Tell me and
I will forget,
show me and
I may remember,
involve me and
I will understand

— Confucius

UCD4SME

Small to Medium-sized Enterprises involving
their users and clients for product innovation

Christine De Lille — proefschrift

UCD4SME

Small to Medium-sized Enterprises involving their users and clients for product innovation

Proefschrift

ter verkrijging van de graad van doctor
aan de Technische Universiteit Delft,
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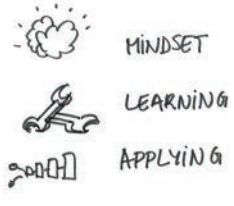
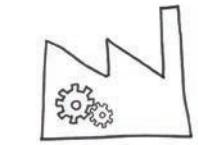




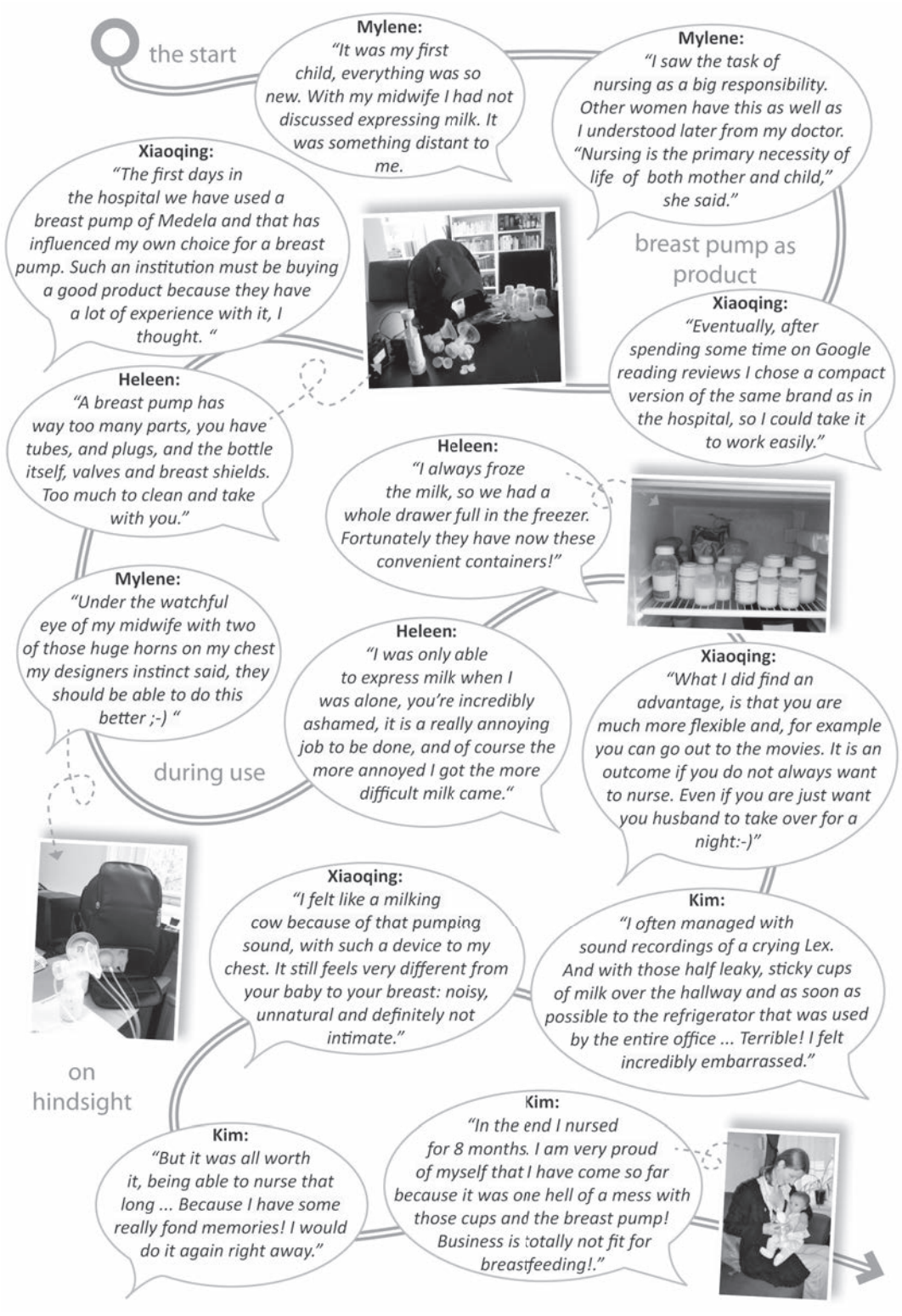


Figure 1.0: Overview of user experiences of the use of a breast pump (Marijke Verhoef, 2013)

Chapter 1

Introduction

Over the past decades, User-Centered Design (UCD) has become a mature field of research and profession. It is widely covered in various journals studying the different ways of involving users, discussing a vast amount of cases, unravelling and reflecting on the underlying mechanisms. A lot of knowledge on UCD is gathered in the context of large companies or is developed in an academic setting (Repo et al., 2007; Sleeswijk Visser, 2009). Knowledge on how Small to Medium-sized Enterprises (SMEs) can apply UCD for product innovation is limited to a small number of case studies. This thesis focuses on how SMEs could involve users in design projects to increase their product innovation capability. The term user in itself is quite ambiguous and will be explained in 1.1. To illustrate User-Centered Design in the context of this thesis I give an example of an SME applying UCD for product innovation that I personally was involved in as a user:

> During the course of this PhD. project I became a mother of two children. Nursing and taking care of my children, especially during the first half a year of their life is a rich memorable experience. As a young working mother, I made use of a breast pump to nurse my children. When I asked other young mothers about their experiences with the product it brought up many interesting stories (see Figure 1.0 for some examples).

