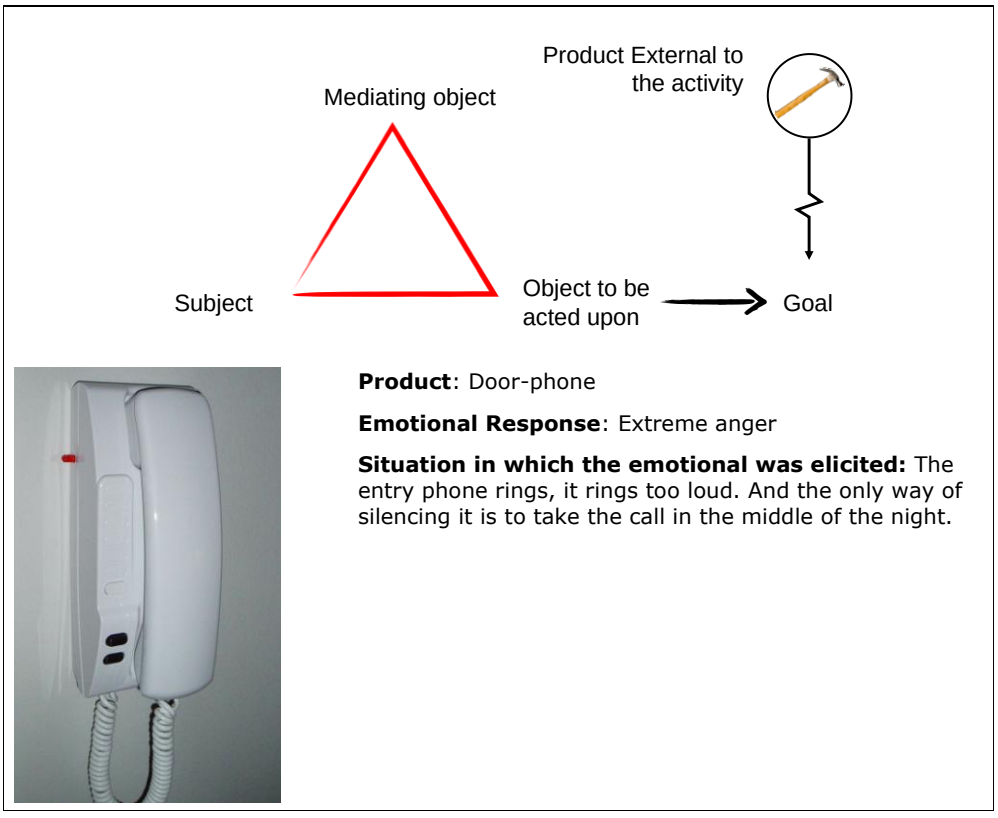
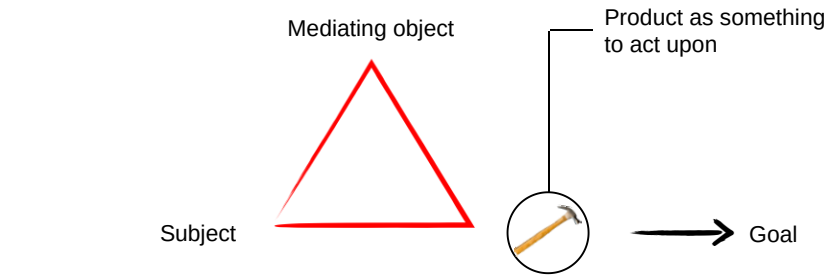


Fig. 35 *Products external to activity*. Participants in some cases described events in which products that are initially not part of an activity interfere or in some other way require attention. Excerpt from self-report submitted by a participant in Study (II) focusing on a product interfering with sleep.



Product: Overhead Garage Door

/.../ The aspect of it that has influenced my negative experience is poor design or more specifically, the lack of a garage door opener connection system.

Emotional Response: Resentment and frustration. I resent the fact that I have had to struggle with the lack of an opener connection design for multiple years. I am frustrated because I had to design and create my own connection system as well as repair it several times.

Situation in which the emotional was elicited: This garage door came with my house. I soon learned of the lack of a connection system after purchasing a garage door opener. /.../ I designed a connection system using a metal bracket and a block of wood. My connection system has broken away from the door on multiple occasions /.../ each time meaning an hour or two of repair time for me /.../ I feel resentment every time I see the connection system tearing away from the door, knowing that it will need immediate repair.

Fig. 36 *Products as objects to act upon*. Participants in some cases described products that required action. Excerpt from self-report submitted by a participant in Study (II).

Different aspects of products may become more or less salient depending on the role a thing plays in an activity. Where participants discussed use, they were typically more concerned with interaction and goals. In cases where they discussed things encountered in catalogues, buying situations etc. they commented to a greater extent on qualities of things, for example functions and expression. A person who comes across a thing in a store or catalogue may contemplate it, and appraise its potential for future mediation in relation to various goals. A person who is using the artefact to achieve a specific goal may, on the other hand, pay very little attention to it as long as its performance and use are in line with expectations.

Products play different roles in different activities, leading to qualitatively different relations. What the person is doing, and the role of the product in a specific activity, seem more significant to participants than the mere presence of a thing.

5.2.4 Events, Changes & Consequences for the user

Events that unfold and consequences were often significant to informants.

Specific events in which products had some implications were frequently discussed by participants in Studies (I) and (II). As an example, a participant in Study (II) shared the following example; "*Last year my wife and I were coming back from our honeymoon and we had just taken off. It was about 20 minutes into our flight when we heard one of the engines blow*

out. Because of that experience I am afraid to fly. Whenever I fly, those emotions that I had during that flight always evoke fear. /…/My emotions to the situation would not have been as strong if I had known that there was another engine that could carry us to our destination."

Many of the accounts on experiences with products describe sequences of events in which the role of the product shifts over time, eliciting various experiences, see Fig. 37.

Product: Car

Emotional response: I experienced a variety of emotions with this particular product. That started with excitement, then turned into confinement and frustration, and ultimately disappointment.

Situation in which emotion was elicited: My first experience with this product was a press release for a new cross-over SUV that would bring fuel economy and style together. Being a member of the /…/ team positive press is always exciting and forms a sense of pride inside one self. I took a business trip where I needed to get a rental car, and when I saw that I had an option to pick this new style and press praised vehicle I seized it. Once I arrived at the vehicle I noticed that it was considerable smaller than I had anticipated. Keeping my optimism up I got into the driver seat only to find out that the seat did not accommodate for drivers larger than 6 feet in height. I pulled out of the rental car parking lot and arrived at a stop light, only to notice that I had to lean practically on the steering wheel to see the light turn. As my aggravation started to increase I could feel my body temperature start to rise. Frustration then became to anger as I noticed that the buttons for the automatic windows were not in their normal location (on the door frame), but camouflaged in with the dash in the middle counsel. Driving on the interstate at 70 mph, starting to sweat, as the daylight fades away, with my eyes no longer on the road but looking for some hidden automatic window button made for a very disappointing experience.

Fig. 37 Excerpt from self-report submitted by a participant in Study (II) focusing on changes in relations and experiences over time

In both the trigged and un-triggered accounts, participants often focused on something that deviated from expectations. As an example, participants in Study (I) explicitly commented on the context in which some products were presented, stating that it is somehow incongruent with how the products were normally encountered. Deviations from expectations were often central to the accounts, both in terms of product features, for example an unexpected extra hand on an alarm clock, and in terms of changes in a course of events.

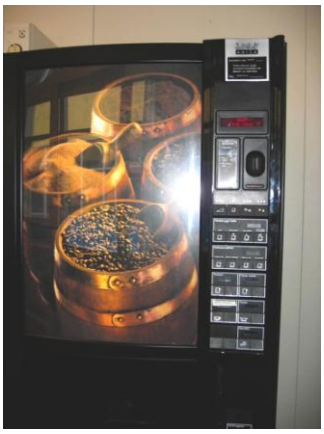
Changes in a situation were also central to many of the accounts[58], and participants frequently commented on outcomes in relation to expectations. One of the participants in Study (II) described how his dreams of DJ'ing led him to ruin large parts of his parents' record collection scratching away on a normal record player. Imagine then the joy of being able to borrow his much admired cousin's DJ equipment. Participants shared examples of how expectations about desirable outcomes that were confirmed elicited joy/satisfaction, whereas disconfirmed positive expectations led to disappointment, see Fig. 37. Participants also shared examples focusing on being relieved by avoiding expected adverse outcomes. One participant in Study II describes how his kitchen was in a mess when some friends announced that

58 This is consistent with what Frijda (1988, 353) describes as Law of Change: "Emotions are elicited not so much by the presence of favourable or unfavourable conditions, but by actual or expected changes in favourable or unfavourable conditions"

they would soon drop in on him for an unplanned visit. In fear of looking bad, he had managed to borrow his neighbour's dishwasher.

Expectations may also help explain the many negative comments in relation to maintenance and household chores. To take an example, one participant described his garage door breaking down time after time (Fig. 36.). Each time he has to spend more time getting it back to the initial condition. Another participant discussed the annoyance of having to change the tyres on his car. Both these participants were initially doing something else but were *forced* to engage in activities that did not contribute to making progress toward any motives beyond restoring the status quo.

Patterns in changes may in some cases explain participants' reactions to events[59], and products are significant in having behavioural consequences.



Product: Coffee vending machine

Emotional response: Tired, calm, full of expectation, disappointed!

Situation in which emotion was elicited: Pause at work. Long for coffee. Chooses coffee as a reflect form at well-known coffee vending machine with different types of coffee but receive another kind of coffee than intended. Have to choose again

Aspects that elicited the emotional response: Several coffee vending machine with the same appearance are placed at the company, but the coffee-choices are in different places at different keypads in the seemingly identical coffee machines, which means you can make the wrong choice if you are not observant.

Fig. 38 Excerpt from self-report submitted by a participant in Study (II) focusing on unexpected outcomes and automated action.

Participants shared descriptions of consequences on different levels of activity. Things have implications in terms of enabling actions oriented to explicit goals. However, things also have an impact on the other levels of behaviour. Many participants discuss situations where products start malfunctioning, or where some aspect of their use suddenly breaks down and becomes conscious. Things may threaten conscious goals, but also trigger operations, see Fig. 38. When operations for some reason lead to unexpected consequences, they may break down and become conscious, and it is likely that the person's attention turns from the object of the activity to interaction[60]. When a course of events is incongruent with expectations, changes may require immediate attention and increase the likelihood of reactions being elicited.

Changes occur not only in relation to specific events, but also on a more general level. Product may support and in some cases change habits and the activities someone engages in. Participants in the studies on PSS (III-V) describe how subscription to a new solution may have consequences for someone's everyday life. The user may for example have to engage in various activities in order to get to actually use the

59 Different emotions have been claimed to have different underlying themes, and confirmed or disconfirmed expectations have been claimed to elicit qualitatively different emotions (Ortony, Clore, and Collins 1988).

60 See breakdowns in Display 4 on Activity Theory.

solution. Consider, for example, a participant in Study (IV) who described how he now rides a bike or goes by public transport to work. Changing to a using a car from a car pool would introduce new things to do, and new ways of doing things. In addition to the actual bus ride, he must today also figure out when to go, potentially buy a ticket in advance, wait at the bus stop etc. With the car pool he would probably no longer have to worry about buying bus passes, but at the same time would probably have to engage in other similarly undesirable activities such as having to plan his travelling further in advance etc. Frequently riding his bike to work also means that he gets exercise, something that he would otherwise have to seek out actively. What may seem like a small change can turn out to have fairly far-reaching consequences. A change in technology may have an impact on a range of different activities, hence influencing the realisation of various motives. These consequences may not occur immediately, but can be of great importance to the user.

Sometimes things make a difference by impacting on practical consequences. Products are significant in setting conditions for behaviour on different levels and, as a consequence, the degree to which goals are met and motives realised. Behaviour on either level may be more or less desirable, and participants are likely to seek some activities and actions, and avoid others. It is, however, worth noting that while some thing or activity may be more or less desirable, *changes* may be at least as significant to users.

5.3 Reactions and mediating processing

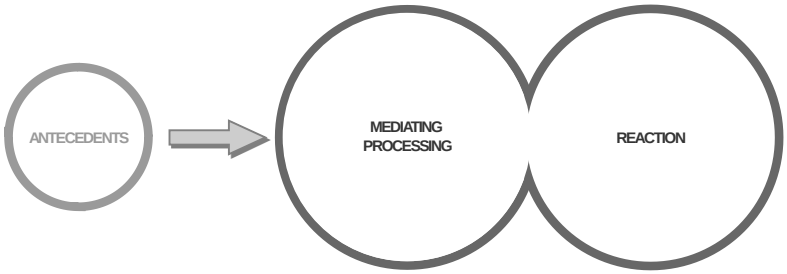


Fig. 39 The remainder of this chapter focuses on the experiences brought up by participants, here taken to encompass both mediating processing and reactions.

Various experiences were reported in the studies, including beliefs about products and situations, as well as judgements about how these were perceived as significant. However, experiences per se were rarely elaborated. While participants reported emotions, judgements etc. when asked to do so, they did not spontaneously analyse and label their experiences in terms of "beliefs", "sensations", "perceptions" etc. From the perspective of the subject a range of different issues may blend in consciousness, and the underlying processes may be executed by different physiological systems processing similar information on different levels[61]. It could be

61 Several different information processing systems may be involved in continuous monitoring and appraisal of significance for the subject, see for example Scherer (2001).

questioned whether experience can be reduced to specific components. However, to identify how product related aspects have a bearing on experiences, it is desirable to introduce analytical distinctions. This section hence aims to identify dimensions of experiences which are here taken to include processes judging significance, as well as reactions. Furthermore, the ambition of this section has been to identify patterns in how participants described experiences and compare these to distinctions made in theory, for example the frameworks reviewed in Chapter 2. Some general characteristics are summarised in Table 9.

Table 9 Some central difference between studies; categories are elaborated in subsequent sections.

	(I)	(II)	(III), (IV), (V)	(VI)
Focus	Things, use and events	Things, use and events	Situations & Consequences for what the person can and must do.	Things
Valence (Meaning/ Significance)	Mostly focus on significance. Triggered associations with, reactions to, and judgements of products Retrospective accounts on strong experiences with things	Mostly focus on significance; Participants reported ways in which products of their choice had been significant in eliciting emotional experiences	Some meaning-oriented comments on how to interpret the PSS descriptions Mostly appraised significance of the consequences subscriptions of specific PSS could have	Constructs used to differentiate between products (Meaning)
Immediacy & Mode of reasoning	Dispositional as well as acute Many categorical comments	In most cases deliberately elaborated descriptions of acute experiences	Some schematic interpretations Consequences deliberately elaborated	Tied to triads of products rather than a situation Reactive rather than conscious elaborations

5.3.1 Focus

A characteristic of mental experiences is that they are directed at something, and participants' reports focused on a range of different issues. As described in the previous sections, participants shared reactions oriented towards things as well as events. In the studies triggering experiences, participants focused not only on the products depicted in the visual representations but a range of different issues, see Fig.40. When participants in the various studies discussed use, the experiences also seemed to be directed at a range of different objects, for example *activities, goals, mediation, interference* and *interaction* as such. In some cases participants brought up situations where a product played a central role but where the focus was on something else, for example the behaviour of some person, using the product or leaving it in a certain state. People and their (disgraceful or admirable) behaviour may also become the object of experiences.

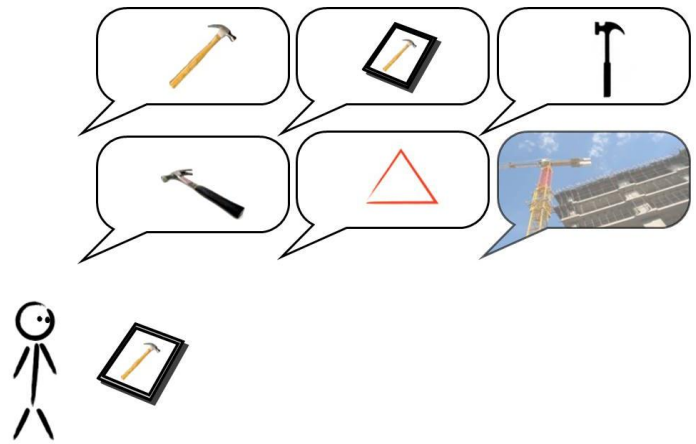


Fig. 40 Faced with product representations, participants commented on the portrayed products, but sometimes also on the representation as such, general ideas about categories of things, similar products, as well as ideas about use and specific situations.

The experiences described by participants also had a temporal focus[62]. While many of the examples shared by participants in Studies (I) and (II) concerned products that were described as being significant in the *past* or immediate *present*, participants in Studies (III-V) in many cases anticipate consequences of solutions in *future events*.

Future-oriented experiences were also reported by participants in Study (II), especially in relation to trying things out for the first time, shopping experiences etc.[63]. Some of the participants' examples concerned generalisations rather than the significance of things in events, but a temporal focus was often noticeable, see Fig. 41.

Informants sharing future-oriented examples often expressed uncertainty about consequences. With prospective beliefs, predictions are central to anticipating what actions need to be taken in order to ensure positive outcomes. In the studies on PSS (III, IV, V), participants expressed concerns about uncertainties regarding their interpretations of the offers, but also to what extent this could be expected to be delivered, as well as in some cases about their own future needs. Uncertainties may conflict with the users' ability to make reasonable appraisals about anticipated benefits, coping potential etc[64].

A temporal dimension has been proposed as central to giving specific experiences their particular character. In the specific cases of experiences with products, Sanders (2001) emphasises experiences always occurring in the present but the specific moment always being coupled with memories (past-oriented) and dreams (future-

62 The psychological processes of the person are likely in themselves to have a strong temporal dimension, for example by being determined by how activities develop (see e.g. Leont'ev 1981) and how the person anticipates events (see e.g. Kelly 2003). The distinction made here, however, concerns the *focus* of specific experiences

63 While Studies (III-V) were set up to elicit future-oriented accounts, examples in Study (II) took the form of remembering anticipating some consequence, for example remembering what it was like to test a product for the first time and expecting certain consequences.

64 Uncertainties may also play a special role in user adoption and have been discussed as a central aspect of innovation diffusion for example by Rogers (2003).

oriented). A temporal component has also been claimed as central to some emotions. Fears may, for example, be future-oriented, whereas disappointment is past-oriented (Ortony, Clore, and Collins 1988). A person's experiences with a thing are likely to evolve over time and events, and may include past-, present-, and future-oriented components.

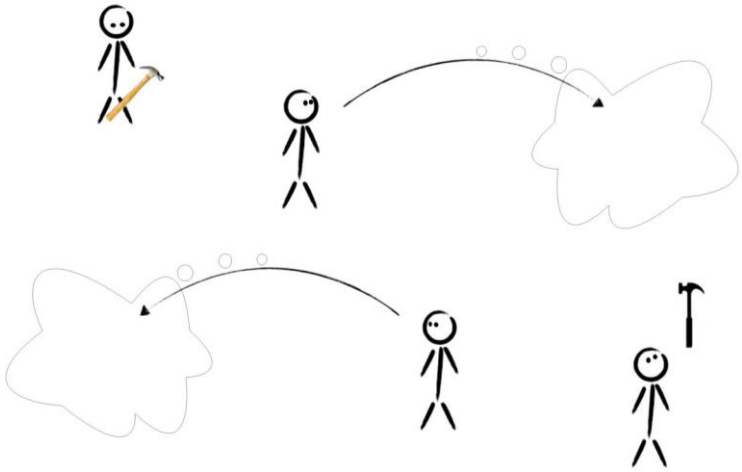


Fig. 41 The reported experiences often had a temporal dimension, being oriented at something in the present, an anticipated future, memories of the past. In some cases, however, participants report on issues that are less tied to specific situations.