In the past two decades more and more methods have been developed to bring this kind of tacit and latent knowledge to the surface by providing users the means to make their experiences explicit. I refer to these methods as UCD methods.

At the moment the most common breast pump is a product from Medela (Figure 1.1). You need two hands to use it; you need privacy as you are handling the complete machine with your breasts uncovered (note the word machine). It makes a lot of noise and it does not look appealing, unfit for the special intimate context of nursing your new-born child. Many women feel embarrassed using it

Figure 1.1 (left): Breast pump from the current market leader: Medela

Figure 1.2 (right): The breast pump developed by Difrax applying UCD.

Medela, the market leader, is a large international company. In 2010 Difrax, an SME with only 32 employees (of which two are designers), decided to develop a breast pump based on user insights similar to those presented in Figure 1.0. Difrax talked to young mothers and doctors, and gained insight in what matters to mothers when needing a breast pump. This resulted in their B2b (Breast 2 baby) breast pump (Figure 1.2) that can be used without hands allowing the mother to do something else in the meantime. Mothers do not need to uncover themselves. The machine is quiet, comfortable and attractive. The milk goes directly in a bottle. It was a major breakthrough for young mothers and the market. The company won several important design awards, for instance the Red Dot Design Award in 2012.

The kind of user stories, as presented in Figure 1.0, provides inspiration to designers redesigning the breast pump. Using user insights is a challenging process for small companies because of the lack of dedicated experts or even designers in the company. In this Introduction chapter I set out the two main components of this thesis: User-Centered Design and Small to Medium-sized Enterprises. I will clarify my view on UCD, how UCD is used and describe the kind of companies that are the subject of this thesis. I will formulate the research questions forming the basis of this research and I will explain the structure of this thesis.

1.1 — User-Centered Design in the context of this thesis

Users, clients, customers, and others have been increasingly involved in the design process during the last decades. This is demonstrated by the names of emerging design approaches:

- participatory design (Schuler and Namioka, 1993)
- human-centered design (ISO, 1999).
- customer-centered design (Chandler and Hyatt, 2002, Beyer and Holtzblatt, 1998),
- user-centered design (Vredenburg et al., 2002), and
- people-centered design (Wakeford, 2004).

These approaches claim that designing with user information helps getting a better insight in what things delight or serve people, resulting in products that better suit their needs. Such products have a smaller chance to fail when they enter the market (Laurel, 2003). The variety of names suggests that the field doesn't have a single use of words. People who use products, experience using products, buy products, or participate in user studies are variously referred to as (end-) users, customers, participants, etc. Although the terms can refer to the same individuals, it indicates that there are different perspectives for the roles that invited people take in product development. These different perspectives, such as User-centered Design, imply a specific approach in setting users central to design process, having a mindset centered towards users, and applying a collection of methods in order to gain knowledge from users. In the respect of this thesis I regard UCD as an approach which cannot exist without the means (methods) to place users central, nor can the methods be regarded equal to UCD itself.

So who is the user?

As involving users brings different perspectives to the design process making it a complex phenomenon, I would like to use an example:
One of the SMEs that were involved during my studies is Tilcentrum. They produce (amongst others) lifting aids for hospitals. Their primary client is the head of the hospital purchasing their products. The patient and the nurse operating the lifting aid are considered as users (See Figure 1.3 for an overview). Still, these are not the only people who are affected by the product. They can be divided into:

- users (who make use of the product)
- direct stakeholders (people who have a direct stake or interest in the product) and
- indirect stakeholders (people who deal with the product indirectly).

A direct stakeholder is for example the technical staff, who is called by the nurse every time a patient needs to be lifted, as they have to install the lifting aid. An example of an indirect stakeholder is a visitor, who does not use the product, but could provide interesting information on how they perceive the product.