Distinctions between experiences of products, their use, realised and anticipated outcomes are to some extent acknowledged by the reviewed frameworks in Chapter 2. However, they to a varying degree emphasise experiences oriented towards products or use. At one extreme Kansei Engineering (Nagamachi 1995) is concerned with experiences oriented to things, whereas the Four Pleasures model (Jordan 1999) is concerned with the outcomes of product use, and to some extent characteristics of interaction.

While the frameworks in chapter two all to some degree acknowledge a range of different antecedents including use, or at least interaction, they are only to a limited extent concerned with characterising the relations between a person and the product in specific activities and frequently present products as the object of experience. Hassenzahl (2004a) makes a distinction between different aspects of experience, using the term character to refer to the subject's experience *of the product* based on characteristics of the product in combination with personal expectations and standards, and the term consequences to refer to issues such as satisfaction or pleasures, "viewed as outcomes of experiences with or through technology" (Hassenzahl 2004a, p.38). Hassenzahl also distinguishes different use modes; oriented to actions through the product where the goals are to the fore of attention (goal mode), and action mode where actions are to the fore and using the product becomes an end in itself (action mode). Desmet (2002) also acknowledges that emotions with products may take as their objects something beyond the product as such, and

describes how a person may relate to the product differently, treating the product as an object, agent or event[65].

Mental experiences have a focus, but experiences *with* products may in many cases be *about* something beyond the thing. The experience elicited by a product depends on how a user relates to it, both in terms of roles in an activity (see Section 5.2.3), and the person treating it a certain way.

5.3.2 Types of experiences

Participants often described how things may elicit a range of different reactions; *"It is mixed feelings so to speak. It is a stress factor, generally, with mobile phones that howl and something you have to watch over all the time. At the same time it evokes curiosity in that you don't mind waiting for it to ring, there may be texts. There's sort of an excitement in it all /…/ like it very much when it works as I want it to work but I hate it when it freezes and makes me confused"* [Participant in Study (I)]. A general characteristic of the accounts across studies is that a range of different product aspects serve as objects of experiences. Many of the accounts were less explicit in linking specific experiences to specific product aspects, but when probed participants shared explanations. However, experiences do not necessarily take the form of discrete categories. A person may have many parallel relations to a thing, and depending on circumstances certain aspects may be more or less salient[66].

In describing their experiences, the participants in the studies in some cases referred to something external, for example products and situations. In other cases their comments concerned the implications this may have in terms of judgements of significance, reactions etc. In a few cases they make reference to bodily experiences, for example sensations, tastes etc. as well as feelings such as hunger, being tired etc. Their experiences can be described as lying along two dimensions[67], bodily-mental and focusing on something external or the subject, see Fig. 42. All these can to a varying degree occur in relation to a product: the user may perceive it through some bodily sensation, interpret it and evaluate it. Internal bodily states are likely to affect these processes and products may also have implications for them, for example food relieving the user of hunger. However, the latter are not oriented towards products or events, whereas a person may have a sensation *of* a thing, beliefs *about* it, and pass judgement *on* it.

65 The latter concerns products *as* events rather than *in* events, and is exemplified by Desmet by product referring to past or anticipated events.

66 Also Desmet (2002) found that emotions may change over time and that products can elicit more than one emotion at a specific point of time as it may be relevant for more than one concern.

67 While it is possible to present experiences as categories, distinctions are made here based on dimensions in to emphasise that specific experiences are likely to be more or less bodily or mental rather than exclusively one or the other.

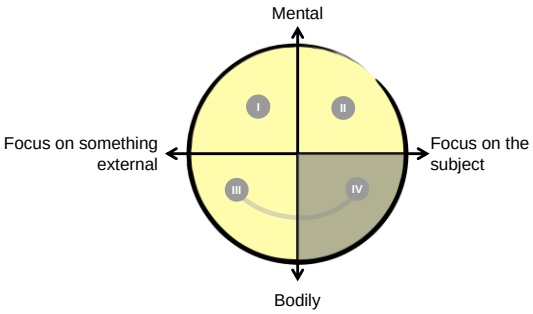


Fig. 42 Experiences with things; I) beliefs (meaning), II) judgements of significance, III) sensations of something external to the person, IV) Internal sensation (sleepy, hungry etc.). While internal bodily states may be involved in many experiences with things, they are taken here to be less central as they are not oriented to products.

The three facets of experience sensations, beliefs and evaluations parallels those found in the framework of product experience (Desmet and Hekkert 2007); aesthetic experiences, experience of meaning and emotion. The Four Pleasures model (e.g. Jordan 2000) also highlights both bodily and mental pleasures, emphasising that sensations are a central component of experience, while the other frameworks reviewed in Chapter 2 predominantly focus on mental experiences and consider sensory information as mediating the perception of objects or events.

Mental experiences were more frequently commented on in the studies. Bodily experiences were mentioned in many of the accounts in Studies (I) and (II), but were less frequently the focus of participants' examples. A few of the submitted examples in Study (II) concerned sensations that seem to have been of great significance to the participants, for example pain associated with syringes. However, the mental experiences were elaborated to a greater degree, and the remainder of this chapter is hence concerned with discussing these further.

5.3.3 Meaning & significance

A distinction can be made between the beliefs someone forms about something, and the implications this may have, i.e. the top two quadrants in Fig. 42.

Participants in all studies discussed interpretations of and meanings ascribed to products, as well as how the products were perceived as affecting them personally. Among the more explicit comments on interpretations were statements in Study (VI), which to a great extent focus on the interpretation or ascription of meanings to things. Among the more explicit elaborations on judgements of significance were the individual interviews on PSS in which participants questioned the extent to which something would be delivered, and discussed the impact different solutions would have on a multitude of goals.

A distinction can be made between two types of beliefs: *meaning* and *significance*. The *meaning* of a product is taken here to be comprised of the sum of a person's cognitions about, and associations with, it. It is what the user perceives the product to be and what it makes him/her think of. The *appraised significance* is a judgement on whether this is beneficial or not. This roughly equates to a distinction made by Lazarus (1991,

p.144) between knowledge referring to what is going, and appraisal consisting of "continuing evaluation or the significance of what is happening for one's personal well-being". Forming beliefs and attributing meaning does not imply that the person is moved by these ideas. Parallels can be drawn to the specific case of emotions. Cornelius (1996, p.112) quotes Arnold (1960): "*To arouse an emotion, [an] object must be appraised as affecting me in some way, affecting me personally as an individual with my particular experience and my particular aims. If I see an apple, I know that it is an apple of a particular kind and taste. This knowledge need not touch me personally in any way. But if the apple is of my favourite kind and I am in a part of the world where it does not grow and cannot be bought, I may want with real emotional craving*".

The different frameworks reviewed in Chapter 2 to a varying degree address meaning and significance. Kansei Engineering studies typically concern beliefs about things, and can be said to represent a focus on meaning. The Four Pleasures framework, on the other hand, is concerned with significance and how different aspects (ideas, challenge in activity, sensations) meet concerns that a user holds (for example social relations), but is less concerned with presenting a schematic of how the different pleasures are elicited[68]. Similarly the product emotion model of Desmet (2002) focuses on significance in what is essentially a match-mismatch theory focusing on products being appraised as more or less congruent with concerns. However, the Product Experience framework (Desmet and Hekkert 2007) explicitly identify meaning and significance (in terms of emotions) as components of experience. Hassenzahl (2004a) also makes an explicit distinction between beliefs about things (character) and outcomes in terms of judgements of significance.

Mental experiences can be said to encompass meaning (interpretations) and evaluations of significance. These can take different forms, which is elaborated in subsequent sections.

5.3.4 Immediacy

The experiences reported by participants can be described as more or less dispositional or acute. A distinction can be made between meaning and significance of a product in a particular situation, and beliefs that hold true across situations.

Participants in the studies shared descriptions of how products elicited brief reactions in specific events, but also described how some things are valued or disliked across situations. Studies (I) and (II) both encouraged participants to share descriptions of strong experiences with things. Participants described some dispositional likings/dislikings but also many discrete experiences[69]. Studies (III-V) were less tied to specific situations and concerned issues that, while having large consequences, were less immediate. In these studies participants shared judgements on PSS, an idea novel to them. These may to some extent be an effect of the interviewing situations, in

68 While ideas are acknowledged as a source of pleasure the framework does not focus on the beliefs someone forms about a product.

69 It is likely that the focus on *actual* experiences in Study (II) leads to examples that focus on experiences in discrete events.

which case they can be taken to be states. They may also to some degree hold true over situations, and reflect more general preferences in which case they should be taken to be dispositional. In Study (VI) participants' experiences were presented as beliefs that could be general across situations.

A distinction can be made between experiences based on for how long they extend. Some things touch a person in the present and elicit reactions. In other cases a person may have beliefs that last an extended period of time.

The reviewed frameworks in Chapter 2 differ in the degree to which they emphasise dispositions, and products' propensity to elicit reactions across situations or concrete experiences elicited in specific situations. Kansei Engineering (Nagamachi 1995) tends to focus on beliefs that could be expected to occur across situations, and the Four Pleasures framework (Jordan 2000) addresses propensity for a product eliciting experiences across situations. Hassenzahl (2004a) describes how constructions of character may vary over time, but emphasises in particular the acuteness and situational dependence of consequences. Acute experiences are also in focus for the frameworks of Desmet (2002), and Desmet and Hekkert (2007).

Based on the two dimensions introduced above (meaning - significance and acute - dispositional) it is possible to identify four categories of mental experiences: meaning extending over situations, meaning in a particular situation, significance in particular situations and more long-lasting judgements about the significance of things beyond particular situations[70], see Fig. 43.

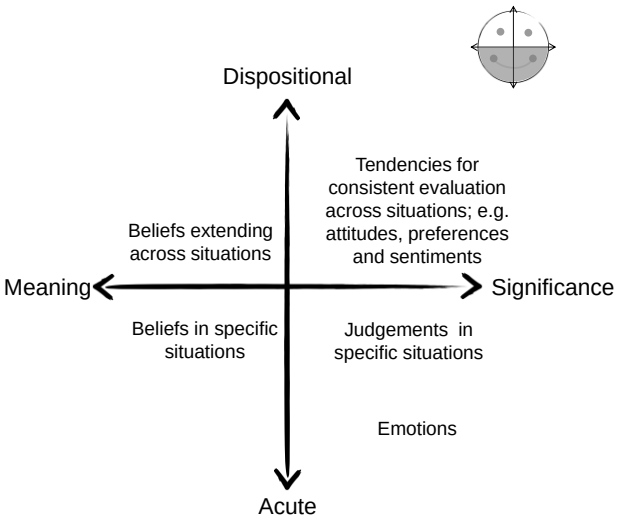


Fig. 43 Distinctions between experiences based on immediacy and relevance to the person.

70 It is possible that experiences depending on what they focus on take more or less dispositional or acute forms, with acute experiences to a greater degree being oriented towards events, whereas evaluation of products may be more dispositional. Scherer (1988) even questions the extent to which reactions to things such as like/dislike or love/hate should be considered emotions as, while they may change over time, "it is likely that the time scale and reasons for change are different from those found in emotions as episodes." Scherer instead proposes that these be called emotional attitudes.

Display 5. Emotions

Emotions are generally considered to be brief reactions elicited by appraisals of the significance events have for well-being. They are typically described as encompassing subjective experience (quality and intensity), expressive reactions, physiological changes, action tendencies and cognitions (Cornelius 1996; Ratner 2000; Solomon 2002). Emotions have been proposed in some cases to be universal across cultures (see for example Ekman 1999), having evolutionary origins (see for example Plutchik 2001), leading to distinct emotions being tied to specific action tendencies, preparing the person to rapidly respond to situations, see Table 10.

Emotions are often distinguished from other affective phenomena. As an example, mood is typically seen as lasting longer and being directed at life as a whole rather than specific events (Frijda 1986), and while emotion functions to bias action, mood changes cognition (Davidson 1994; Beedie, Terry and Lane 2005). While emotions last seconds, the duration of moods extend from minutes to days, and there are also more dispositional affective traits, such as temperament which may be stable over months or years, while activated in specific contexts (Goldsmith 1994). It is also possible to distinguish emotions from relatively enduring beliefs or evaluations such as preferences and attitudes in relation to an object or person (Scherer 2005).

Table 10 Action tendencies, and functions of some emotions (Frijda 1986).

	End state	**Function**	**Emotion**
Approach	Access	Producing situation permitting consummatory activity	Desire
Avoidance	Own accessibility	Protection	Fear
Being with	Contact, interaction	Permitting consummatory activity	Enjoyment, confidence
Attending (opening)	Identification	Orientation	Interest
Rejecting (closing)	Removal of object	Protection	Disgust
Non-attending	No information or contact	Selection	Indifference
Agnostic	Removal of obstruction	Regaining control	Anger
Interrupting	Reorientation	Reorientation	Shock, surprise
Dominating	Retained control	Generalized control	Arrogance
Submitting	Deflected pleasure	Secondary control	Humility, resignation

While there is reason to expect patterns in emotions across different persons or even cultures, these patterns seem to concern a set of emotions and their underlying processes rather than reactions to specific stimuli. In the law of concern, Frijda (1988, p.351) states that emotions "arise in response to events that are important to the individual's goals, motives or concerns". According to appraisal theories, themes or relational meanings underlie emotions and each emotion is said to be tied to a specific pattern of appraisal concerning the specific implications for personal well-being a person perceives in a situation (Scherer 2005). Specific positive emotions are said to be tied to particular appraised benefits, whereas specific negative emotions are said to be tied to particular appraised harms (Smith and Lazarus 1993). As an example, desire has been described as resulting from "the absence of concern satisfaction and from recognition of fit objects for concerns" (Frijda 1986, p.278); other examples of themes of appraisals are presented in Table 11. These appraisals do not necessarily involve conscious thought, but are intervening processes between stimuli and response taking into account amongst other things prior experiences (Frijda 1986) in judgements of relevance. They may involve several levels of processing "ranging from automatic and implicit to conscious conceptual or propositional evaluations" and the organism may engage in "reappraisal", serving to correct initial evaluation based on more elaborate processing or new information (Scherer 2001). Drawing on Leventhal and

Scherer (1987), Scherer (2001) describes the involved processing as occurring on three levels interacting continuously, both bottom-up and top-down: (a) a sensory-motor level primarily governed by prewired mechanisms, (b) a schematic level, where judgements are based on criteria mostly acquired through social learning processes. On this level too, the responses mostly occur outside consciousness, and finally (c) a conceptual level, where processing is done in terms where the information is consciously processed and involves culture-based meaning systems.

While themes underlying specific emotions are proposed to be more or less universal, appraisal theories also emphasise idiosyncrasy. Appraisal is always subjective, and while this subjective perception under most conditions may resemble the objective event characteristics, the two can diverge drastically (Frijda 1986; Scherer 2001). "Goals, desires, and expectations interact with thoughts and associations emanating from actual events in forming the effective emotional stimuli" (Frijda 1986, p.268), and individual differences, moods, and cultural values etc can strongly influence the evaluation process (Ortony, Clore, and Collins 1988). For an overview of appraisal theories, see e.g. Scherer (1999).

Table 11 Core relational themes, from Cornelius (1996), Smith and Lazarus (1993).

	Core relational theme
Anger	A demeaning offence against oneself
Anxiety	Facing uncertain threat
Fright (fear)	Facing an immediate, concrete, overwhelming physical danger
Guilt	Transgression of a moral imperative
Sadness	Experiencing an irrevocable loss
Happiness	Making progress toward the realisation of a goal
Love	Desiring or participating in affection, usually but not necessarily reciprocated
Compassion	Being moved by another's suffering and wanting to help

Appraisals have been said to be a part of an organism's ongoing monitoring of relations to the environment, and emotions are typically triggered by some event that have been evaluated in terms of its significance (Frijda 1986). This need not be external; emotions can also be elicited by imagination and fantasies (Frijda 1986). Deviations between expected or desired states and an actual situation are often proposed to underlie emotions (Scherer 2005), but these are not necessarily static. Rather emotions are be triggered by changes in stimulation (Scherer 1988). Frijda describes this in what is referred to as the Law of Change; "Emotions are elicited not so much by the presence of favourable or unfavourable conditions but by actual or expected changes in favourable or unfavourable conditions" (Frijda 2007, p.11) It has also been argued (Scherer 1988) that this change needs to be seen relative expectations; i.e. emotions are more likely to be elicited by unexpected events than expected ones, see table 12.

Table 12 Expected and actually occurring state changes and their effects, after Scherer (1988)

	Expected: Change	**Expected: No change**
Occurring: Change	*Not novel:* Acknowledgement (followed by relief, satisfaction, resignation, etc.)	*Novel:* Surprise (fear, anger, disgust)
Occurring: No Change	*Novel:* Surprise (disappointment, frustration, anger, perplexity)	*Not novel:* Normal functioning, no emotional response

5.3.5 Mode of reasoning

Acute interpretations and evaluations of significance can be more or less deliberate and explicitly reasoned, or schematic and instinctive.

Different modes of reasoning were sometimes noticeable in participants' statements. In many cases they appeared to apply some heuristics and spontaneously categorise things as members of more general categories. These generalisations occurred in relation to various issues, for example products having a certain style, technical character (for example being complex, high-tech etc.), functionality or being used in certain types of activities. These categorical statements were seemingly fewer in number when participants talked about *actual* experiences than when they reasoned about products presented to them in photographs etc. In Study (VI) triads with different types of products led to comments about categories of products, whereas comparison of similar things led to comments that to a greater extent led to comments on details. Participants also engaged in more explicit reasoning, and in many cases also made more extensive comments in relation to details that somehow call for attention, for example something being inconsistent with expectations or difficult to interpret.

In a few examples participants in Studies (I) and (II) seemingly reacted on an instinctive level without deliberate thought. This was the case, for example, when we presented a picture portraying an ashtray to participants in Study (I). The moment it was shown to participants, their faces changed and they expressed disgust. At an extreme, a person may interpret and judge significance on a very instinctive, potentially innate level which manifests itself through emotions, see Display 5.

Comparing the dimension of deliberate–reactive to meaning-significance, see Fig. 44, it is possible to make further distinctions between experiences: explicit interpretations, explicit judgements, schematic/stereotyping beliefs, and evaluative reactions (e.g. emotions). A person may interpret and judge significance with respect to things as well as events, both deliberately and as a reaction. At the extreme, emotions encompass both a component of interpretation and action. While Fig. 44 refers to mental experience and *reactions to* things or events, the dimension of reactive versus deliberate also has an equivalent in *actions through* things[71].