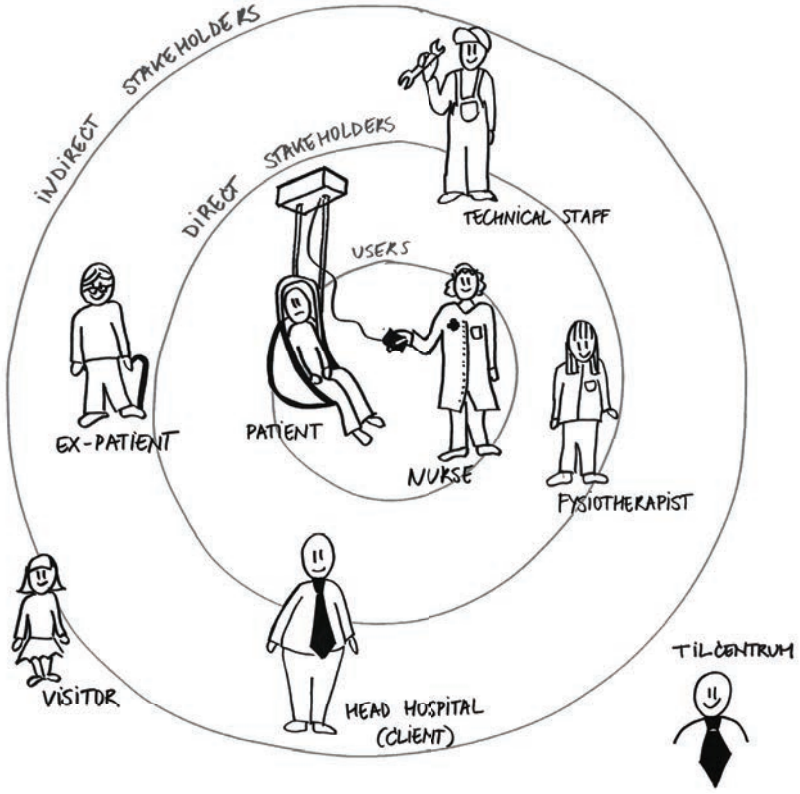


Figure 1.3: A map of all stakeholders involved in the context of lifting aids in hospitals.

In many cases, companies only involve whom they consider their 'users'. During a project with Tilcentrum a major breakthrough was realized by addressing the dynamics between the technical staff and the nurses. The design team used the insights from the technical staff and the nurses to design the support structure of the lifting aid in such a way that the technical staff was no longer needed for lifting, saving time for both the nurses and the technical staff.

The term 'user' suggests that they are using a product, which is not the case for all stakeholders. The term 'user' often restricts the relevance of the person to the time he or she is interacting with the product, and makes the designer blind for the larger life that this person leads. Another limitation of this term is that users and other stakeholders cannot yet 'use' a product, when it still has to be designed. There is an emerging view that 'the person being served through design' should be regarded as a complex human being, and that designers can influence and therefore should pay attention to the many facets of his experiences (Green and Jordan, 1999). Although the term 'user' is not always appropriate, the people being served through design are referred to as 'users' in the remainder of this thesis. In the example of the lifting aid, I refer to the user as the person being lifted which has the experience, the nurse and the technical staff. They are the ones with direct interaction with the product.

So what role does the head of the hospital have if he is not considered as a user but an indirect stakeholder? Many vendors primarily deal with the persons buying their products, their clients. The head of the hospital is considered as a client even though he is not only a purchaser but also concerned about the working conditions of his staff. In general, two different kinds of companies can be distinguished in this respect: those selling products to other businesses (B2B) and those selling products to consumers (B2C).

Figure 1.4 shows the chain of stakeholders for Alrec. This is a B2B SME that develops in-store displays. They developed for example small "shop in shop" systems for clients like Bosch that want to have dedicated floor space in DIY markets. Alrec has contact with the retailers to know what dimensions and characteristics their products can have. Alrec has no direct knowledge of shoppers in general: in this case the person interested in buying a Bosch product by consulting the shop-in-shop system.

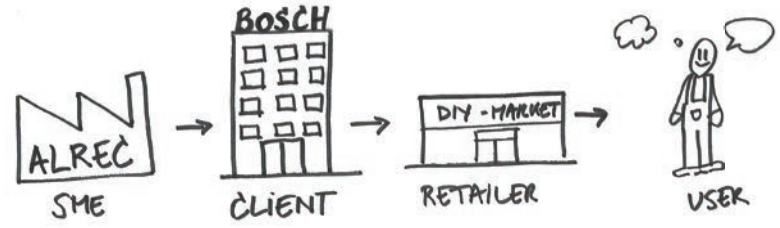


Figure 1.4: An overview of the chain of stakeholders for Alrec. The actual user is distant and unknown.

Companies have different stakeholders regarding the products they develop. They have clients buying their products and users 'using' their products all adding to the complexity of getting an overview of their stakeholders. Each type of stakeholder has different requirements for the product and each type is worthwhile considering. At the same time, it is the combination of information gathered from multiple perspectives of the stakeholders that is interesting.

Bringing tacit and latent knowledge to the surface

Returning to the example at the start of this chapter: the experience information gathered on using a breast pump and nursing (Figure 1.0) illustrates what can come to the surface. This knowledge has different levels (Figure 1.5).

- Explicit knowledge is for example factual knowledge, often top of the mind. "What kind of breast pump did you use? How long did you use the breast pump?"
- A level lower is the observable knowledge. By looking how people use the breast pump insights come forward like: "When putting the milk from the cups into the bottle, this mother always spills milk making the bottles sticky."
- Tacit knowledge is knowledge that people can act upon, but cannot readily express in words (Polanyi, 1964).
- Latent needs are those of which people are not yet aware of. They are needs that become real and into existence in the future.