71 C.f. operations in activity theory, display 4.

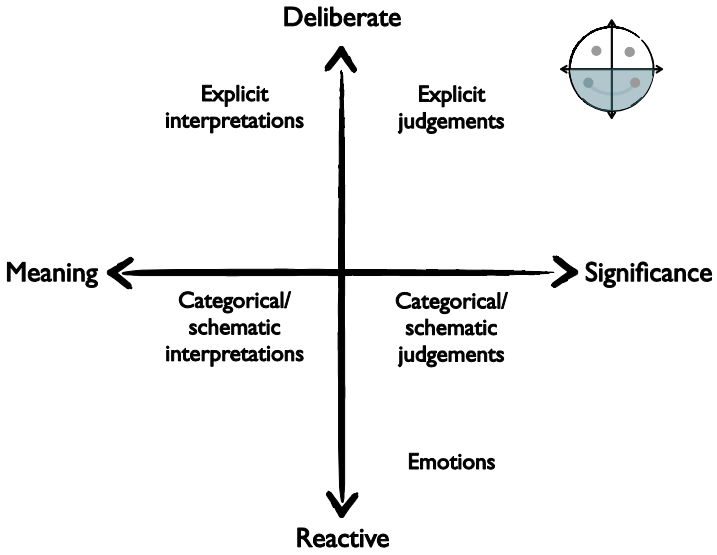


Fig. 44 Meaning and significance vs. mode of reasoning.

Deliberate and reactive information processing is likely to have been involved in the experiences reported by participants in all studies. However the data–collection procedures may have led to a disproportionate amount of explicit reasoning in comparison to what people would engage in with everyday product encounters. Furthermore, it could be questioned in retrospect whether what participants in Studies (I) and (II) mention are in fact to be considered emotions from a psychological perspective. Capturing only basic emotions such as fear, anger, joy etc. would have required a different methodology. What was reported were emotions from a different but in no respect less important point of view, that of the participants.

Different levels of information processing have also been discussed in the frameworks reviewed in Chapter 2. Hassenzahl (2004a) includes judgements as well as emotional reactions in one consequence category, while Desmet (2002) focuses on emotions. Distinctions between *different* levels of information processing are central to the frameworks of Norman (2004). Also Desmet and Hekkert (2007) emphasise that experiences occur on both a cognitive and visceral level.

Ascribing of meaning and appraisal of significance may occur at different levels of information processing. Regardless of whether the evaluations reported by participants were deliberate or reactive, they reflect some judgement of significance. The idea of themes underlying specific experiences found in appraisal theories may be applicable not only to hardwired reactions but also to more explicit judgements.

5.3.6 Appraisals in the studies

In many, if not most, cases the reason participants put forward for products eliciting experiences was their relevance to the realisation of some tangible or social goal.

Participants in the studies made judgements with respect to a number of different dimensions, but did not always put forward any specific explanation. Some thing may be perceived as *intrinsically* pleasant or unpleasant[72]. Often however, participants judged things on their *goal congruence* in terms of their (actual or anticipated) potential for assisting the realisation of some desirable outcomes. Participants also frequently described how things came to symbolise relations to other people, as well as how the opinions of other people in some cases affected their judgements. They also commented on the *legitimacy* of certain things or behaviour. Some things are likely to be seen as praiseworthy within a certain sociocultural setting, whereas others are not. In Study (II) one participant described the mascot of a (rival) football team as being strongly associated with a memory of going to a game and being subjected to the throwing of beer bottles by the other team's fans. Such actions may not only pose a physical threat, but are simply not acceptable.

A number of different appraisal dimensions have been identified, see Display 5. As an example, Frijda (1986, p.194) lists three elements of the situational meaning structure: "*cognitions of what the situation does or offers to the subject, or withholds from him, or might do or offer or withhold; cognitions of what the situation allows him to do, prevents him from doing or invites him to do; and evaluations of whether the various forms are desirable or not*". Similarly, Lazarus (1991) stresses emotions as outcomes of appraisals of the significance of events for the individual's well-being (primary appraisal) and potential to cope with an event (secondary appraisal). Scherer (2001, p.94) describes four general appraisal objectives of appraisals: "*1. How relevant is this event for me? Does it directly affect me or my social reference group? (relevance) 2. What are the implications of this event and how do these affect my well-being and my immediate and long-term goals? (implications) 3. How well can I cope with or adjust to these consequences? (coping potential) 4. What is the significance of this event with respect to my self-conception and to social norms and values? (normative significance)".*

These theories are congruent with the outcomes of the studies. A person may have a range of experiences with some thing, and can deliberately pass judgements on both things and events. However, emotions are elicited not by things per se, but how individuals appraise them to be significant. Furthermore, things are significant not by their mere presence, but by having a bearing on something that is important to the subject. This often takes the form of an event that is more or less congruent with goals and motives. Participants showed appreciation for products that mediate activities but also expressed frustration when having to engage in something that conflicted with other interests, or when for some reason they were not in control of the situation. Products may play different roles in events, but it is the subject's appraisal of these *events*, rather than things that elicits emotions.

72 While participants in the studies commented on things and events as intrinsically pleasant, an alternative explanation is that there may be underlying instrumental objectives that are tacit or latent.

Table 13 Consistency of actual with expected state and goal conduciveness of the event (Scherer 1988)

		Actual state	
		consistent with predicted state	**inconsistent with predicted state**
Event	**Blocks plan**	Resignation	Joy
	No change	Satisfaction	Frustration

A central factor that seemed to have triggered experiences in the informants' examples was something deviating from expectations. This too is congruent with appraisal models (see for example Scherer 2005). Attention is likely to be drawn to issues that deviate from expectation, which may explain some of the examples of experiences that vary over time. Match or mismatch with expectations may colour the experience, see Tables 12 and 13. Furthermore activities evolve, and a person's expectations are likely to change. Similarly, different aspects may become more salient in certain situations.

In a concrete experience, a range of different product-related and situational aspects may have a bearing on a range of different concerns, appraised through a range of different appraisals.

Scherer (1988; 2005) suggests a distinction between intrinsic and extrinsic appraisal. The first of these concerns an evaluation of persons and objects irrespective of current needs and goals, based on inherited or learned preferences. The latter is an evaluation of events and consequences in terms of conduciveness for salient needs, desires or goals. Scherer describes how these may interact to yield different emotions, see Table 14. This was in some cases noticeable, as with some confectionery reported in Study (II) as eliciting temptation, desire and remorse. The example described how buying one piece of confectionery whets the appetite. After buying more and consuming them, the participant experiences remorse but still feels like having more.

Table 14 Intrinsic and goal-related valence (Scherer 1988)

	Intrinsically	
	Pleasant	**Unpleasant**
Helps reach goals (beneficial, good)	Agreeable feeling of satisfaction	Uneasy feeling of satisfaction
Hinders reaching goals (harmful, bad)	Regret	Sullen frustration

Appraisal models may explain many of the reports given by informants and imply that people may be predisposed to making judgements on a number of dimensions such as intrinsic pleasantness, goal conduciveness, compatibility with standards etc.

The appraisal dimensions identified in the studies are also found in the reviewed frameworks. Most notably, Desmet (2002) focuses on appraisals as central to the model of Product Emotions. They are also presented as components of experience in the framework of Product Experience (Desmet and Hekkert 2007). However while interaction, use etc. are acknowledged, these frameworks emphasise *products* as central to experience. This can be contrasted with the Four Pleasures model (Jordan 1999), which to a greater degree emphasises active subjects seeking benefits and acting for example with respect to social goals. Hassenzahl (2004a) to an even greater degree emphasises this active side of things: using things and things that have implications for behaviour.

6 Outcomes from the studies

Users seek to act through products, but also in some cases react to them. While most things pass unnoticed, some attract attention and have more or less significance to their users. However, things matter not in themselves but in their relation to something: by being different from expectations, by referring to certain values or by having certain practical implications. The magic of a product lie not so much in some specific attribute, but in the consequences it is perceived to have in relation to a person's well-being.

Products may play different roles in relation to what the user is doing, which affects what factors are attended to. These may in turn be ascribed meaning and appraised as being more or less significant with respect to some concern.

The mere presence of a thing is less likely to elicit emotional reactions than events that change the relation between the user and a thing, with operations forming or breaking down, progress towards goals and less explicit motives being supported or hampered etc. Some things are significant to users because of qualities, or strong associations with values that are congruent or incongruent with some concern the user has. In other cases, products have a strong personal significance because of prior experiences with them. Often, however, the significance of products lies not in things per se but in the role(s) they play in events, and the impact they have on the subject's well-being through consequences for what he or she does.

6.1 Answer to RQ1

What do people focus on when describing experiences with products?

When describing experiences with products, people focus on a range of issues having to do with things, but also the situations in which these are encountered or used and the consequences they may have. Experiences may be oriented towards products or categories they represent, but attention may also be turned to their details. A person may also focus on something the product stands for, such as certain values, memories or more general ideas. A person's experiences with a thing may also be oriented towards use, focusing on goals, the characteristics of interaction with the thing, or the type of activity in which it was used. Something in a situation or an event may also serve as an object for an experience with a product.

Ideas ascribed to things, and the practical consequences of a product, are in many cases more important than product attributes in explanations of experiences with products. What matters to people are often *relations* rather than the thing per se, the thing's relation to concerns, relations between things and other things, vis-à-vis expectations, and most importantly, a thing's relation to use.

6.2 Answer to RQ2

How do people explain the significant aspects when describing experiences with products?

Things are important either because of some ideas associated with them, or through the (perceived) impact the thing has on the participant's ability to realise motives.

A user may have qualitatively different relations to a thing depending on the particulars of the activity in which it is encountered, and attention will only be paid to things under certain conditions. People may care about a range of different issues in one and the same product, some being more salient than others at particular points of time. A user may treat a thing as something to pass judgement on, make sense of, act on or through.

Things often matter not in terms of their mere presence or physical properties, but by differing from expectations, requiring attention or referring to something. A user may find ideas associated with a product significant in relation to more stable preferences (for example attitudes and standards) or expectations. This idea may be the user's conception of the product, its performance etc., but also general values, personal memories etc., or associations with certain types of activities. No specific set of attributes is directly connected to affective experiences; things elicit reactions when they are appraised as having significance for well-being and in the majority of cases this is more likely to be through qualities such as functionality, expression etc. than through specific attributes.

Sequences of events that unfold play a central role in the elicitation of certain experiences. There is reason to believe that humans are predisposed to judgements about the significance something has for well-being, their ability to cope with consequences, compatibility with standards etc. Apart from whether something deviates enough from expectations to capture attention or poses an immediate threat, one of the most important appraisal dimensions is conduciveness to goals and motives.

Things are significant when they are perceived to have an impact on what the user does, or what he or she can and must do. These consequences may be especially significant when things have immediate implications that a person needs to attend to. Products play particular roles in events, and a product may interfere with the operations or match/mismatch with a person's expectations about progress towards goal and motive realisation. Products may also have extensive implications beyond the particular situation, incurring changes describable as enabling, disabling (hampering), relieving or forcing the engagement in activities and progress towards motive realisation.

6.3 Answer to RQ3

How can the experiences with products people report be described?

A person may have a range of different relations and reactions to one and the same thing, and these are likely to change over time. Experiences with things can be described in terms of immediacy, valence, focus and theme.

Experiences may be more or less bodily or mental. Mental experiences have more or less *immediacy*. They can concern a fairly stable relation to a thing or category of things, but also specific events and (anticipated or realised) consequences thereof. Experiences with things can be described as *oriented* towards things, use or something in a situation. They take on a *focus,* or object.

They can also be described in terms of having a certain *valence*. Some beliefs for example about what a product represents may be fairly neutral. A person may, however, through reactive or deliberated appraisals also judge this to be more or less significant with respect to some *theme,* for example intrinsic pleasantness, goal conduciveness, compatibility with social standards etc.

Experiences can also be characterised in terms of a *temporal focus*. Some concern general ideas that are not situational, while others have a strong temporal focus, oriented towards past, present or future.

6.4 Summing-up

For the purposes of PD it is desirable to distinguish between different experiences such as sensations, meaning and judgements about significance. While specific experiences are always acute, a person may also form beliefs that apply across a range of situations, and in some cases these may be stable enough to be considered dispositional.

The elicitation of a reaction depends on how a particular subject deems a product to have significance for well-being in a particular situation. The quality of the experience is likely to depend on how the thing plays a role in a particular activity, and evolves over time. There are great limitations as to whether we can predict the characteristics of any acute experience at any particular time, as there are many contingencies that could not be anticipated or even less predetermined.

Only a fraction of all experiences with things could be prescribed in product development. Nevertheless there are factors that are addressable, both in relation to the significance of things and to the significance of use. The following chapter therefore elaborates on some of these, and discusses some implications for product development.

7 Implications for Product Development

This chapter discusses the implications the outcomes have for Product Development and the extent to which it is possible at all to design specific experiences. In addition, it addresses three ways in which products may be significant to users, each introducing somewhat different objectives for design, and different needs for information.

Experiences with things can be described and at least to a certain degree explained, which is a prerequisite for addressing them in PD. However, in PD there is a need to specify requirements and come up with solutions that can then be evaluated. Attention should therefore be paid to specific solutions rather than the experiences people have with things in general. Designing for affective relations would require it to be possible to predict their occurrence, and to change something that has a bearing on them, which presupposes that relevant information can be collected and understood.

The analysis across studies highlighted some challenges to addressing experiences. Dispositional preferences etc. oriented towards products could be addressed. Acute experiences, however, occur in situations and depend on expectations, regardless of whether they take the form of deliberate or reactive judgements. Furthermore, there are some challenges in capturing the objects of experiences in studies. In PD there is typically a need to go beyond the idiosyncratic and create something that is of value to a range of users across situations. Those experiences a product may elicit universally, or at least inter-subjectively, should therefore be separated from those that could not be addressed in product development. There is also a need to identify antecedents that act as signifiers, triggers, cues etc. in eliciting experiences.

Designing for experiences could, in the extreme case, take the form of deliberately aiming to elicit specific reactions. However, it is also possible to take a more open stance and consider the objective to be an informed understanding of how users experience particular products and situations without making the elicitation of specific experiences an explicit objective.

In accordance with the previous chapter, experiences are here taken to encompass sensations, beliefs about something (meaning), and judgements of the significance this has in relation to the subject's well-being. Meaning and significance can be oriented towards things or events, and take the form of reactions or deliberate interpretation and judgements. See Fig. 45.

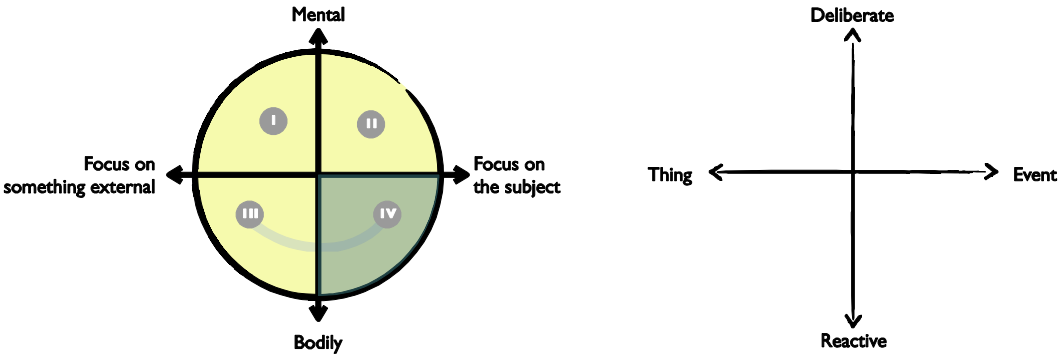


Fig. 45 Experiences with products. *Left*: Experiences with products, meaning (I), significance (II), and sensations (III). *Right*: Mental experiences may take as their object something in a thing or an event, and may be more or less deliberate or reactive.

7.1 Experiences with things

This section looks at some conditions for experiences with things in everyday situations, and questions whether they can be predicted.

7.1.1 Experiences with things and experiences of things

Even in an encounter that involves a specific product, experiences *with* things do not necessarily equate to experiences *of* things.

Experiences can be oriented towards things or events, and may involve both deliberate and reactive components. On a very basic level products may elicit orientation reflexes, requiring the subject to pay attention to them. Under certain conditions they may also take the form of brief emotions accompanied by action tendencies, bodily reactions etc. This is likely to only occur when something is perceived to be at stake for the subject, in which case the subject may also proceed to make more conscious elaborations of whether the thing is congruent with concerns or not. A product may, however, play a role in an event that is somehow appraised to be significant to a person without the thing coming into focus. Even when things play a role for example in progress towards motive fulfilment they are not necessarily actively contemplated. The user may very well (rightfully) be more concerned about the goal than the means of getting there. People act in material contexts, and are continuously surrounded by products. The majority of these things most of the time are fairly insignificant and receive very little attention. In addressing experiences with things there is a need also to consider issues beyond the product.

7.1.2 Experienceability?

Given the situational and subjective character of acute experiences, there are limitations in the extent to which experiences can be located to a specific product or attribute. It would be difficult to predict whether or not a specific person will have certain reactions, and even more so to prescribe something that would universally elicit specific emotions across a group of people and situations. This does not mean that it is not possible to reason in terms of a product having a certain propensity for

eliciting certain reactions. Some issues are likely to be relevant across situations and be significant for several members in a group. An interesting question is then to what extent it would make sense to discuss "experienceability" as a performance domain for products.

Parallels can be drawn to other aspects. A function may only be fulfilled by some relation to other system components but it is possible to talk about things having certain "functionality", i.e. potential for fulfilling functions. How well a specific user will perform a specific task, the errors he or she will make, or the time it will take to achieve a desired result cannot be predicted. Nevertheless, it is possible to talk about usability and make predictions regarding whether particular groups of users will be more or less likely to have problems in handling something. Drawing on these parallels, it would be possible to talk about something's "angerability" (its propensity to elicit anger), "fearabilty" (its propensity to elicit "fear"), its "surprisability", "disgustability" etc. However, it makes less sense to group these together in a larger "experienceability" dimension. It may be possible to set targets in terms of certain products more or less frequently eliciting certain experiences, but such targets in that case must concern specific types of experiences.

While specific experiences are elicited in particular events, a user may have dispositional relations to a thing, remaining latent until foregrounded under certain circumstances. A wine may have a certain propensity to convey a certain taste without this being realised while the bottle is sitting on a shelf. A product may have certain stylistic features that can represent a certain meaning once someone with the right background knowledge actively contemplates it. A certain propensity for eliciting specific experiences could therefore be said to be embeddable in a product while the qualities of the actual experience once elicited is likely to vary. A thing may have a certain tendency to elicit experiences that are similar across situations and persons and it is therefore relevant to consider experiences that *may* occur in relation to different attributes.

7.1.3 The role(s) of things in activities

People do not just react to things but also act through them. While this perhaps borders on being a circular argument, it is worth stressing that users do in fact care about use. Tools may in many cases be less significant than the consequences they have. People act and care about how things have an impact on what they do, what they can do, and what they must do. From this perspective it becomes important to take use and human activity into account when explaining experiences with things. The significance of a specific thing to a specific user in a specific event is often through the consequences it has for what he or she is doing, can do, must do and so forth. Hence the explanations for experience lie in the (appraised) consequences for activity rather than things themselves.