The latter two levels of knowledge (tacit and latent) address what people know, feel and dream. They are hard to discover. People need time to make these experiences on deeper levels of knowledge explicit. It is this kind of knowledge that enables designers to think about future applications.

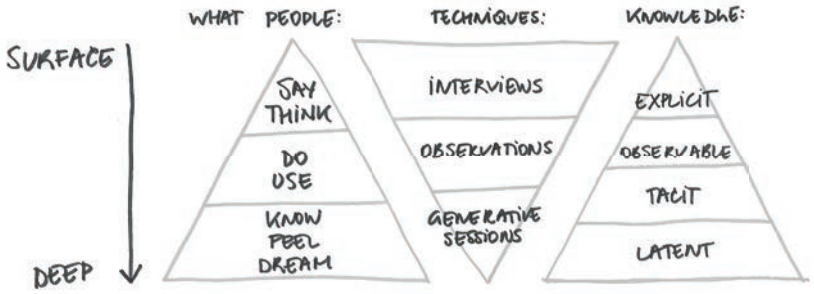


Figure 1.5: Different levels of knowledge accessed by different methods.
(Sleeswijk Visser et al., 2005)

The different kinds of knowledge are explored using a variety of techniques and methods. Consequently the data has various forms. Data can consist of all kinds of fragments of people's experiences, in different forms, e.g., stories, drawings, self-made photographs, video material etc., including the complexity and richness of people in their everyday life. The outcomes provide a view of the elements of people's everyday experiences, not a total overview, but a collection of glimpses into their experiences (Sleeswijk Visser, 2009). These outcomes can be gathered by applying a combination of different methods that are discussed in the following section.

A landscape of methods and approaches to involve users

Several qualitative research methods have been developed to document people's experiences for use in design (see for an overview of current qualitative research methods: Preece et al., 2002; Laurel, 2003; IDEO, 2009 and KAIST, 2009). Most of these methods originate from classical research-orientated disciplines (Sanders and Stappers, 2008). Observations, field visits, interviews, focus groups and applied ethnography have a long history and have been applied for a wide variety of research aims. These methods address the top layers of explicit and observable knowledge. More recently, research methods have emerged from the design discipline itself aiming at the more tacit and latent knowledge, such as cultural probes (Gaver et al., 1999), and generative techniques (Sanders, 2000). These methods make use of a designer's skills to create eliciting assignments and exercises. Users performing these assignments make use of classical 'design' techniques, e.g., collages, to explore, document, and interpret their everyday experiences. These methods can be suitable for generating a holistic view of people, including people's everyday experiences in their full complexity. There is not one appropriate method for a design project (Goodman et al., 2006). The benefit lies in the mix of knowledge gained from these different types of methods (Sleeswijk Visser, 2009). Anecdotes expressed in a generative session can, for example, enlarge the understanding of a field visit observation.

To get a grip on this multitude of existing methods aimed at attaining user insights, Sanders and Stappers (2012) created a landscape, mapping existing methods along two axes (Figure 1.6: participation on the horizontal axis, and the type of approach on the vertical axis). Designers have been moving increasingly closer to the future users of what they design and are increasingly giving their users an active role in the design process. Sanders and Stappers argue we are extending from research-led approaches, where the user is considered subject and the designer is the expert, to design-led approaches, where the user is an active participant in the design process and the designer facilitates this participation. This stems from the change in the design of categories of "products" to designing for people's needs.

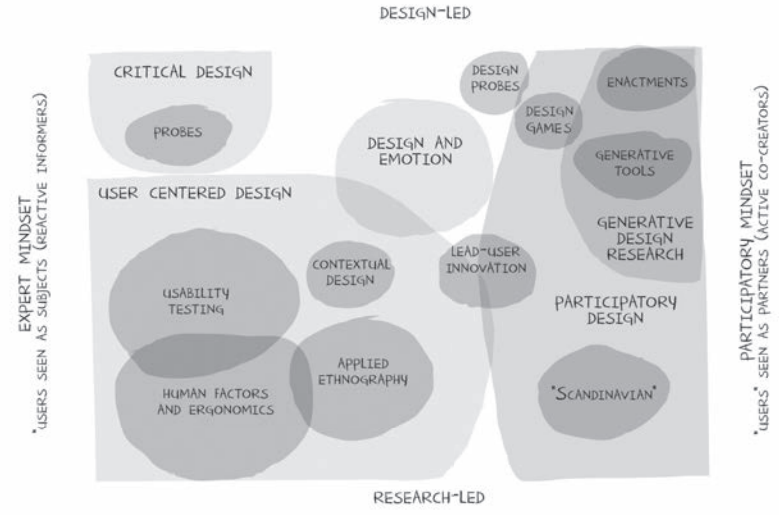


Figure 1.6: The emerging landscape of methods and approaches to involve users in the design process (Sanders and Stappers, 2012 with "design games" added to the landscape as I consider design games to be a possibly valuable UCD method for SMEs).