The relation(s) someone has with a thing will vary with situation and time, and influence possible experiences with it. When something is first encountered it may elicit curiosity, or if the thing has potential for fulfilling a need, even desire. The thing here serves as the object of one's attention. Assuming that it is some sort of consumer

product, our subject may decide to acquire it, and potentially get it at a good price. The thing here shifts between different roles in relation to the subject's activities. At first it is something to make sense of, it then moves over to being a resource that one strives to acquire, to being a resource that is available for use, and our user may feel content or even proud of striking a good deal. The subject may then continue to engage with it, exploring it, or practise its application, where it becomes something to master. Presuming that it is not very similar to what he or she already possesses, this mastery may take a while. At first the subject needs to consciously plan his or her actions in order to achieve the desirable outcomes, now acting on the product in order to have some effect. With a little practice this orientation is no longer necessary and the subject can focus on the results without paying much attention to the product. He or she may evolve a new conception of the thing, taking it for granted or changing his or her ideas about it. After a while it may (given that it has particularly strong significance) continue to be valued, perhaps also for its association with the particularly good deal he or she got for it. It may also disappear from consciousness, until suddenly it fails or requires some maintenance.

The experiences someone has with a thing depend not only on the thing but is at least as much a function of his or her relation to it: in terms of roles of the product as object of desire, toy, tool, stupid thing that requires attention, rubbish etc., and the person as a potential buyer, owner, user, caretaker etc. The subject's concerns are likely to evolve, as will his or her skills, and especially his or her conception of a specific artefact. Even if it was possible to induce a particular reaction in a person, through a certain relation in a particular situation, it is not certain that the person would have the same reaction at two different points in time[73].

7.1.4 Eliciting reactions or enabling action?

Addressing the experiences something may elicit could adopt different foci. In one case the ambition would be to adjust characteristics of the product based on the experiences it may give rise to. An alternative would be to actively aim to elicit specific experiences. The difference between these *product-driven* and *experience-driven approache*s may, however, mostly be one of degree.

While emotional design often "is understood as an explicit attempt to induce emotions through a particular product" (Hassenzahl 2004b, p.47), it is possible to question reactions such as emotions as goals of design activities. To actively address experiences there is a need to identify something actionable, something changeable that can be expected to have some bearing on experiences. Sanders (2001) puts it: "*There is no such thing as experience design. You can't design experience because experiencing is in people. You can design for experiencing, however. You can design the scaffolding or infrastructure that people can use to create their own experiences*".

73 Unfortunately there is something known as hedonic asymmetry which leads to a focus on negative aspects, while positive ones may wear off, meaning that they will disappear with repeated occurrence."Pleasure is always contingent upon change and disappears with continuous satisfaction. Pain may persist under persisting adverse conditions" (Frijda 1988, p.353)

Emphasising emotions or other reactions per se puts situational antecedents and the concerns of the user into a secondary position. The idea of addressing emotions in order to develop things that to a greater degree appeal to a target group faces challenges as it starkly contrasts with the individual, situational aspect of emotions. Desmet and Hekkert (2007, p.62) write that concerns may be situational: "in order to understand emotional responses to human-product interaction, one must understand the users' concerns given the context in which he or she interacts with the product". However, it is also possible to argue the converse: "Emotions point to the presence of some concern" (Frijda 1988, p.351), and it is from this perspective that they are interesting. The ephemerality and situational dependence of reactions means that we can question to what extent we can see emotions as an objective for design. In fact, their underlying reasons in terms of perceived benefits and harm/drawbacks are of higher interest. At least for everyday products it may be more appropriate to take emotions not as goals, but as indicators of match or mismatch between concerns and something that the product may have bearing on.

A preoccupation with acute experiences is problematic in a design context, as they result from very personal appraisals. This does not imply that we cannot address factors that are significant for experiences with and of products, but it is relevant to as Hassenzahl (2004b) raise the question of how we can make possible positive emotions such as joy, satisfaction, pride, and what the designable parameters would be. Narratives and measurements of experiences are interesting, especially when they can be traced back to something that could be designed, but it is the latter that is the objective. From this perspective it may be less relevant to look at what experiences are elicited than what elicits them.

An alternative to the goal of eliciting reactions would be to address the actual conditions being appraised. The objective of PD is not necessarily to change interpretations and judgements, but the underlying conditions they focus on.

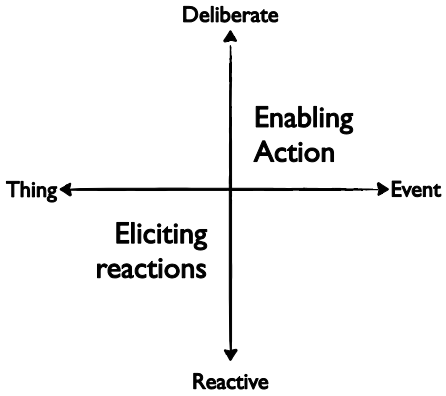


Fig. 46 Two potential objectives for addressing experiences in design: creating things that elicit reactions (bottom left quadrant), and enabling users to make good of products to meet goals and motives in events (top right quadrant).

Addressing the extent to which products support users in meeting needs opens the way to an alternative perspective that focuses not on reactions elicited by things, but on enabling users to act with respect to different goals to realise underlying motives, see Fig. 46. A focus on making possible experiences has been advocated for example by Sanders (2001), who uses the term scaffolding for creating conditions that enable people to create their own experiences. Hassenzahl (2004b, p.47) suggests that there may be a set of general needs: "for manipulation (goal achievement), stimulation (personal growth, an increase of knowledge and skills), identification (self-expression, interaction with relevant others) and evocation (self-maintenance, memories) "that would serve better as a starting point for design than emotions. Several researchers have proposed lists of needs or consumption values in relation to products (e.g. Hanna 1980; Lai 1995; Sheth, Newman, and Gross 1991). It should be noted that such general inventories are lists of human needs, rather than lists of *the* human needs as actual which may be virtually endless and do not necessarily have a fixed position in a hierarchy (Leont'ev 1978). Nevertheless such classifications can be taken as a starting point for a need-*driven approach*.

Focusing on enabling, and scaffolding for meeting needs, could be viewed as a *use-driven approach*. Traditional use-oriented approaches typically address issues such as ease of use and utility and tend to primarily focus on an action-level where the subject consciously engages in behaviour oriented to conscious goals. However, when discussing emotional experiences with things in the studies, participants sometimes highlighted issues that concerned implications for operations or motives, and consequences extending beyond the interaction. Events that elicit behaviour on an operations level may take a seemingly "emotional" form because of their unconscious nature. Furthermore, users may make good of a thing to meet a range of different motives, some of which have not traditionally been considered pragmatic, for example issues having to do with identity or social relations. To address the issues participants discussed as significant, a more comprehensive understanding of use may prove at least as important as insights into emotions as such.

Product-, experience-, need- and use-oriented approaches all have their respective benefits and drawbacks in emphasising different aspects of user-artefact relations. While the possibilities for intentionally eliciting acute emotions are likely to be limited, it is possible to address some of the issues that have a bearing on experiences. Such an approach would ideally strive to enable, creating conditions and deliberately taking into account the various ways in which different aspects may be appraised as having implications for well-being: scaffolding for significance.

7.2 Scaffolding for significance

The overall aim in scaffolding for significance can be described as creating an intentional fit or misfit between different designable aspects and concerns, expectations and skills, enabling desirable changes, addressing both instrumental and intrinsic values. Based on the various relations to things discussed by participants in the studies, it is possible to distinguish between three perspectives that may be of special interest depending on what is significant to the person - experiences oriented

towards things, use or consequences beyond use[74]. These can simplified be described as relating to *"what the thing is", "how it interplays with the user" and "overall consequences" beyond interaction* and imply somewhat different objectives for design, see Table 15.

Table 15 Table 1. Three types of product significance.

	Significant THINGS	**Significant USE**	**Significant consequences BEYOND USE**
Theme	Intrinsic pleasantness of *products and associations*. The thing's congruence with desirable ideas	Intrinsic pleasantness of *use.* Progress towards goals	*Consequences* in relation to motives.
Experiences	Aesthetic and bodily experiences Experiences of character (beliefs about things) Appraised significance	Aesthetic and bodily experiences Character of the thing in use and character of use Appraised significance	Expected behavioural consequences Appraised significance

Different aspects may serve as objects for experience in the three perspectives, see Fig. 47. Furthermore, they are characterised by different relations between the person and the product and require somewhat different units of analysis.

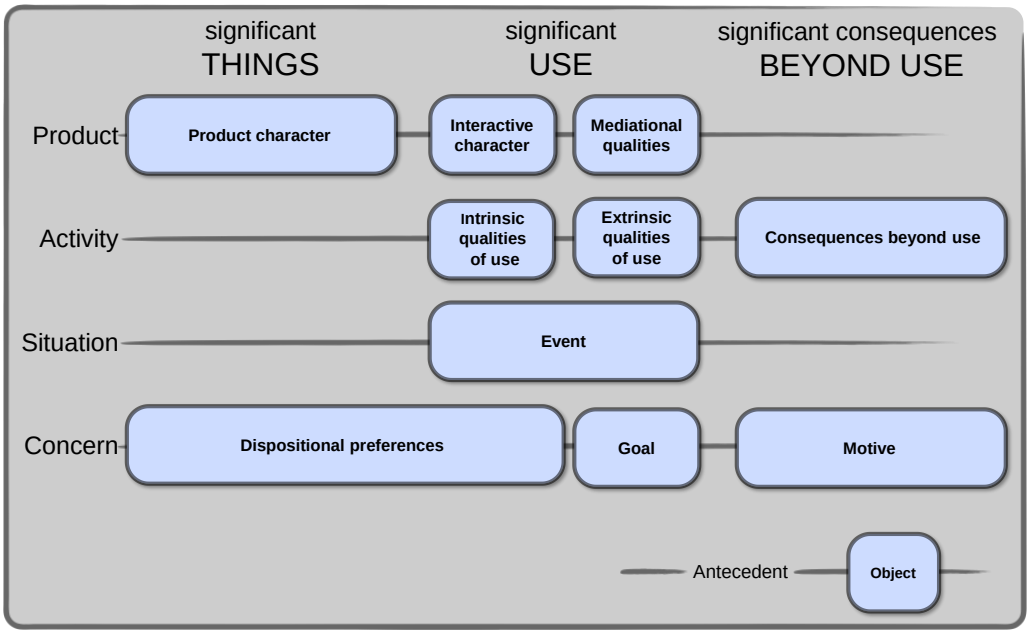


Fig. 47 Some antecedents and objects of experiences with things in relation to the three types of significance. The product, activity and situational factors serving as objects of experience may to some extent be addressable in design.

74 These issues are closely intertwined: the thing as such is only encountered within particular activities, and interaction occurs in a wider context, for a certain reason. However, making this distinction may be useful as addressing the issues would imply slightly different foci and raise different questions.

7.2.1 Significant things & thereby associated meanings

Significant things and thereby associated meanings concern the experience of a product and any associations it comes with, see Fig. 48. Several affective relations are relevant to this, with person and product taking different roles:

A) The Thing elicits a reaction in the user.

B) The User interprets and ascribes meaning to the Thing and reacts to or passes judgement on this.

C) The Thing refers to some idea beyond itself on which the user passes judgement or to which the user reacts.

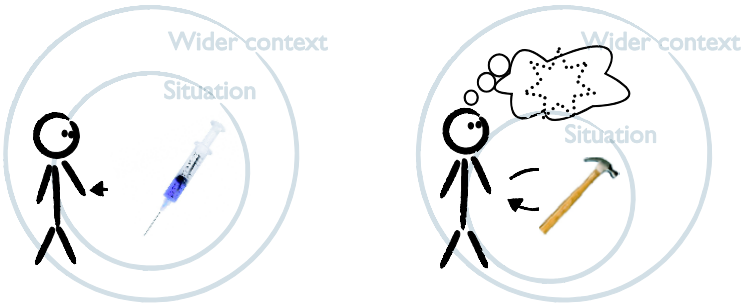


Fig. 48 A subject's experiences with a product may be oriented towards products or ideas they refer to.

The object of experience is either what the product is perceived to be (its character) or some idea it refers to, and experiences are elicited by a fit with dispositional preferences and expectations.

A user may react to or pass judgement on any aspect of a thing or thereby associated values and ideas, provided attention is given to them. In a few cases stimuli may be found intrinsically pleasant or unpleasant (A) because of sensory processes; i.e. bodily pleasures or aesthetics[75]. However, in the vast majority of cases a subject also interprets or ascribes meanings to the thing (B). This implies another type of experiences: experiences of things or situations having a certain character. This may be more or less significant and can lead to conscious or conscious evaluation of well and woe. Furthermore, things may also refer to something beyond themselves (C), for example some memory or more general idea.

A subject may focus his or her attention on any aspect of a product, either as a voluntary act or as a reaction, and may pass judgement on the product's overall character as well as details. However, attention is likely to be directed at something that actually requires it. In some cases this may be something that stands out from that which it is contrasted with, for example deviating from expectations. The subject will also form some sort of belief about the thing: its character. This may partly be an

75 The product elicits a reaction in the person. Certain stimuli may trigger reflexes, for example certain smells being repulsive. Aesthetic and bodily experiences are likely to take this form of seemingly S->R like reactions. However, they may in many cases be a function not only of the stimuli as such, but of the complexity in processing it. Cf. Berlyne (1971).

interpretation and partly meanings ascribed to the thing. It is to at least some extent determined by the subject's prior experiences, but is also a result of cues embodied in the product. Furthermore, the interpretation of the artefact will also be evaluated in relation to concerns. This is not to suggest that this is a linear process or even that conscious judgements are necessarily involved.

At least four experiences are relevant from this perspective: aesthetic and bodily experiences, experiences of character (meanings/beliefs about things), ideas beyond things and judgements of significance.

These may to some extent be addressable in what can be described as a product-focused approach. Such an approach may address three "levels of objectives", designing for bodily pleasures, styling/giving character, and fitting things to values, expectations and preferences. Aspects of the product that give rise to different bodily experiences can be addressed. It is also possible to address product-related factors that have bearing on the meanings someone will ascribe to a thing, for example the communicative functions of products. There is, however, a need to understand what contributes to desirable character, i.e. those explicit or implicit cues that give rise to a certain interpretation. Furthermore, there is also a need to somehow identify expectations, and what characters the target users would in fact appreciate.

7.2.2 Significant use

Significant use concerns interactive qualities in and of use, as well as episodes of events in specific situations, see Fig. 49.

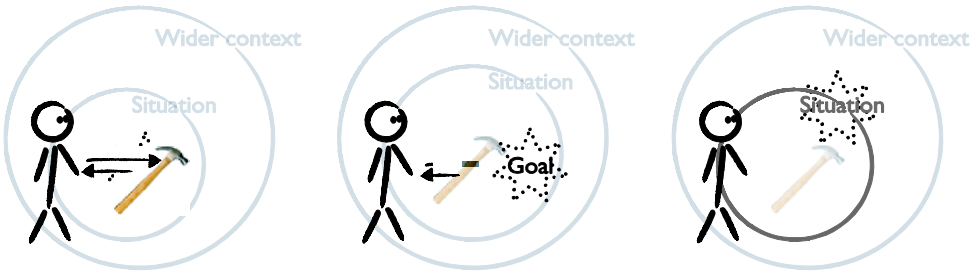


Fig. 49 A subject's experiences with a product may be oriented towards characteristics of the product in use, interaction, goals or situations.

Here too the relations between the user and product may take different forms:

D) The User acts on the Thing with the goal to change its state

E) The User acts through the Thing to meet some goal

F) Something in the situation changes the course of events

The objects of experience from this perspective include those characteristics of the product that present themselves when a person manipulates the thing, i.e. the product's interactive character, and its perceived quality in meeting some goal. Furthermore, interaction and use as such, as well as events, may also become objects of experience.

Sometimes a product requires action (D). Depending on how outcomes are expected to be congruent or incongruent with concerns, this may elicit positive or negative experiences. In the studies, however, products requiring action were in many cases associated with activities that were considered to be compulsory or chores, and as such negative. In many cases, however, a user acts not on a product but through it (E). This interaction may in itself be perceived as intrinsically pleasant or unpleasant. Experiences may also be elicited by the product supporting or hampering progress towards goals[76]. In addition, something beyond the user and product may happen that changes a course of events (F).

At least four types of experiences are relevant from this perspective: bodily experiences, beliefs about the character of the thing in use and character of use as such, judgement of significance of interactive qualities and events. Significant use may be closely related to acute experiences, as events, interaction etc. may have a strong temporal dimension.

These may to some extent be addressed in what can be referred to as a use-focused or event-focused approach. The potential for actually designing interactions and events that elicit specific experiences is probably limited to a few applications. Some products such as amusement park rides, movies etc. have a temporal dimension with more or less predictable sequences of expectations and events. More generally there are seemingly three potential objectives for design: designing pleasant interaction, designing goal-congruent tools, and designing for events.

Appropriate interaction is not a new objective for design. However, for certain products it may be relevant to consider interaction beyond the traditional ease-of-use paradigm which emphasises overall system performance with respect to a specific goal and in doing so typically strive to reduce the number of errors, the effort it takes to meet a goal etc. Things display certain behaviour and can be more or less challenging, useful or offensive in their interaction with the user, i.e. have a certain character in use which may in itself be more or less desirable. The interaction with the thing may in some cases have intrinsic qualities.

In addressing the instrumental aspects there is a need to understand not only interaction but also the wider scope of activities in relation to a wide range of goals/motives, including enabling users to act on self and social reality.

It is possible to aim at supporting various use-situations, regardless of whether the activity is intrinsically or extrinsically motivated. While contingencies colour the actual experiences of users, it may be possible to foresee some of the events in which a product is encountered, and the scaffold for experience in relation to how these unfold. For many products there are more or less predictable use cases that focus not

76 It should be noted that this judgement may in many cases be in relation to something, for example expectations based in prior events. Frijda (2007, p.11) refers to what he calls "The law of Comparative feeling: The nature and intensity of emotion depend on the relationship between an event and some frame of reference with which the event is compared. It is not the magnitude of the event that decides the emotion but its magnitude relative to that frame of reference. /…/ The frame of reference is often the prevailing state of affairs, but it can also be an expectation".

only on application in use but also on shelf life, un-boxing, storage etc. To some extent it is also possible to design events[77].

Addressing these issues would require an understanding of the background on users, their skills, knowledge etc. as well as the various goals they have, the contexts in which they act, the concerns they have etc.

7.2.3 Significant consequences beyond use

Significant consequences concern behavioural and social consequences following upon a specific events, or adoption of a product, see Fig. 50. These have to do with the significance a product has for someone in relation to overall activities and everyday life. Here too, several affective relations may be relevant:

G) The Thing makes a certain activity possible

H) The Thing requires engagement in a certain activity

I) An event with a product alters what activities the user can or must engage in.

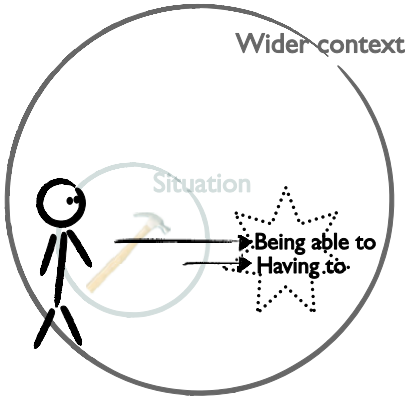


Fig. 50 A subject's experiences with a product may be oriented towards social and behavioural consequences beyond the use situation.

Products not only touch people in the immediate present but have consequences for motive realisation, and for activities beyond the situation of use, and these too may serve as objects of experiences. A product may have both social and behavioural implications in someone's life.

Products may support a range of different actions, which in turn enable various different activities oriented towards various motives, see Paper D and Fig. 51.

77 Foreseeing and staging events is to some extent the objective of service design, see for example Stuart & Tax (2004). Staging events in relation to experiences may also take appraisal patterns such as those listed in section 5.3 into account.

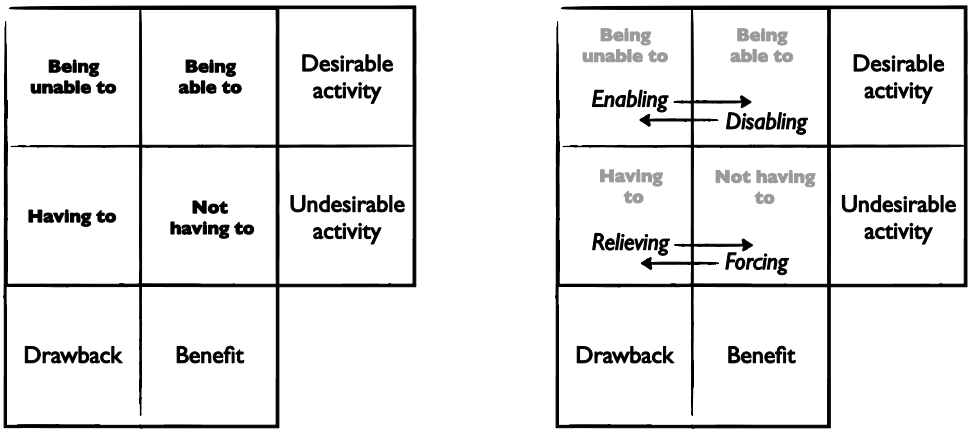


Fig. 51 Change scheme: Benefits may occur from either being able to engage in something desirable or avoiding something undesirable. Changes may enable (support), disable (hamper), relieve or force.

With a minor change in technology, the user's interaction with it is likely to change while the overall use of the product and derived utility may remain the same. However, with more extensive changes such as replacing the product with a different technical principle (for example going by bus to work instead of by bike as in the example in section 5.2.3), the changes may be more extensive. While some of these may be closely associated with things (for example the thermal comfort provided by a bus as opposed to a bike), products may also have secondary consequences. To take an example, going by bus may imply a need to go to the gym because of no longer getting exercise from cycling.

Experiences tied to consequences beyond use include judgements of significance of (practical) consequences, either realised or expected.

These can to some extent be addressed in what can be referred to as a need-focused approach. From this perspective the objective is to mediate progress towards motives by enabling engagement in desirable activities or avoidance of undesirable ones. In order to achieve this it is relevant to identify a range of benefits sought in products, which may very well extend beyond what is normally expected to be the main functionality of a thing. There is also a need to identify actual (or expected) implications, and to elaborate both the present and an expected future.

The concepts relating to shifts in activities can be applied in analysis, as demonstrated in Paper D. However, predicting consequences beyond a use situation and implications in relation to general concerns poses some challenges and may require a good general understanding of habits, practices and values.

7.3 Addressing significance in a PD process

The three different perspectives significant things, use and consequences beyond use are intended to be a starting point for grasping how a specific thing may be significant under different circumstances, and how different aspects can serve as objects for experiences with things. They should not be taken as a list of aspects to maximise, but as a support for holistic understanding and in comprehensive requirements identification.

The three perspectives imply different design objectives and problems to solve. As a consequence, addressing them would also require somewhat different information, see Table 16. This section therefore discusses some methodological issues in addressing the three types of significance, where applicable drawing on some reflections about the methodology used in the studies[78].

Table 16 Examples of design objectives for addressing the three types of significance

	Significant THINGS	**Significant USE**	**Significant consequences BEYOND USE**
Examples of design objectives	Create a fit between character and concerns Address intrinsic pleasantness of things, e.g. aesthetics	Mediate desirable action with respect to a range of goals and motives Consider factors contributing to intrinsic pleasantness of use Scaffold for events in a wide range of use-situations, including maintenance, unwrapping etc. For a particular event look at sequences of interaction in relation to appraisal dimensions	Enable and Relieve users of desirable and undesirable activities based on an understanding of overall habits, expectations, concerns and the implications a product may have for overall activities beyond use
Objects of design	Product character	Interactive character and mediational qualities of things Interaction Predictable situations	Overall utility and consequences

Different types of information are needed in addressing the three perspectives. Much PD theory presents development as a series of problems that can be solved in an algorithmic manner by first gathering all relevant information and then transforming this into a solution in a number of steps (see e.g. Altshuller 1996; Pahl and Beitz 1996). However, there are also scholars who to a greater extent emphasise the persons carrying out the development activities as a form of reflective practice (Schön 1995),

78 The studies were conducted with the intention of exploring different aspects of affective relations to things, whereas the purpose of a study in a PD context typically has a narrower focus, for example identifying requirements or evaluating whether certain goals have been met. However, while the studies were not planned with methodological comparison in mind, it may still prove worthwhile to use them for a discussion on how different methodological issues can enable participants to share information.

in which the framing of the problems changes with the conceptions of solutions. The development of a product does not necessarily follow from solving problems that can be specified in advance. Rather, many design problems may be what Rittel and Webber (1973) referred to as wicked (Buchanan 1992; Coyne 2005), among other things characterised by not having a definite formulation or optimal solution.

Developers may need well-framed precise information, as well as a general understanding of the issues they address. Decisions on specific aspects in a PD process may be supported by data collected through close-ended questions in nomothetic studies. However, interpreting such data and translating it into requirements or specifications for products may require a frame of reference founded in good a priori knowledge and/or rich data. Issues such as habits, skills, users' frames of reference, concerns etc. do not necessarily lend themselves well to specification, and may to a certain extent be tacit. The transfer of such knowledge may require other approaches, for example socialisation (Nonaka and Takeuchi 1995), implying a need for more contextual methods.

Addressing experiential aspects in a PD process could take the three types of significance as a starting point. Depending on the nature of the project, different aspects may be more or less significant to users. The degree to which different affective relations and product aspects are important is likely to depend on what type of product the project concerns, and what implications the product would have for the target group.

Different aspects may be more or less relevant, depending on the nature of the development project. When a development concerns a well-defined product of which the organisation already has experience, for example a minor update to an existing product, the implications for the user in terms of consequences beyond use may already be well known. If, however, the project concerns radical innovation, for example introducing a completely new type of technology or replacing goods with services, the implications the thing has for activities beyond use may be significant. With incremental innovation, as with a minor product redesign, the novel information needed for PD may to a greater extent concern the significance of things and use.

Different types of user studies may also be relevant at different stages of development processes, see Fig. 52.

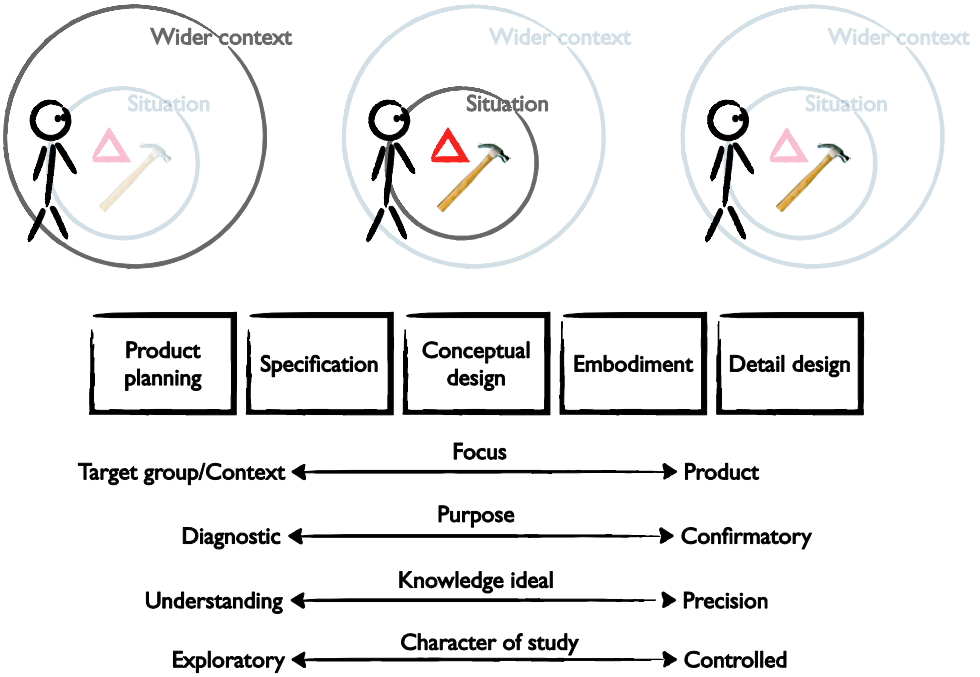


Fig. 52 Scaffolding for significance is likely to take different forms depending on stage of development process, and would require different types of studies.

PD is typically conceived as a process encompassing phases such as product planning, specification, conceptual design, detail design etc. The different types of product significance are likely to relate to decisions taken at different stages. Overall consequences beyond use are likely to be somewhat related to the product's overall functionality, determined early, whereas some aspects relating to product character, for example fine-tuning of specific design parameters may occur later in the process.

PD processes can be described as moving from information poor stages to information rich ones. The relevant questions are likely to take different forms and have different *foci*, moving from focusing in early stages on the target group, their values, habits, aspirations etc. Studies at later stages are likely to a greater degree focus on products, for example assessing whether one set of product attributes or another contribute to some objective. Studies are also likely to have different purposes. In early stages there is a need for diagnostic studies supporting identification of requirements, whereas studies conducted in later stages may take on a more evaluative character either taking the form of identifying solution-dependent requirements, supporting selection between conceptual solutions or validating that requirements are in fact met.

Depending on stage of development process and the novelty of the project, the need for information is also likely to vary in terms of what *knowledge ideal* it is addressing, ranging for example from rich data that support the understanding of a user group to precise measures for instance about the performance of some subsystem. It is also possible that early phases, issues of consequences beyond use, may require rich material. Later phases may require more constrained information in relation to specific solutions which are to be evaluated with respect to some criteria, implying a shift in the character of studies from exploratory to more controlled.

7.3.1 Studies on significant consequences beyond use

Significant consequences are behavioural and social consequences following upon a specific events, or adoption of a product. These have to do with a product's overall utility and the changes the product incurs in a person's life to a greater extent than specific product attributes. The goal from this perspective is to make activities and changes incurred by a solution fit with habits and motives. The information needed to address significant consequences has to do with a wider context and practice in which a subject takes part.

In diagnostic studies in early phases of PD it may be relevant to conduct studies focusing on the target group, their habits, activities, motives etc. aimed at understanding the user group as such. Anticipating the extent to which things have consequences beyond use situations, and the extent to which these change the conditions for a person to fulfil certain motives may require a deep understanding, possibly grounded in idiosyncratic examples rather than patterns across groups. As the purpose of such studies would be to understand a wider context, complex social relations, practices etc., they are likely to be exploratory, and may require in situ studies, for example using ethnographic approaches.

Diagnostic studies for a specific solution could also aim to focus on a set of activities that are at least closely associated with an existing solution or practices that a new solution is expected to introduce. Such studies could take current products as a starting point for explorations of what activities the target group engages in and what motives these contribute to, and then proceed to elaborate changes a new product may introduce. While it may be difficult for a participant in a study to describe habits etc., question-based approaches may to some extent be used to explore motives and more general values.

7.3.2 Studies on significant use

Significant use concerns the interactive qualities in and of use, as well as episodes of events in specific situations. The goal from this perspective has to do with creating congruency between, on the one hand, interactive qualities, use and events, and, on the other hand, intrinsic and extrinsic motivation. The information needed for addressing significant use has to do with activities, events and episodes.

Diagnostic studies from this perspective should aim to capture requirements for intrinsically and extrinsically motivated use of a product. Such studies would focus on specific situations and the interactions between a person and a thing. Some events with a product may be anticipated, and it may be possible to arrive at requirements pertaining to situations in which the product is encountered and used.

Early studies would aim at understanding, whereas more controlled studies would be relevant in order to specify requirements. Capturing actual use situations may require in-situ studies. It may also be possible to stage events in order to comprehend how different stages of episodes relate to intrinsic and extrinsic motivation. In early stages, such studies may potentially take competitor products as a starting point. Both the interactive character and mediational qualities of products could to some extent be

prototyped for evaluative studies comparing solutions. Confirmatory studies at later stages aiming to ensure that requirements are met may also take a more controlled form, aiming for nomothetic evaluation, possibly evaluating scenarios or product representations in laboratories.

7.3.3 Studies on significant things & thereby associated meanings

Significant things and thereby associated meanings concern the experience of a product and any associations it conveys. The goal from this perspective is to fit the product's character to expectations and preferences. The information needed concerns, among other things, what the product will be compared to, desirable values the product should be congruent with (and undesirable values that should be avoided), as well as an understanding of the processes leading to the ascribing of certain meanings.

Diagnostic studies in early stages may aim to capture a range of products the thing will be compared to, a range of meanings applied to similar products etc. Furthermore, it would be relevant to develop a general understanding of target group values and a range of meanings that the product may be attributed, as well as potentially the character of any products the new product needs to be congruent or incongruent with.

As the relations relevant for this are essentially about fit between product aspects, the subject's knowledge and expectations. The important antecedents are compared to the other two perspectives fewer, and the significance of things may potentially to a greater extent be evaluated in artificial contexts. It is possible to conduct comparative studies with product representations in order to derive information that supports the selection of concepts, or the specification of details.

7.3.4 Methodological challenges

Studies on affective relations with things come with challenges in terms of enabling participants in studies to express themselves. Furthermore there are some challenges in capturing what the subject focuses on (object), see Fig.53, and any prior understanding participants draw on.

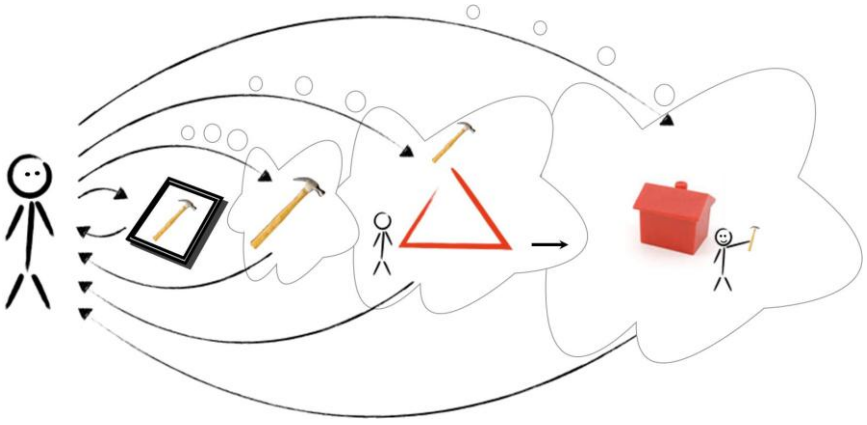


Fig. 53 Products or product representations frequently seemed to have led to associations beyond the thing, e.g. use or consequences

Like any user study, studies on affective relations to things are subject to challenges in terms of creating conditions under which relevant information can be shared, while ensuring that the information is applicable to the actual conditions which it aims to investigate. Decisions have to be made regarding methodological aspects such as what data collection method to employ, in what setting to conduct the study etc.

Any design process is concerned with the specification of something that does not yet exist. To answer the questions raised in PD it may be necessary to address not only how already existing products are significant, but which out of a range of alternative potential solutions to proceed with. There may therefore be a need to represent the solution in some simplified form, or stage artificial situations.

The degree to which inferences can be made about a product eliciting certain reactions depend on whether the study conditions reflect the conditions under which the product will be encountered, see Fig. 54. Studies on experiences may be especially sensitive to whether something is made salient and whether the subject has a specific relation to the artefact, and attention should be paid to the boundary conditions under which information is valid.

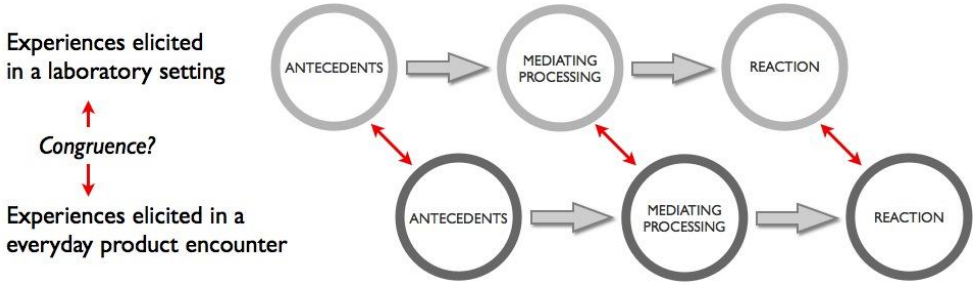


Fig. 54 The degree to which inferences can be drawn about something occurring beyond a study depends on the degree to which the conditions remain the same.

To elicit relevant information, the study should be designed and administered to enable participants to pay attention, form an understanding of what is to be commented on, and appraise significance in relation to concerns. If the participant is to share information on this, he or she must also somehow conceptualise and externalise it. Without prior experiences of a specific product, the participant may (if encouraged) nonetheless try to interpret it, drawing on whatever is there, for example some schema, see Fig 55. In going through the sequence attention, interpretation, appraisal of consequences, a participant will interact with associations and his or her prior knowledge about similar products, general constructs and so on. The participant's ability to share relevant information is likely to be a function of his or her frame of reference, but the participant may also receive more or less support in carrying out these actions.

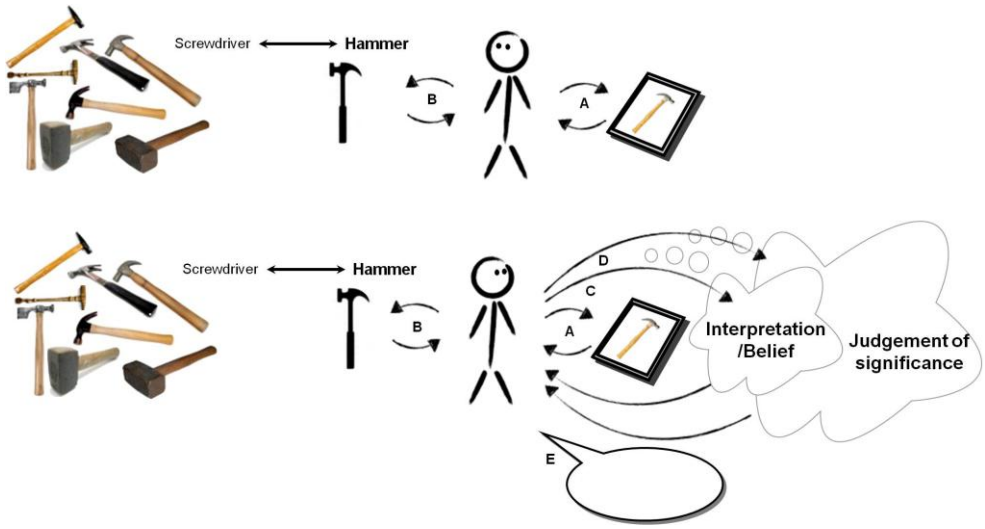


Fig. 55 Participants interact with a product or product representation (A), and draw on prior specific experiences as well as more general beliefs (B) in making interpretations and judgements (C) and judgements of significance (D). A person with a rich background may draw more accurate inferences and can possibly also to a greater extent verbalise (E) information.