The traditional design disciplines on the left of Figure 1.6 are centered on a product or a technology. Here the designer gains the skills needed to expertly conceive and give shape to products such as brand identities, interior spaces, buildings, consumer products, etc. The emerging design practices, on the right, centre on people's or societal needs, and require a different approach in that they need to take longer views and address larger scopes of inquiry. In the example of developing a new breast pump based on user insights, the methods on the top of the landscape will provide insight into the needs of mothers going beyond the shape and utter functionality of the product (its intended and expected use). Using the top right methods, information on context of the user, desires and needs, will be gained enabling the designer to develop a product that suits the intimate context of nursing.

User involvement as discussed in this dissertation focuses on involving users in the first stages of the design process to provide direction for product innovation. The emphasis lies on design-led methods as they provide knowledge unfamiliar to SMEs (Cooper, 2001). In this thesis I will refer to User-Centered Design as an activity where users are involved in the design process, for designers to gain insight into the product and the context of use for product innovation. In this context, I consider applying UCD as not only acquiring information from users, but also involving users in the design process and letting

users participate in the design process. UCD in this thesis covers a wider area of methods to involve users than as defined by Sanders and Stappers (2008). With regard to product innovation, UCD is not the magical perspective, which will only make successful products. Applying UCD in companies still presents many challenges and has some pitfalls in its application such as: time-consuming, required expertise, It might not be valuable for any company to use. UCD offers opportunities to organisations to open up and explore new possible directions for product innovation.

1.2 — Introducing SMEs

Each country uses a different definition for SMEs, and literature from various regions can result in sometimes contradicting conclusions. From the first of January 2005, the European Commission of Enterprise and Industry describes Small and Medium Sized Enterprises (SMEs) as: Enterprises with no more than 250 employees (as for example opposed to that used in the USA including companies up to 1000 employees). Since so many companies are categorized as 'SMEs', this means there is a large diversity in how small or large they actually are. The European Union defines the following categories among SMEs (European Commission, 2005):

- Micro firms have fewer than 10 employees and an annual turnover of less than € 2 million
- Small firms have up to 50 employees and an annual turnover of less than € 10 million
- Medium sized firms have up to 250 employees and an annual turnover of less than € 50 million.

In a European context Small to Medium-sized companies not only represent a large number of companies, they also play an important role to the national economies:

> Micro, small and medium-sized enterprises (SMEs) play a central role in the European economy. They are a major source of entrepreneurial skills, innovation and employment. In the enlarged European Union of 25 countries, some 23 million SMEs provide around 75 million jobs (2/3 of all jobs in the EU) and represent 99% of all enterprises contributing to more than half of the total value-added created by businesses in the EU. (European Commission, 2005)

Characteristics of SMEs

Companies that fall within this definition cover a wide variety of activities. They can be service-providers like the next-door hairdresser, product retailers selling goods like bread and flowers, as well as manufacturers of products and suppliers to other producing companies.
SMEs that are the subject of this thesis are manufacturers of products either for other businesses (B2B) or for end users (B2C). The products are designed in-house, or initiated in-house, but outsourced for its design.

Many SMEs start serving some kind of niche market (Nooteboom, 1994 and Cawood, 1997). They often originated from an idea of the owner based on a problem he experienced himself (Guimarães et al., 1996; Hadjimanolis, 2000; Brougrain and Haudeville, 2001). The owners of these SMEs started being their own users or having a user in their direct environment. The owner is the pivot of the SME, has an important impact on the company, is heavily involved in product innovation and is in charge of the decision-making. The owner is an important stakeholder in the studies covered in this thesis.

SMEs enter the market as single product or technology-led company without the financial resources to broaden their product range even if this was considered strategically desirable (Storey, 1982). The niche markets in which SMEs operate are often so small and so specific a large company could not survive.

SMEs are often a forgotten child in academia, media and the general public.

Literature on SMEs describes primarily the downsides or problems: restricted budget, no specialized staff, limited time, no real innovation program or process, etc. (Birchall et al., 1996; Chandler et al., 2000 and Beaver and Prince, 2002; Hausman, 2005). Chapter 3 of this thesis will demonstrate that SMEs also have opportunities, flexibility, close contact with users, ambition, interest in the long-term future, in making a difference. When we think of innovation and more in particular product innovation we think of large companies such as Apple, 3M, Philips, Samsung, Unilever, Proctor and Gamble and others. But the actual innovative heart of the economy consists of Small to Medium-sized Enterprises (Acs and Audretsch, 1993). It is not so strange that large companies are more and more interested in their smaller brothers for new ways of innovating. This thesis focuses on the opportunities and strengths of SMEs, enabling them to become even better by opening up new ways to innovate by using their existing user contacts.

At the time this PhD. project started (in 2008) only few SMEs were making use of UCD. Difrax is an example of an SME successfully applying UCD in product innovation. SMEs are able and interested in applying UCD but in another way than large companies or academia. SMEs have no dedicated UCD expert or, in some cases, even no designer. SMEs acknowledge that the user perspective is a good way to deal with the increasing complexity of products and products becoming more and more service-embedded. This thesis investigates how SMEs, interested and willing to apply UCD, can be supported.

A definition of SMEs based on company size, provides little insight into the day-to-day reality of SMEs and remains abstract. To illustrate the kind of companies involved in this PhD. project, some of these existing companies are introduced: Gefken is a B2B company (page 18), supplying on demand solutions for their clients. Tilcentrum is both a B2B and B2C company with some prior experience involving users for product innovation (page 19). Difrax, mentioned earlier, manufactures baby care products (page 20). Experiences with these companies will be used to illustrate different aspects of product innovation in SMEs.

Gefken Cases

Gefken Cases, a 54 years old family-owned company, makes custom made, on demand only, cases (no stock, about 20.000 cases a year). They started their business making cases for records. Wouter Gefken, the current owner-manager, is responsible for developing new products together with Diego Noriega (sales responsible). Gefken employs 8 people of whom 2 deal with designing and developing the cases. They have however no formal design background.
Gefken has a returning client base (about 40%, others are one-time orders) and does not actively approach clients. Wouter Gefken (owner-manager): *"At the moment we do not actively market our products, this is one of our points of focus for the future."* They currently serve well-known clients like NASA, KLM, Coca Cola, Hunter Douglas, General Electrics etc. Over time Gefken has become European market leader in this segment.
In general, the client chooses the appearance of the case (print, colour and texture, content). The basic design of the case does not change although several standard options can be customized. The different lines of cases are: to pack to present, to pack to protect, flexwork with a laptop in the case and flight cases. Diego Noriaga (sales): *"Ten years ago it was profitable to produce small series of simple cases, competition from countries e.g. China caused a shift towards specialism and more complex products."* Gefken has their production on site in the Netherlands.
Till 2007 product innovation was limited. Then they started a new product line focussing on flightcases developed in collaboration with TU Delft. Since then, Gefken started focussing on product innovation to differentiate from competition. This is limited to technology-driven aspects such biometrics (e.g. fingerprint security protection), GPS integration and solar cells. The design of the case did not change. The grip was the last change made 10 years ago.
Regarding their future strategy Wouter Gefken (owner-manager) says: *"We want to continue producing the products we deliver. Resale is not an option"*.

Tilcentrum

Tilcentrum is market leader in lifting aids in the Netherlands for home use (B2C) and for medical organizations (B2B). Ted van Scheppingen founded Tilcentrum (lifting-centre in English) in 1996 in a garage. Ted has a background in mechanical engineering and had someone in his environment needing a lifting aid. With the help of his brother, he developed lifting aids for people needing medical assistance at home.

Tilcentrum aims to support people to keep their physical state, to live longer and have a higher quality of life. They make unique pieces to help someone with very specific needs, sometimes even just at the cost of the materials. Tilcentrum business is not only about market share. Currently Tilcentrum employs 34 people developing lifting aids primarily for rehabilitation centres. The company stands out for its innovative functionality -e.g. steering in two directions- and in fast and flexible delivery and service. The market of lifting aids is highly influenced by Health and Safety laws to avoid back troubles and sickness absence among nurses. Ted van Scheppingen (owner-manager of Tilcentrum): *"and most institutions have an employee responsible for all work-related regulations for caretakers. When you talk to them you hear many opportunities. Only, they do not see opportunities, they only think: I have a problem"*.

Tilcentrum has 3 core activities:
- selling lifting aids and similar aid products,
- repairing and installing their products (24h service) and
- training hospital staff and care takers to use the products.

The last two activities are service related and are a crucial part of their business.

Tilcentrum has no design department. The entire organization consists of sales and maintenance personnel. Ted van Scheppingen, as owner-manager, is the heart of the company and the driving force behind new developments. Occasionally Tilcentrum invites users for a round table talk to share experiences. Ted van Scheppingen (owner-manager of Tilcentrum): *"Innovation takes a lot of effort. When you involve someone else to continue with your work, your work is not done. You have to keep on pushing. That takes a lot of energy and effort."* Ted van Scheppingen collaborates with design engineering schools to work out ideas in student projects. Once the students have further developed the ideas of the entrepreneur, and he sees opportunities, an engineering agency converts the concepts into products. Tilcentrum has a small sewing and repair workshop in the Netherlands and uses production facilities in Eastern-Europe.

Difrax:

Difrax manufactures soothers, baby bottles, sterilizers, and other products for babies. Difrax is a Dutch medium-sized family-owned company founded in 1967 with 32 employees. Difrax not only designs and sells soothers; they also published a book to help children stop soothing.

Vivienne Eijkelenborg (owner-manager and also known as the soother-fairy) sets yearly goals that are tackled using a very structured innovation process. In this process Gert Blijenburg (product designer at Difrax) and Jonathan van Veelen (director of operations) support Vivienne. One year they focus on export, the following year on developing new products. This way they keep overview and focus. During a year with a specific goal, every month has another theme, enabling them to break targets down into pieces.

In 2011, due to a change in European law (something they had already anticipated a year earlier) the main material component of their baby bottles was prohibited. This required a replacing material and a different production process. Despite of these challenges, their market share grew.