By consciously addressing methodological aspects, it may be possible to stage conditions under which information can be elicited, see fig. 56.

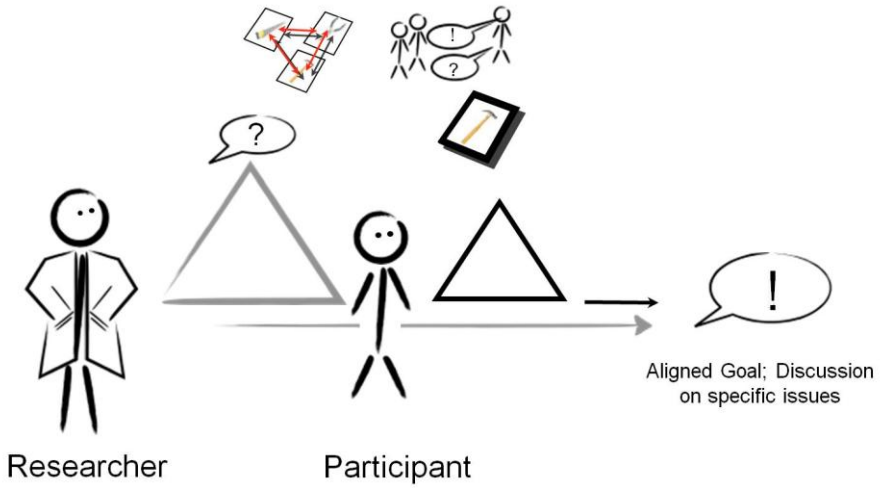


Fig. 56 A researcher may act on/through participants in order to get specific information increasing salience of specific issues through e.g. questions, and product representations.

A researcher can create conditions to enable two types of desirable shifts: foregrounding certain issues that are made more salient and making information explicit, see Fig. 57. The salience of something can be increased by triggering and probing for information, drawing attention to certain issues, causing breakdowns and leading to conscious elaborations. Both comments based on schematic and conscious reasoning may be relevant to product development. In the first case they may indicate general expectations and may to a greater degree reflect how a person would experience something in an everyday situation. However, both for the purpose of eliciting requirements and in evaluating concepts, deliberated statements may be more informative and contain more concrete information.

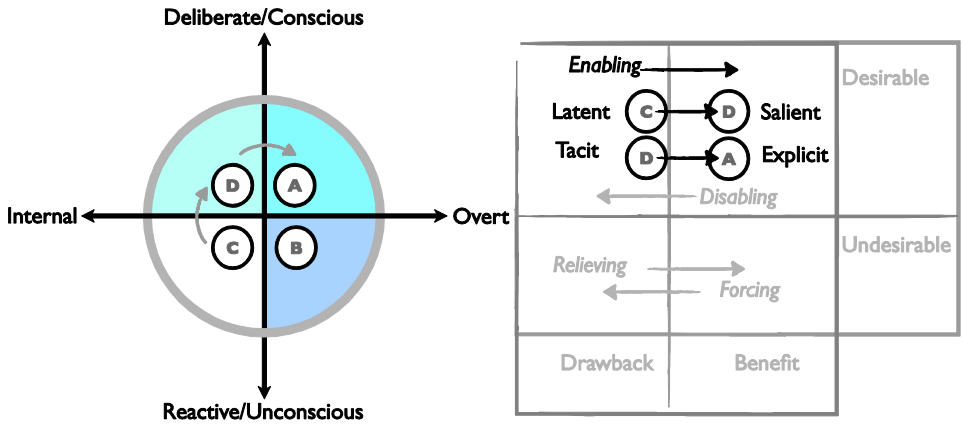


Fig. 57 Some issues are available to both a participant in a study and the person conducting it (A). There are also issues that are noticeable to an observer that the subject is not necessarily aware of (B), e.g. operations. For the purpose of eliciting requirements two types of shifts may be of interest. ↑C-D Encouraging conscious reflection, and → D-A Enabling the participant to make something overt.

In retrospect, some of the methodological aspects of the studies described in this thesis could potentially support participants in sharing information. Factors found to potentially support direction of attention and a shift to deliberate evaluation included:

- *Dialogue*. Evaluations made by others may trigger the subject to attend to a certain judgement, as can explicit questions from an interviewer. For a participant in group interviews such as those in Studies (I), (III), (V), facing the statements of others may lead to breakdown from schematic reasoning, drawing attention to details that may have passed unnoticed.
- *Product representations*. The use of product representations may draw attention to aspects of the thing, but can also elicit more general ideas beyond the thing. All studies except (II) used various visual product representations, yielding a range of different comments about the portrayed products, but also about categories, memories and more general ideas beyond the thing.
- *Contrasting*. Presenting a situation where the participant can *contrast* aspects (for example different products or situations with and without a product) may draw attention to details while drawing on participants' constructs rather than predetermined aspects. In Study (VI), contrasting different types of products led to categorical comments, whereas contrasting similar products led to comments on details. In Study (IV) contrasting a current situation with a future with a solution was used to draw attention to the implications the solution may introduce.

Factors found to potentially support information sharing included:

- *Subject expertise/prior experience*. A person with much relevant prior experience is likely to be able to provide more detailed info (cf. Engelbrektsson 2004), as he or she has experiences with more things to contrast with and is more likely to notice details and draw parallels in anticipating consequences. In Studies (III-V) users were able to share richer descriptions of their current product use than anticipated futures with a novel solution.

- *Time for reflection*. The studies, with one exception, were conducted as interviews. Participants in Study (II) wrote down their own examples and explanations. Compared for example to the dialogue in a focus group, this means considerably more time for the participant to reflect and on her or his experiences and put them into words.
- *Giving participants a vocabulary*. Participants do not necessarily possess a vocabulary for talking about these issues. Participants in Study (II) were provided with basic introductions to theories and taxonomies on emotions in order to enable them to express themselves[79].

7.4 Key implications

Specific experiences can only be prescribed to a limited extent. It is, however, possible to scaffold for significant things, significant use and significant consequences. Studying experiences with things provides clues to the relations people have with them, to what they find significant, what they like, what they reject, what they find offensive.

Gaining a complete understanding of relations between a target group and a specific product is likely to require a different type of studies than the ones in this project, which explored affective relations to things by sampling what could be seen as snapshots of experiences. Such an endeavour would require a sound understanding of the user group, their concerns, habits, expectations etc., drawing on more in-depth data related to different levels of activity, ranging from lifestyle and general values to interaction in specific situations, ascription of meaning etc. This may require contextual and potentially longitudinal studies as well as more controlled studies elaborating on specific details.

While products may contribute to positive experiences, the purpose of UCPD is to make things better from a user perspective. Under some conditions this may be achieved by actively addressing specific experiences. However, a significant contribution may also lie in enabling people by make things, their use and consequences congruent with motives.

79 No baseline material that would allow for comparisons of whether this had an effect was collected and participants appear to have read a lot of different meanings into concepts such as emotion. Nevertheless, the approach of educating participants in the use of certain concepts has previously proved useful (cf. Wikström 2002).

8 Final reflections

This chapter sets out to discuss contributions, and present some reflections on the research process. Furthermore, it discusses identified needs for future research and ends with some concluding remarks.

8.1 Contribution

The contributions from the project have primarily come in relation to descriptions and explanation of how things are significant, and to some extent in the identified implications for product development. See Fig. 58.

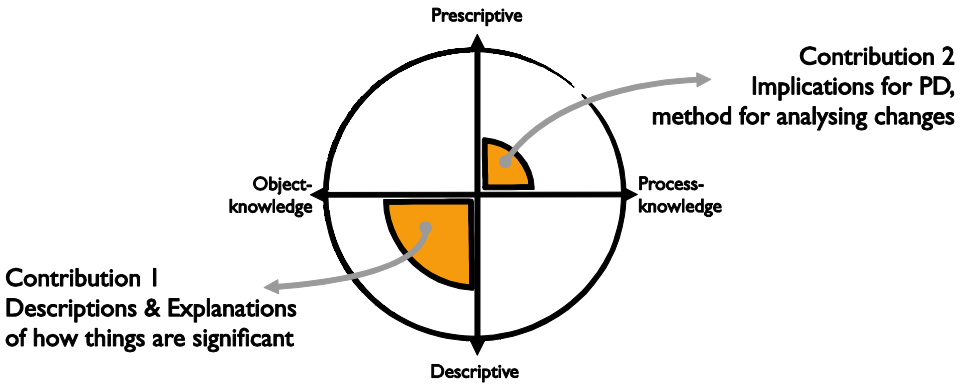


Fig. 58 The major contributions in the project have come in relation to descriptions and explanations of how things are significant, based on what participants in the studies have shared. The project has also resulted in a tool for analysing changes in activities and a framework distinguishing between different types of significance in relation to products which can serve as a foundation for requirements identification.

Chapter two identified a need for knowledge on the antecedents of experiences with things. The text has provided a structure for describing and explaining some of the ways in which things are significant to people beyond the traditional use focus. By starting from people's descriptions of experiences with things rather than a specific theory, this project has adopted a different perspective than the frameworks reviewed in Chapter 2. The suggested classification stresses that people act through and react to products but that also ideas and realised or anticipated consequences are significant. The conditions for reactions are determined by activities and the roles and significance of products in these, implying a need to be explicit about the boundary conditions for different types of explanations for experiences with things.

The results have shown that experiences *with* things are by no means limited to experiences *of* things. Experiences are as much a function of how a person relates to something as of the product as such. If the purpose of a study is to address the experience *of* things there is a need to capture what it is directed at, which is a function not only of the thing as such but of how the person treats it, for example as a member of a more general category. If, however, the goal is to contribute in a positive way to users, there are also several aspects to address beyond things to address.

Chapter two also identified a need for methods supporting PD in addressing experiences. The project has identified limitations to which experiences could in fact be addressed in PD, and highlighted some challenges in addressing acute reactions. While this is not in itself a novel insight, the point should be stressed in light of how experiences such as emotions are sometimes discussed in relation to design. The thesis has also highlighted three perspectives that could, in fact, be taken as starting points for addressing the significance of things from a user perspective. The three types of product significance in Chapter 7 could serve as a foundation for more systematic investigations aimed at holistic understanding of users' relations to specific products. This text has also argued for consequences this has for product development, including some methodological challenges for eliciting requirements and a tool for analysing changes in activities.

The suggested framework shifts attention to use and implications. Changing focus from experiences to the conditions for their elicitation highlights a problem with scope conditions for some approaches. In discussions on experiences with things, products are often presented as being significant in themselves, or in their relation to concerns. However, in many of the examples shared by participants in the studies behavioural implications and use were often more significant. To shed light on experiences use should be taken into focus rather than just acknowledged it as a possible antecedent, see Fig.59. Furthermore, distinguishing different experiences based on the conditions for their elicitation emphasises factors that could be interpreted as requirements. A focus on reactions may be the wrong objective for product development, as they in many cases are situational. While reactions to things may in part depend on products, they cannot in themselves be *predicted* or *prescribed*. I have instead argued for focusing on what in fact matters to users - *the ways in which things are significant*.

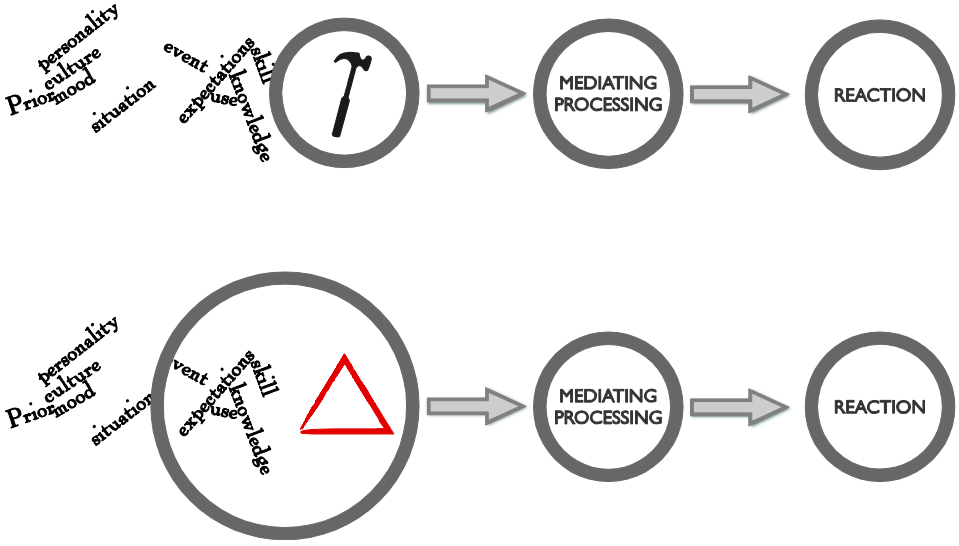


Fig. 59 The reviewed frameworks emphasise information processing or experiences, whereas this thesis argues for shifting attention to a wider range of antecedents, and the need to take the roles of things in particular activities into account.

8.2 Reflections on the research process

The starting points, questions raised, and approach taken have affected outcomes. The aim to make a contribution within a specific field has led to an emphasis on individuals in activities. This is taken to be an appropriate unit of analysis in that it focuses attention on relations between specific users and certain aspects of things. However, adopting this focus implies neglecting some potential explanations at other levels of analysis, for example culture or biology.

8.2.1 Reflection on the approach

The project has drawn on interpretations, and it may be fair in retrospect to reflect on it. The qualitative approach is found to be appropriate to capture descriptions and explanations for how things are significant to people. What is presented here is built from empirical material and literature studies but is also subject to my interpretations.

I have aimed to be upfront with my starting points and to stay truthful to the material. In many cases several researchers have been involved in the analysis, and I have had ongoing dialogues with colleagues on how to interpret certain issues. Furthermore, I have, where possible, sought to stay close to the empirical material and what I see in it, rather than referring to abstract theory.

The approach has been exploratory, and what studies were conducted was in part determined by available research collaboration. Perhaps the greatest limitation, to me, is that I have not yet had the opportunity to conduct studies focusing on applications of the outcomes in PD with respect to a specific product. The project emphasised a range of affective relations in relation to a range of different things. Knowing what I know now, it would be relevant to proceed with more focused study seeking answers to more precise questions. However, a narrower starting point would not have highlighted the character of different types of affective relations to things. Any theoretical foundation or methodological starting point implies a certain framing for the conception of the phenomena to be studied. By triangulating, it has been possible to compare and contrast and put my framing to the test, and notice aspects I may otherwise have missed.

While the outcomes draw on comments from a wide range of informants in relation to a wide range of experiences, they highlight but some of the ways in which things may be significant. I make no claim to this being exhaustive and acknowledge that there are other ways of conceptualising these issues. Furthermore, the sample of participants cannot be expected to represent the totality of mankind but spans a range of people with somewhat different backgrounds and may be sufficient to identify some recurring patterns in affective relations to things. I cannot claim that the issues I have emphasised are the most important ones. However, as similar issues were brought up by participants in studies using different methods, I expect them also to be significant to users beyond the studies.

8.2.2 Reflection on the studies

In retrospect the studies might, given other methodological choices, have provided a clearer view of certain details in relation to the nature of the relations they addressed. Furthermore, a trade-off had to be made between the range of different examples collected from participants in studies and the level of detail in each of them.

The collected data was limited to verbal and written reports, requiring participants to be aware of what to comment on and be able to express themselves. Whether their explanations are accurate descriptions of the conditions under which the specific experiences were elicited could be questioned. The specific examples brought up by participants in Studies (I) and (II), the explanations they give etc. may to some extent be coloured by post-event rationalisation. The same to some extent also holds true for Studies (III, IV, and V) where participants envisaged a future which is likely to have led to some speculative statements. Nevertheless the explanations they put forward can be expected to reflect something that is significant to them and indicate concerns. However, for other purposes, it may be important to also address the actual conditions eliciting experiences. The verbal data could have been complemented by e.g. observation-based methods and potentially some psycho-physiological measures, which was not prioritised in relation to the goals of the specific studies.

What a participant will comment on is likely to depend on the situation in which the thing is commented on. In (II) and parts of (I), participants shared information from situations in their everyday lives, encountered under natural conditions. However, the majority of the material collected in the other studies is based on comments that were triggered using various types of product representations, which in a way has greater resemblance to a buying situation than one of use. In retrospect, the range of different relations and roles could be taken as a starting point, making congruence with the nature of what is to be commented on a starting point for the study set-up.

8.3 Future research

While the outcomes of the project answer some questions, new ones are also raised, see Fig. 61.

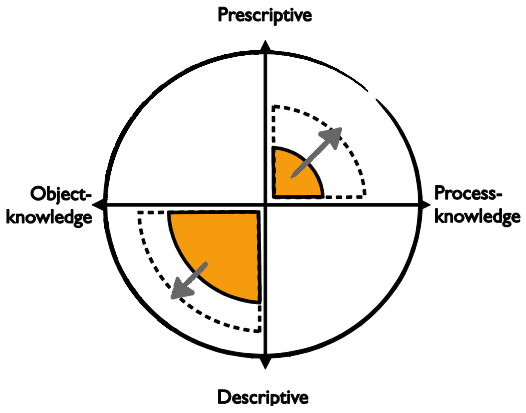


Fig. 60 Future research will aim to contribute more descriptive knowledge on aspects related to the significance of things, use and consequences beyond use as well as more hands-on methodology for addressing these issues.

There is a need for more descriptive/explanatory knowledge about various aspects affecting the significance of things, use and consequences beyond use, including how what is judged as significant shift with time and situation. Furthermore, there is a need for prescriptive knowledge and methodology on how they may be addressed in design.

Regarding the *significance of things* there is a body of knowledge related to explaining the meanings someone ascribes to a thing. However, there is a need for methods that support understanding of the diversity of meanings attributable to things, and what affects the ways in which this may be significant, for example values, expectations etc.

Regarding *significance of use*, there are still knowledge gaps in relation to how temporal aspects affect experience. While sequences of interactions in events are to some extent addressed for example in interaction and service design, there is a need for more knowledge on how to stage events that elicit specific experiences. Furthermore there is a need for deeper understanding of the active use of product symbolism and methods that support specifying qualities in interaction.

Regarding *significance beyond use* there is a need for knowledge in relation to the social dimension of product usage, how to capture issues such as habits, lifestyle etc., and understanding the variety of motives a thing may support.