Gert Blijenburg explains that certain problems encountered by users are often the starting point for a new development process. Difrax develops their products with the help of experts. They employ a paediatrician, an eating counsellor, a maternity nurse and a child physiotherapist. These experts can also be consulted by the users of Difrax. Parents that buy Difrax products can be invited to a consumer panel of Difrax, meeting every couple of months.

Difrax says they can only survive by making good products that suit the users' needs. Jonathan van Veelen: *"We simply need a lot of input from our users. Because we need to remain up front as we are a small company. We cannot compete with Avent (Philips, one of the main competitors, ed.) based on amount of products and prizes. We need to be better. And being better has to do with the user having better products. So we need to talk with users and understand them."*

1.3 — Research Question and Goal

An increasing number of SMEs start to realize that UCD offers opportunities for product innovation (de Jong and von Hippel, 2009). The problem is that our understanding of UCD is either based on studies for large companies and/or is developed in an academic setting (Repo et al., 2007; Sleeswijk Visser, 2009). Often, SMEs interested in UCD run into expensive consultants or fuzzy websites (Moultrie et al, 2005) and do not find the needed information to apply UCD themselves.

To develop an understanding of how UCD can take place in SMEs, this research project builds on the following three areas in literature:

1. Academia has investigated how UCD can be applied and what methods can be used (Steen, 2008 and Vredenburg, 2002) as well as why it is valuable for practice (Kujala, 2003). This research project adds to the present knowledge in design research literature how UCD can be applied in the context of SMEs (with a focus on the methods and approach).
2. Since the 1980s, large companies have involved users in product innovation (Philips, Microsoft, Intel, Xerox and many others). Sleeswijk Visser (2009) and Repo et al (2007) observed that almost all documented cases by academia take place in large companies. Research in the context of large companies is valuable for this project as it gives an idea of the how and why of UCD methods, their purpose, and their practical use. This research project adds to the present knowledge in academia how UCD is approached differently in the context of SMEs in comparison to large companies.
3. As existing knowledge on UCD overlooks the particular context, needs and strengths of SMEs, literature covering SMEs in general and product innovation in SMEs will provide insight on the following aspects: the characteristics of SMEs (Nooteboom, 1994; De Jong & Vermeulen, 2006), their strengths (Dutta & Evrard, 1999), and what makes SMEs successful (Laforet & Tann, 2006).

This research project adds to the innovation management literature what characteristics of SMEs enable SMEs to apply UCD and how UCD can be applied for product innovation.

Although Buijs (1987) explored how SMEs can be supported to improve their innovation capabilities through process-oriented facilitation and experiential learning, the available research on how UCD can be combined with the strengths of SMEs is scarce. There are different examples each covering an aspect of the earlier discussed scope, but none of them covers the entire ground.

- Moultrie et al. (2006) developed an audit tool for SMEs, focusing on assessing design performance, within the wider context of New Product Development (NPD).
- Saastamoinen et al., (2007) assessed current practices and experimented with intensified user interaction together with selected SME participants.

- Asboe (2008) explored what role a design anthropologist can play in SMEs.
- Pozzey (2012) looks at family-owned SMEs and how design thinking can play a role within their organization from an inside perspective.

Existing literature on how product innovation takes place at SMEs and how UCD methods apply to large companies are used as a framework in this research project to explore how UCD can be applied in SMEs (more elaborately discussed in Chapter 3 and 4).

Problem definition

More and more SMEs are involving their users and start to use design-led UCD tools and methods, but lack knowledge on how to make use of them in their daily practice. There is little information in existing literature that provides insight into involving users in the product innovation practice of SMEs. This project explores UCD tools and methods suiting the needs, the context and possibilities of SMEs as well as how UCD as an approach can be aligned with SMEs.

Research goal and question

The goal of this research project is to explore how UCD is approached and applied differently in SMEs for product innovation in comparison to large companies. This is reflected by the following research question: "What characterizes the practices of SMEs as compared to large companies in relation to User-Centered Design?" This question provides the basis to understand the implications of the characteristics of SMEs with regard to existing UCD methods and the existing approach for UCD as developed for large companies. This investigation enables to address the main research question of this thesis is:

How can SMEs apply User-Centered Design for product innovation in their practice?

To find out how SMEs can make use of UCD in a way that fits their practice, the starting point is to investigate the current state of UCD in SMEs and continues exploring how UCD can be approached and applied in SMEs. Chapter 2 further elaborates on the underlying knowledge questions that contribute to answering the main research question and the research approach.

Relevance of this research

In design research, UCD tools and methods have been developed to incorporate users' experiences into the design process (e.g., Gaver et al., 1999; Mattelmäki, 2006; Sleeswijk Visser et al., 2005). As these tools and methods are developed in academia or based on work in large companies, insight is missing on the context of SMEs. UCD methods aimed specifically at SMEs simply do not exist yet. There were only sporadic efforts taking place exploring how UCD takes place in SMEs and was not the primary aim of those studies. This thesis will add new knowledge to the field of design research.