Furthermore, there is a need to support different actors in taking these factors into account in PD through methodology that:

> a) Enables participants in studies to relate to solutions: creating conditions for eliciting and capturing requirements, directing attention and enabling participants in studies to express themselves.
>
> b) Enable the person conducting the study to relate to how the participants relate to things, and understand how things are significant.
>
> c) Enables others to relate to the information drawn from studies. The person doing the study is not always the same person who is to use the information for development, and there are challenges in how to communicate how things are meaningful and significant.

8.4 Some final remarks

Experiences have been promoted as a possible objective for design, based on commercial interests as well as respect for users. This text has instead promoted a focus on the way things are significant, which, while contributing to the same commercial and user-oriented goals, would shift attention to aspects that can be addressed in PD.

Experiences can be consequences of amongst other things products, but are elicited by relations between a person and a thing in a specific activity. Acute experiences occur in a particular situation, and cannot be predetermined. Focusing on the conditions under which specific things are significant, and taking these as objectives draws attention to what matters to users, but also to the aspects that matter to PD, i.e. the factors that can be addressed.

Things are significant in different ways, and have different roles to fulfil. Different aspects may have implications in affecting well-being as well as subjective experience. Some things should be significant in themselves and the ideas they refer to. Others should be significant in use, or the consequence they have.

People seek a wide range of benefits in products and relate to things differently in different situations, for example by acting through and reacting to them. Things elicit reactions, things are associated with dreams, hopes, and aspirations. Things may be used in rituals, regulate relations between people and create bonds. Things may elicit fear, joy and anger. However, while some great works of art may potentially convey emotions or leave the user in awe, most everyday things are fairly insignificant. Most things are of little importance most of the time, emotions can be quite ephemeral, and products do not have experiences. What elicit reactions are not products per se, but their *relations*, to concerns, to expectations, and most importantly to use. While "a rose is a rose is a rose"[80], a thing is a thing is sometimes something completely different. A rose may be a plant, a loving gift from an attentive admirer, or a commodity. Any thing may play a number of different roles in relation to what a person is doing.

Addressing experiences may just as much be about getting things right as about addressing something special. The product aspects found significant by participants in the studies were often issues that are normally addressed in PD, for example appreciation for performance, dislike when things were found to be ugly etc.

There is a problem with how experiences are discussed in design, taking as a starting point something which is difficult to grasp. The rhetoric of desires etc. may be ever so appealing, and the discussions on pleasurable products, affective design etc. are full of seductive examples of products that thrill, excite and elicit reactions. However, discussions about products that please, seduce, and become partners in relationships in some cases lend products a certain grandiosity that is not always warranted. The apparent elevation of a product from a role of servant to that of partner may in some cases be justifiable, but sometimes the arguments tend to elevate things even higher, to something that should be desired or admired and where the user may become the servant.

Things are not always at the centre of attention, nor should they be. Products are not always the focus of people's experiences. Users in some cases have tasks that they may want to get out of the swiftly so that they can move on to voluntary acts, without having to think too much about the tools they use. The activities a product supports or enables may be ever so important without the thing coming into focus. Some things should just be there, work well and stay out of people's attention.

The significant challenges for PD lie not as much in understanding experiences as in understanding the functions products fulfil. Certain experiences can be linked to specific objects for design, for example interaction, product symbolism etc. The objective for UCPD is then to get things right from the user perspective, enabling desirable action, and tailoring things to concerns rather than eliciting reactions.

80 The quote is from Stein's (1922) poem Sacred Emily

Regardless of whether a person acts with respect to a concrete tangible goal, to gain social status or for the pleasure of socialising, there is a need to understand and respect the ways in which things are significant. People use things in a wide range of different ways and make good not only of their physical characteristics but also of their character, and the values they stand for. Whether or not the person will pay attention and reflect consciously, or react on a more instinctive level for most products may be of less interest. The relevant information for making decisions about something in a product is that the subject finds some aspect significant, and in what way this is important to him or her.

In PD there is a need to consider how things and consequences in and beyond use are perceived to be significant, understand what may serve as requirements and have a bearing on things to be, and take it into account in development activities. Things have significance not in their physical presence, or some specific product attribute, but in the relations between the user and the thing in past, present and future events and the perceived impact for the person's well-being, often in terms of the implications for what people (can and must) do.

9 References

Altshuller, Genrich. 1996. *And suddenly the inventor appeared: TRIZ, the theory of inventive problem solving*. Worcester, MA : Technical Innovation Center, Inc.

Andreasen, Mogens Myrup, and Lars Hein. 1987. *Integrated product development*. Bedford: IFS.

Archer, Bruce. 1965. *Systematic Method for Designers*. London.: Council of Industrial Design.

Archer, Bruce 1995. The Nature of Research. *Co-Design* 2: pp.6-13.

Arnold, Magda B. 1960. *Emotion and personality*. New York: Columbia U.P.

Arnould, Eric J, and Linda L Price. 1993. River Magic: Extraordinary Experience and the Extended Service Encounter. *Journal of Consumer Research* 20, no. 1: pp.24-45.

Averill, J.R. 1994. I feel, Therefore I am -I think. In *The Nature of Emotion: Fundamental Questions*, ed. Paul Ekman and Richard J. Davidson, pp.379-385. New York : Oxford University Press.

Bannon, Liam J. 1991. From Human Factors to Human Actors - The Role of Psychology and Human-Computer Interaction Studies in Systems Design. In *Design at work.: Cooperative Design of Computer Systems*, ed. Joan M. Greenbaum and Morten Kyng, pp.25-44. Hillsdale: Lawrence Erlbaum Associates.

Battarbee, Katja. 2004. *Co-experience : understanding user experiences in social interaction*. PhD thesis, Helsinki: University of Art and Design Helsinki

Bazeley, Pat. 2004. Issues in Mixing Qualitative and Quantitative Approaches to Research. In *Applying Qualitative Methods to Marketing Management Research*, ed. Renate Buber, Johannes Gadner, and Lyn Richards, pp.141-156. Palgrave: Macmillan

Beedie, Christopher, Peter Terry, and Andrew Lane. 2005. Distinctions between emotion and mood. *Cognition & Emotion* 19, no. 6: pp.847-878

Belk, Russell W. 1988. Possessions and the Extended Self. *Journal of Consumer Research* 15, no. 2: pp.139-168.

Berlyne, D. E. 1971. *Aesthetics and psychobiology*. New York: Appleton-Century-Crofts.

Bhamra, T., S. Evans, F. van der Zwan, and Cook. 2001. Moving from Eco-Products to Eco-Services. *Journal of Design Research* 1, no. 2.

Bryman, Alan, and Emma Bell. 2007. *Business research methods*. Oxford: Oxford University Press.

Buchanan, Richard. 1992. Wicked Problems in Design Thinking. *Design Issues* 8, no. 2 : pp.5-21.

Bødker, Susanne. 1989. A human activity approach to user interfaces. *Hum.-Comput. Interact.* 4, no. 3: pp.171-195.

Bødker, Susanne. 1991. *Through the interface : a human activity approach to user interface design*. Hillsdale, N.J.: L. Erlbaum.

Caldwell, Niall, and John Coshall. 2002. Measuring brand associations for museums and galleries using repertory grid analysis. *Management Decision* 40, no. 4: pp.383-392.

Carbonell, L., L. Izquierdo, and I. Carbonell. 2007. Sensory analysis of Spanish mandarin juices. Selection of attributes and panel performance. *Food Quality and Preference* 18, no. 2: pp.329-341.

Coates, Del. 2003. *Watches tell more than time : product design, information, and the quest for elegance*. New York: McGraw-Hill.

Cooper, R.G. and Kleinschmidt, E.J. 1987. What makes a new product a winner – success factors at the project level. *R&D Management* 17, no.2: 175–189.

Cooper, T., and S. Evans. 2000. *Products to Services*. Sheffield: The Centre for Sustainable Consumption, Sheffield Hallam University.

Cornelius, Randolph R. 1996. *The science of emotion : research and tradition in the psychology of emotions*. Upper Saddle River, NJ: Prentice Hall.

Coyne, Richard. 2005. Wicked problems revisited. *Design Studies* 26, no. 1 (January): pp. 5-17.

Creusen, Marië, lle E. H., and Jan P. L. Schoormans. 2005. The Different Roles of Product Appearance in Consumer Choice. *Journal of Product Innovation Management* 22 (January): pp. 63-81

Cross, Nigel. 1994. *Engineering design methods : strategies for product design*. Chichester: Wiley.

Cross, Nigel. 1995. Editorial. *Design Studies* 16, no. 1: pp.2-3.

Csíkszentmihályi, Mihály. 1990. *Flow : the psychology of optimal experience*. New York: Harper & Row.

Csíkszentmihályi, Mihály, and Eugene Rochberg-Halton. 1981. *The meaning of things : domestic symbols and the self*. Cambridge: Cambridge U.P.

Dahlman, Sven. 1986. *User requirements : a resource for the development of technical products : evolution of a model based on five case studies*. PhD thesis, Gothenburg: Chalmers University of Technology.

Davidson, Richard. 1994. On Emotion, mood, and related affective constructs. In *The Nature of Emotion: Fundamental Questions*, ed. Paul Ekman and Richard J. Davidson, 51-93. 1st ed. Oxford University Press, USA, December 22.

Denzin, Norman K. 1970. *The research act : a theoretical introduction to sociological methods*. Methodological perspectives, London.

Desmet, Pieter, and Paul Hekkert. 2007. Framework of Product Experience. *International Journal of Design* 1, no.1.

Desmet, Pieter. 2003. Multilayered model of product emotions. *The Design Journal* 6, no.2: pp.4-11.

Desmet, Pieter. 2002. *Designing emotions*. PhD thesis, Delft: Delft University of Technology, Faculty of Industrial Design Engineering.

Dittmar, Helga. 1992. *The social psychology of material possessions : to have is to be*. Hemel Hempstead: Harvester Weatsheaf.

Eason, Kenneth D. 1995. User-centred design: for users or by users? *Ergonomics* 38, no. 8: pp.1667–1673.

Ehn, Pelle. 1988. *Work-oriented design of computer artifacts*. Stockholm: Arbetslivscentrum.

Ekman, Paul (ed.). 1982. *Emotion in the human face*. 2nd ed. Cambridge: Cambridge U.P

Ekman, Paul. 1999. Basic Emotions. In *Handbook of cognition and emotion*, ed. Tim Dalgleish and Michael J. Power, pp.45-60. Chichester: Wiley.

Engelbrektsson, Pontus. 2004. *Enabling the user : exploring methodological effects on user requirements elicitation*. PhD thesis, Gothenburg: Chalmers University of Technology.

Engeström, Yrjö. 1987. *Learning by expanding : an activity-theoretical approach to developmental research*. Helsinki: Orienta-konsultit.

Fielding, Nigel, and Jane L. Fielding. 1986. *Linking data*. Qualitative research methods series, Beverly Hills, Calif.: Sage.

Flick, Uwe. 1992. Triangulation Revisited: Strategy of Validation or Alternative? *Journal for the Theory of Social Behaviour* 22, no. 2: pp.175-197.

Forlizzi, Jodi, and Katja Battarbee. 2004. Understanding experience in interactive systems. In *Proceedings of the 5th conference on Designing interactive systems: processes, practices, methods, and techniques*, pp.261-268. Cambridge, MA, USA: ACM.

Fournier, Susan, and David Glen Mick. 1999. Rediscovering Satisfaction. *The Journal of Marketing* 63, no. 4: pp.5-23.

Frayling, Christopher. 1993. *Research in art and design*. Research paper. Royal College of Art.

Frijda, Nico H. 1988. The laws of emotion. *The American psychologist* 43, no. 5: 349-358.

Frijda, Nico H. 1986. *The emotions*. Studies in emotion and social interaction. Cambridge: Cambridge University Press.

Frijda, Nico H. 2007. *The laws of emotion*. Mahwah, N.J.: Lawrence Erlbaum Associates.

Fällman, Daniel. 2003. *In Romance with the materials of mobile interaction : a phenomenological approach to the design of mobile information technology*. PhD thesis, Umeå: Umeå University.

Goedkoop, M.J., C.J.G. van Halen, H.R.M. te Riele, and P.J.M. Rommens. 1999. *Product Service Systems, Ecological and Economic Basis*. Technical Report. The Hague: PRE Consultants.

Goldsmith, HH. 1994. Parsing the emotional domain from a developmental perspective. In *The Nature of Emotion: Fundamental Questions*, ed. Paul Ekman and Richard J. Davidson, pp.68-73. 1st ed. Oxford: Oxford University Press.

Griffin, Abbie and Hauser, John. 1993. The Voice of the Customer. *Marketing Science* 12, no.1: 1-27.

Gros, Jochen. 1976. Sinn-liche Funktionen im Design, *form-Zeitschrift für Gestaltung* no. 74.

Grönroos, Christian. 2001. The perceived service quality concept - a mistake? *Managing Service Quality* 11, no3: pp.150-152.

Hanna, J. 1980. A typology of consumer needs. In *Research in Marketing*, ed. J.N. Sheth, 3:83-104. Greenwich, CT: JAI Press.

Hannington, Bruce, and Jodi Forlizzi, eds. 2003. *Proceedings of the 2003 international conference on Designing pleasurable products and interfaces*. Carnegie Mellon University, Pittsburgh, PA.

Hassenzahl, Marc. 2004a. The thing and I: understanding the relationship between user and product. In *Funology: from usability to enjoyment*, pp.31-42. Dordrecht: Kluwer Academic Publishers.

Hassenzahl, Marc. 2004b. Emotions can be quite ephemeral; we cannot design them. *interactions* 11, no. 5: pp.46-48.

Hassenzahl, Marc. 2004c. The interplay of beauty, goodness, and usability in interactive products. *Hum.-Comput. Interact.*, 19, no.4: pp.319-349.

Hassenzahl, Marc. 2008. Aesthetics in Interactive Products: Correlates of Consequences of Beauty. In *Product Experience*, ed. Paul Hekkert and Hendrik N. J. Schifferstein. Amsterdam: Elsevier.

Hassenzahl, Marc, and Noam Tractinsky. 2006. User experience - a research agenda. *Behaviour and Information Technology* 25, no. 2: pp.91-97.

Hassenzahl, Marc, and Rainer Wessler. 2000. Capturing Design Space From a User Perspective: The Repertory Grid Technique Revisited. *International Journal of Human-Computer Interaction* 12, no. 3-4: pp.441-460.

Hasu, Mervi, and Yrjö Engeström. 2000. Measurement in action: an activity-theoretical perspective on producer-user interaction. *Int. J. Hum.-Comput. Stud.* 53, no. 1: pp.61-89.

Heiskanen, Eva, Minna Halme, Mikko Jalas, Anna Kärnä, and Lovio Raimo. 2001. *Dematerialization: The Potential of ICT and Services*. Helsinki: Ministry of the Environment.

Hekkert, Paul. 2006. Design Aesthetics: Principles of Pleasure in Product Design. *Psychology Science* 48: pp.157-172.

Helander, Martin, Khalid, H, and Ming Tham, eds. 2001. *Proceedings of The International Conference on Affective Human Factors Design*. Singapore: Asean Academic Press.

Helander, Martin, and Ming Tham. 2003. Hedonomics - Affective human factors design. *Ergonomics* 46, no. 13/14: pp. 1269-1272.

Hiort af Ornäs, Viktor. 2006a. Communicative challenges with dematerialised products. *5th Nordcode Seminar and Workshop*, Oslo: AHO, Arkitektur- & Designhøgskolen i Oslo.

Hiort af Ornäs, Viktor. 2006b. Feelings for products: Sensations, beliefs and emotions. In *Proceedings of the 5th International Conference on Design and Emotion*. Gothenburg: Chalmers University of Technology.

Hiort af Ornäs, Viktor. 2009. Towards a typology of emotional experiences with things. *8th Nordcode Seminar and Workshop*. Kolding: Designskolen Kolding.

Hiort af Ornäs, Viktor, and Karlsson, MariAnne. 2004. Causes of Emotive Response to Artefacts. In *Proceedings of the 4th International Conference on Design and Emotion*. Ankara: METU.

Hiort af Ornäs, Viktor, and Rexfelt, Oskar. 2006a. *Kundkrav vid Funktionsförsäljning. Litteraturgenomgång och erfarenheter från Göteborg Energi*. Research series - Department of Product and Production Development. Gothenburg: Chalmers University of Technology.

Hiort af Ornäs, Viktor, and Rexfelt, Oskar. 2006b. Functional Sales From A Consumer Perspective. *In proceedings of Wondergrund – The 2006 Design Research Society International conference,* ed. Friedman, K., T. Love, E Corte-Real. and C. Rust. Lisbon.

Hiort af Ornäs, Viktor, and Rexfelt, Oskar 2007. *Möjliggöranden, Avlastningar, Tvång och Hinder- Konsumenters resonemang kring praktiska konsekvenser av fyra funktionserbjudanden*. Research series - Department of Product and Production Development. Gothenburg: Chalmers University of Technology

Hirschman, Elizabeth C., and Morris B. Holbrook. 1982. Hedonic Consumption: Emerging Concepts, Methods and Propositions. *The Journal of Marketing* 46, no. 3: pp. 92-101.

Hockerts, K. 1999. Eco-efficient services innovation, increasing business-ecological efficiency of products and services. In *Greener Marketing: A Global Perspective on Greening Marketing Practice*, ed. Martin Charter and Michael Jay Polonsky. pp. 95-108 Sheffield: Greenleaf Pubns,

Holyfield, Lori. 1999. Manufacturing adventure. *Journal of Contemporary Ethnography* 28, no. 1: pp.3-33.

Hubka, V., and J.W. Schregenberger. 1987. Paths Towards Design Science. In *WDK 13:*108 *Proceedings of the 1987 International Conference on Engineering Design*, ed. W.E. Eder. New York: ASME Press.

Hubka, Vladimir, and W. Ernst Eder. 1996. *Design science : introduction to the needs, scope and organization of engineering design knowledge*. London: Springer.

Hydén, Lars-Christer. 1981. *Psykologi och materialism : introduktion till den materialistiska psykologin*. Stockholm: Prisma.

IEA. 2000. *The Discipline of Ergonomics*. Retrieved from: www.iea.cc/01_what/What%20is%20Ergonomics [2010-11-05]

ISO 9241-11. 1998. Ergonomic requirements for office work with visual display terminals (VDTs). International Organization for Standardization.

Jankowicz, Devi. 2001. Why does subjectivity make us nervous? Making the tacit explicit. *Journal of Intellectual Capital* 2, no. 1: pp.61-73.

Jankowicz, Devi. 2004. *The easy guide to repertory grids*. Chichester, West Sussex, England: Wiley.

Jensen, Rolf. 1999. The dream society : how the coming shift from information to imagination will transform your business. New York: McGraw-Hill.

Jordan P. W. 1997. The four pleasures – taking human factors beyond usability, *Proceedings of the 13th Triennial Congress of the International Ergonomics Association*, pp. 364 – 365.Tampere, Finland: Finnish Institute for Occupational Health

Jordan, Patrick W. 1998. *An introduction to usability*. London: Taylor & Francis.

Jordan, Patrick W. 1999. Pleasure with Products: Human Factors for Body, Mind and Soul. In *Human factors in product design*, ed. William S. Green and Patrick W. Jordan, pp.206-217. CRC Press.

Jordan, Patrick W. 2000. *Designing pleasurable products : an introduction to the new human factors*. London: Taylor & Francis.

Kamptner, N. Laura. 1995. Treasured possessions and their meanings in adolescent males and females. Adolescence 30, no. 118: pp.301-319.

Kaptelenin, Victor. 1996. Activity Theory: Implications for Human - Computer Interaction. In *Context and consciousness : activity theory and human-computer interaction*, ed. Bonnie A. Nardi, pp.103-116. Cambridge, Mass.: MIT Press.

Karapanos, Evangelos, Marc Hassenzahl, and Jean-Bernard Martens. 2008. User experience over time. In *CHI '08 extended abstracts on Human factors in computing systems*, pp.3561-3566. Florence, Italy: ACM.

Karjalainen, Toni-Matti. 2004. *Semantic transformation in design : communicating strategic brand identity through product design references*. PhD thesis, Helsinki: University of Art and Design Helsinki

Karlsson, I.C. Marianne. 1996. *User requirements elicitation: a framework for the study of the relation between user and artefact*. PhD thesis, Gothenburg: Chalmers University of Technology.

Karlsson, I.C. Marianne, Jan van Eerp, and Pieter Desmet, eds. 2006. *Proceedings of the 5th Conference on Design and Emotion*. Gothenburg: Chalmers University of Technology.

Kaulio, Matti A., and I.C. Marianne Karlsson. 1998. Triangulation strategies in user requirements investigations: a case study on the development of an IT-mediated service. *Behaviour & Information Technology* 17, no. 2: pp.103-112.

Kaulio, Matti A., I.C. Marianne Karlsson, Helena Grubb, and Clas Mellby. 1999. *PRE - Kundförståelse i produktutvecklingen*. Mölndal: Institutet för Verkstadsteknisk Forskning.

Keitsch, Martina, and Viktor Hiort af Ornäs. 2008. Meaning and Interpretation : An analysis of two theoretical perspectives in product design. In *Proceedings from the 6th Conference on Design & Emotion 2008*, ed. Pieter Desmet, SA Tzvetanova, Paul Hekkert, and Loraine Justice. Hong Kong: The Hong Kong Polytechnic University.

Kelly, George A. 2003. A Brief Introduction to Personal Construct Theory. In *International handbook of personal construct psychology*, ed. Fay Fransella, pp.3-20. Chichester, West Sussex, England: J. Wiley & Sons.

Kelly, George Alexander. 1955. *The psychology of personal constructs*. New York.

Krippendorff, Klaus, and R Butter. 1984. Product Semantics: Exploring the Symbolic Qualities of Form. *Innovation, The Journal of the Industrial Designers Society of America* 3, no. 2: pp.4-9.

Kuhn, Thomas S. 1996. *The structure of scientific revolutions*. Chicago, Ill.: University of Chicago Press.

Kuutti, Kari. 1996. Activity Theory as a Potential Framework for Human-Computer Interaction Research. In *Context and consciousness : activity theory and human-computer interaction*, ed. Bonnie A. Nardi, pp.17-44. Cambridge, Mass.: MIT Press.

Kvale, Steinar. 1996. Interviews : an introduction to qualitative research interviewing. Thousand Oaks: SAGE.

Lai, Albert Wenben. 1991. Consumption Situation and Product Knowledge in the Adoption of a New Product. *European Journal of Marketing* 25, no. 10: pp.55-68.

Lai, Albert Wenben. 1995. Consumer Values, Product Benefits and Customer Value: A Consumption Behavior Approach. *Advances in Consumer Research* 22, no. 1: pp.381-388.

Lantz, Annika. 1993. *Intervjumetodik : den professionellt genomförda intervjun*. Lund: Studentlitteratur.

Lazarus, Richard S. 1991. *Emotion and adaptation*. New York: Oxford Univ. Press.

Lee, S. H., Harada, A., & Stappers, P. J. (2002). Pleasure with products: Design based on Kansei. In W. S. Green & P. W. Jordan (Eds.), *Pleasure with products- beyond usability*. pp.219-229. London : Taylor & Francis

Leont'ev, Aleksej Nikolaevic. 1981. The problem of activity in psychology. In *The concept of activity in Soviet psychology*, ed. James V. Wertsch, pp.37 - 71. Armonk, N.Y.: Sharpe.

Leont'ev, Aleksej Nikolaevic. 1978. *Activity, consciousness, and personality*. Englewood Cliffs, N.J.: Prentice-Hall.

Leventhal, Howard, and Klaus Scherer. 1987. The Relationship of Emotion to Cognition: A Functional Approach to a Semantic Controversy. *Cognition & Emotion* 1, no. 1: pp.3-28.

Luria, Alexander K. 1971. Towards the problem of the historical nature of psychological processes. *International Journal of Psychology* 6, no. 4.

Manzini, Ezio, Carlo Vezzoli, Garette Clark, and M. Cook. 2001. Product-Service Systems. Using an Existing Concept as a New Approach to Sustainability. *Journal of Design Research* 1, no. 2.

Marsden, David, and Dale Littler. 2000a. Repertory grid technique - An interpretive research framework. *European Journal of Marketing* 34, no. 7: pp.816-834.

Marsden, David, and Dale Littler. 2000b. Exploring consumer product construct systems with the repertory grid technique. *Qualitative Market Research* 3, no. 3: pp.127-143.

Maslow, Abraham H. 1970. *Motivation and personality*. New York: Harper & Row.

Mathison, Sandra. 1988. Why Triangulate? *Educational Researcher* 17, no. 2: pp.13-17.

Meijkamp, Rens. 2000. *Changing consumer behaviour through eco-efficient services; an empirical study on car sharing in the Netherlands*. PhD thesis, Delft: Delft University of Technology, Faculty of Industrial Design Engineering.

Merriam-Webster. 2010. significance. *Merriam-Webster online Dictionary*. Retrieved from www.merriam-webster.com/dictionary/significance.

Mont, Oksana K. 2002. Clarifying the concept of product-service system. *Journal of Cleaner Production* 10, no. 3: pp.237-245.

Mont, Oksana K. 2004. *Product-service systems: panacea of myth?* IIIEE dissertations, 1402-3016 ; 2004:1. Lund: Internationella miljöinstitutet, Univ.

Mont, Oksana K., and Thomas Lindhqvist. 2002. *Funktionsperspektiv på varor och tjänster*. Stockholm: Naturvårdsverket.

Mont, Oksana K., and A Plepys. 2003. *Customer satisfaction: review of. literature and application to the. product-service systems*. Lund: International Institute for Industrial Environmental Economics at Lund University.

Monö, Rune G. 1997. *Design for product understanding : the aesthetics of design from a semiotic approach*. Stockholm: Liber.

Moody, W., C. Baber, A. Wing, R. Morgan, and P. Dillon. 2001. Factors Underlying Fabric Perception. In Proceedings of Eurohaptics 2001, ed. C. Baber, M. Faint, S. Wall, and A.M. Wing. Birmingham.

Morgan, David L. 1998. Practical strategies for combining qualitative and quantitative methods: Applications to health research *Qualitative Health Research* 8, no. 3: pp.362-377.

Morris, Charles W. 1946. *Signs, language and behavior*. New York: Prentice-Hall.

Nagamachi, Mitsuo. 1995. Kansei Engineering: A new ergonomic consumer-oriented technology for product development. *International Journal of Industrial Ergonomics* 15, no. 1: pp.3-11.

Nardi, Bonnie A. 1996a. Preface. In *Context and consciousness : activity theory and human-computer interaction*, ed. Bonnie A. Nardi. Cambridge, Mass.: MIT Press.

Nardi, Bonnie A. 1996b. Activity Theory and Human-Computer Interaction. In *Context and consciousness : activity theory and human-computer interaction*, ed. Bonnie A. Nardi, pp.7-16. Cambridge, Mass.: MIT Press.

Nielsen, Jakob. 1993. *Usability engineering*. Boston: AP Professional.

Niu, Nan, and Steve Easterbrook. 2006. Discovering aspects in requirements with repertory grid. In *Proceedings of the 2006 international workshop on Early aspects at ICSE* , pp.35-42. Shanghai, China: ACM.

Nonaka, Ikujiro, and Hirotaka Takeuchi. 1995. *The knowledge-creating company: how Japanese companies create the dynamics of innovation*. Oxford University Press US.

Norman, Donald A. 1990. *The design of everyday things*. New York: Doubleday.

Norman, Donald A. 2004. *Emotional design : why we love (or hate) everyday things*. New York: Basic Books.

Norman, Donald A., Andrew Ortony, and D. M. Russell. 2003. Affect and machine design: Lessons for the development of autonomous machines. *IBM Syst. J.* 42, no. 1: pp.38-44.

Norman, Donald A. and Ortony, Andrew. 2003 Designers and Users: Two Perspectives on Emotion and Design. *Proc. of the Symposium on Foundations of Interaction Design.* Ivrea, Italy: The Interaction Design Institute.

Nöth, Winfried. 1995. *Handbook of semiotics*. Indiana University Press.

OECD. 2000. *The Service Economy*. OECD Business and Industry Policy Forum Series. Retrieved from www.oecd.org/dataoecd/10/33/2090561.pdf.

Ortony, Andrew, Gerald L. Clore, and Allan Collins. 1988. *The cognitive structure of emotions*. Cambridge: Cambridge University Press.

Osgood, Charles E., George J. Suci, and Percy H. Tannenbaum. 1957. *The measurement of meaning*. Urbana: University of Illinois Press.

Overbeeke, CJ, and Paul Hekkert, eds. 1999. *Proceedings of the First International Conference on Design and Emotion*. Delft: Delft University of Technology.

Pahl, Gerhard, and Wolfgang Beitz. 1996. *Engineering design : a systematic approach*. Berlin: Springer.

Peirce, Charles S. 1894. What is a sign? In *Essential Peirce: Selected Philosophical Writings 1893-1913*, ed. Nathan Houser and Christian J. W. Kloesel, pp.4-10. Indiana Univ Pr.

Persson, Sara. 2005. *Toward enhanced interaction between engineering design and industrial design*. PhD thesis, Gothenburg: Chalmers University of Technology.

Persson, Sara, Viktor Hiort af Ornäs, and Patrick W. Jordan. 2007. Disciplinary Differences of Product Constructs? investigating Human Factors, Engineering and Industrial Design Professionals. *Ergonomics for a future - Proceedings of the Nordic Ergonomics Society conference 2007*. Lysekil.

Pine, B. Joseph, and James H. Gilmore. 1999. *The experience economy : work is theatre & every business a stage*. Boston, Mass.: Harvard Business School.

Plutchik, Robert. 2001. The Nature of Emotions. *American Scientist* 89, no. 4: pp.344-351.

Pugh, Stuart. 1990. *Total design : integrated methods for successful product engineering*. Wokingham: Addison-Wesley.

Ratner, Carl. 1996. Activity as a Key Concept for Cultural Psychology. *Culture Psychology* 2, no. 4 (December 1): 407-434.

Ratner, Carl. 2000. A Cultural-Psychological Analysis of Emotions. *Culture Psychology* 6, no. 1: pp.5-39.

Rexfelt, Oskar. 2008. *User-centred design and technology-mediated services : identifying and addressing challenges by analysing activities*. PhD thesis, Gothenburg: Chalmers University of Technology.

Rexfelt, Oskar, and Hiort af Ornäs, Viktor. 2006. *Funktionsförsäljning till privatkonsumenter –Resonemang kring fyra funktionserbjudanden*. Research series - Department of Product and Production Development. Gothenburg: Chalmers University of Technology

Rexfelt, Oskar, and Viktor Hiort af Ornäs. 2007. *Betalning för nytta? : privatkonsumenters resonemang kring tre funktionserbjudanden*. Research series - Department of Product and Production Development. Gothenburg: Chalmers University of Technology

Richins, Marsha L. 1994. Valuing Things: The Public and Private Meanings of Possessions. *The Journal of Consumer Research* 21, no. 3: pp.504-521.

Rittel, Horst W. J., and Melvin M. Webber. 1973. Dilemmas in a general theory of planning. *Policy Sciences* 4, no. 2: pp.155-169.

Rocchi, Benedetto, and Gianluca Stefani. 2006. Consumers' perception of wine packaging: a case study. *International Journal of Wine Marketing* 18, no. 1: pp.33-44.

Rogers, Everett M. 2003. *Diffusion of innovations*. New York: Free press.

Roozenburg, Norbert F. M., and J. Eekels. 1995. *Product design : fundamentals and methods*. Chichester: Wiley.

Rosenblad-Wallin, Elsa. 1983. *Människa, beklädnad och miljö : metod för utveckling av funktionell beklädnad*. PhD thesis, Gothenburg: Chalmers University of Technology.

Sanders, Elizabeth B.N. 1993. Product Development Research for The 1990's. *Human Factors and Ergonomics Society Annual Meeting Proceedings* 37: pp.422-426.

Sanders, Elizabeth B.N. 2001. Virtuosos of the experience domain. In *Proceedings of the 2001 IDSA. Education Conference*.

Scherer, Klaus R. 1988. Criteria for Emotion-Antecedent Appraisal: A Review. In *Cognitive Perspectives on Emotion and Motivation*, ed. V. Hamilton, G.H. Bower, and N.H. Frijda, pp.89-126. Dordrecht: Kluwer Academic Publishers.

Scherer, Klaus R. 1999. Appraisal Theory. In *Handbook of cognition and emotion*, ed. Tim Dalgleish and Michael J. Power, pp.637-663. Chichester: Wiley.

Scherer, Klaus R. 2001. Appraisal Considered as a Process of Mulitlevel Sequential Checking. In *Appraisal processes in emotion*, ed. Klaus R. Scherer, Angela Schorr, and Tom Johnstone, pp.92-120. Oxford University Press US.

Scherer, Klaus R. 2005. What are emotions? And how can they be measured? *Social Science Information* 44, no. 4 : pp.695-729.

Schifferstein, Hendrik N.J., and Elly P.H. Zwartkruis-Pelgrim. 2008. Consumer-Product Attachment: Measurement and Design Implications. *International Journal of Design* 2, no. 3.

Schrader, U. 1999. Consumer acceptance of eco-efficient services. A German perspective. *Greener Management International* 25: pp.105-22.

Schütte, S. 2005. *Engineering Emotional Values in Product Design- Kansei Engineering in Development*. PhD thesis, Linköping: Institute of Technology, Linköping University.

Schütte, Simon, Shigekazu Ishihara, Jörgen Eklund, and Mitsuo Nagamachi. 2008. Affective Meaning: The Kansei Engineering Approach. In *Product Experience*, ed. Hendrik Schifferstein and Paul Hekkert. pp.477-496 Amsterdam: Elsevier.

Schön, Donald A. 1995. *The reflective practitioner : how professionals think in action*. Aldershot: Arena.

Sheth, Jagdish N., Bruce I. Newman, and Barbara L. Gross. 1991. Why we buy what we buy: A theory of consumption values. *Journal of Business Research* 22, no. 2. Journal of Business Research: pp.159-170.

Simon, Herbert A. 1969. *The sciences of the artificial*. Karl Taylor Compton lectures 1968. Cambridge, Mass.: MIT Press

Smith, Craig A., and Richard S. Lazarus. 1993. Appraisal components, core relational themes, and the emotions. *Cognition & Emotion* 7, no. 3: pp.233-269.

Solomon, Robert C. 2002. Back to Basics: On the Very Idea of "Basic Emotions". *Journal for the Theory of Social Behaviour* 32, no. 2: pp.115-144.

Stahel, Walter R. 1997. The Functional Economy: Cultural and Organizational Change. In *The industrial green game : implications for environmental design and management*, ed. Deanna J. Richards, pp.91-100. Cambridge : Royal Society of Chemistry.

Steffen, Dagmar. 2007. Design Semantics of Innovation. Product Language as a Reflection on Technical Innovation and Socio-Cultural Change. *Design semiotics in use -6th Nordcode Seminar and Workshop*. Helsinki: University of Art and Design Helsinki.

Steffen, Dagmar. 2009. Categorizing Product Meaning: An Investigation into the Product Language of Clothing and Fashion. In *Design and semantics of form and movement*, ed. Lin-Lin Chen, Martina Hessler, Steven Kyffin, Pei-Ling Liu, CJ Overbeeke, and Bob Young, pp.73-81. Taipei

Stein, Gertrude. 1922. *Geography and plays*. Boston: The four seas company

Stewart, Valerie, and Andrew Stewart. 1981. *Business applications of repertory grid*. New York: McGraw-Hill Book Co.

Stuart, F. Ian, and Stephen Tax. 2004. Toward an integrative approach to designing service experiences: Lessons learned from the theatre. *Journal of Operations Management* 22, no. 6 (December): pp.609-627.

Tiger, Lionel. 1992. *The pursuit of pleasure*. Boston: Little, Brown.

Tomico, Oscar, Evangelos Karapanos, **Pierre Levy, Nanami Mizutani, and Toshimasa Yamanaka**. 2009. The Repertory Grid Technique as a Method for the Study of Cultural Differences. Repertory Grid, Cultural Differences, Designers' Perceptions, Product Attribute Prioritization Measurements.

Tukker, Arnold, and Ursula Tischner. 2006. Product-services as a research field: past, present and future. Reflections from a decade of research. *Journal of Cleaner Production* 14, no. 17:pp. 1552-1556.

Ulrich, Karl T., and Steven D. Eppinger. 2000. *Product design and development*. Boston: McGraw-Hill.

Valtonen, Anna. 2007. *Redefining industrial design : changes in the design practice in Finland*. PhD thesis, Helsinki: University of Art and Design Helsinki

Warell, Anders. 2001. *Design syntactics : a functional approach to visual product form : theory, models and methods*. PhD thesis, Gothenburg: Chalmers University of Technology.

Webb, Eugene J., Donald T. Campbell, Richard D. Schwartz, and Lee Sechrest. 1966. *Unobtrusive Measures: Nonreactive Research in the Social Sciences*. Chicago: Rand Mcnally

White, Allen L., Mark Stoughthon, and Linda Feng. 1999. *Servicing - The Quiet Transition to Ex-tended Product Responsibility*. U.S. Environmental Protection Agency, Office of Solid Waste.

Vihma, Susann. 1995. *Products as representations : a semiotic and aesthetic study of design products*. Helsinki: University of Art and Design Helsinki.

Wikström, Li. 2002. *Produktens budskap : metoder för värdering av produkters semantiska funktioner ur ett användarperspektiv*. PhD thesis, Gothenburg: Chalmers University of Technology.

Wright, Peter, John McCarthy, and Lisa Meekison. 2004. Making sense of experience. In *Funology: from usability to enjoyment*, ed. Mark A. Blythe, CJ Overbeeke, Andrew F. Monk, and Peter C. Wright, pp.43-53. Dordrecht: Kluwer Academic Publishers.

Vygotsky, Lev Semenovic. 1978. *Mind in society : the development of higher psychological processes*. Ed. Michael Cole. Cambridge, Mass.: Harvard U.P.

Zaring, Olof. 2001. *Creating Eco-efficient Producer Services*. Gothenburg: Gothenburg Research Institute.

Ölundh, Gunilla. 2003. *Environmental and developmental perspectives of functional sales*. Licentiate Thesis. Stockholm: Royal Institute of Technology