1.4 — Audiences

This thesis is written for and in collaboration with different audiences. Throughout this thesis, the accompanying icons will show what is interesting for the corresponding audience:

For other researchers that study UCD, product innovation and organizational change at SMEs. This thesis provides insight into product innovation activities and how they (can) involve users in this process. The great variety in SMEs involved and the amount of SME cases from SMEs enable other researchers to draw upon the results for future research projects. The suggested process for SMEs to apply UCD can be a starting point for other researchers.

For the designers and owner-managers of SMEs. They will value the case examples as well as the developed approach to apply UCD. The recommendations in Chapter 8 of this thesis provide hands on information for both design agencies supporting SMEs as well as the SMEs.

Governmental organizations like for example Syntens[1] and Agentschap NL in the Netherlands, Flanders In Shape[2] in Belgium, Better by Design[3] in New Zealand and the British Design Council[4]. These organizations are funded by their national government to support SMEs to innovate through design. UCD is recognized by all of these organizations as a valuable way to innovate. Here the examples can be used to illustrate their own work. The toolkits, the proposed process and the 'tips and tricks' can inspire them to develop their own means to support SMEs.

Students of Industrial Design Engineering. Design students are trained in using UCD methods and tools. The curriculum aims primarily at large B2C companies. Yet, many students will start working for small B2B companies. As a result, they often face working in an unfamiliar and challenging context. The cases can support the students with examples of UCD project in SMEs, and provides them information on how to support an organization when applying UCD.

[1]www.syntens.nl [2]www.flandersinshape.be [3]www.betterbydesign.org.nz [4]www.designcouncil.org.uk

1.5 — Overview of this thesis

The chapters in thesis built on a combination of insights and collected feedback from studies in practice and on theory (See Figure 1.7).

Chapter 1 introduced the context and the main research question of this thesis: How can SMEs apply UCD for product innovation in their practice?

Chapter 2 describes the research approach used for this project, the research questions and places it in research traditions of the Faculty of Industrial Design Engineering (IDE).

Chapter 3 and 4 discuss how product innovation currently takes place in SMEs and explores how UCD can take place based on literature, interviews with designers and entrepreneurs of SMEs and workshops. Based on this information four methods are selected for further exploration in cases.

Chapter 5 describes a first study that involved 10 SMEs working with UCD experts to get acquainted with UCD during a design project. This study explores the use of the four UCD methods selected in Chapter 4.

Chapter 6 returns to the main research question formulated in Chapter 1. Based on findings presented in Chapter 5 a process is developed to support SMEs in adopting UCD. To explore the underlying mechanisms of the suggested process, a set of design guidelines are constructed.

Chapter 7 describes the process of developing two toolkits that were designed to support SMEs in adopting UCD. The toolkits make use of the set of design guidelines developed in Chapter 6. Learning lessons from designing these toolkits and using them in practice are the basis for the considerations on the process suggested in Chapter 6.

Chapter 8 discusses the overall findings of this research project and reflects on the research aim, approach and recommendations for further research. It ends with tips and tricks for both design agencies and SMEs.

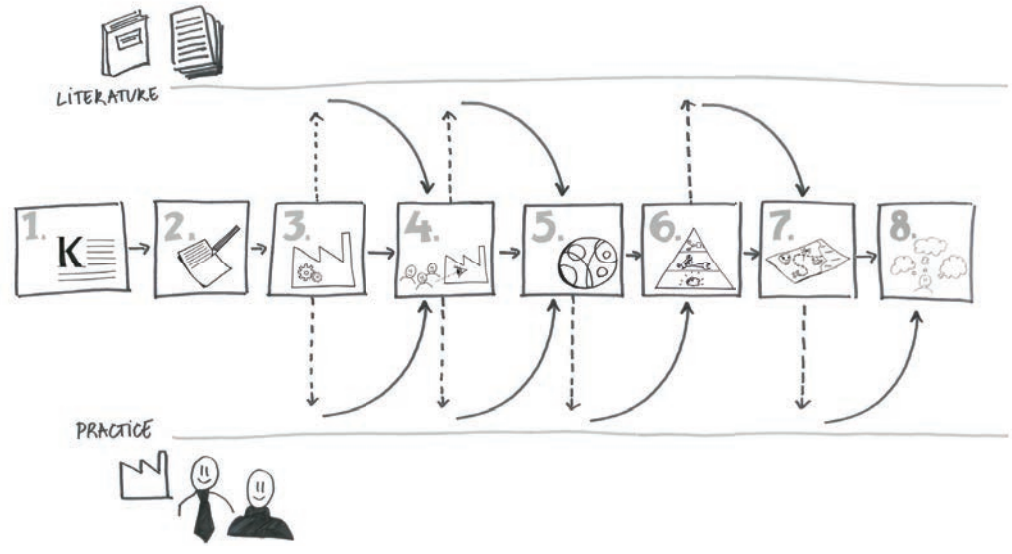


Figure 1.7: Overview and structure of this thesis. Each chapter builds on either practice or literature and is the basis for the following chapter. Chapters 3 and 4 frame the current state using both literature and insights from practice.

This chapter is based on the following publication:
De Lille, C.S.H. and Asboe, M. (2011) Research methods for Participatory Innovation in Small-to-Medium sized companies. In J. Buur (Ed.) Proceedings of the first Participatory Innovation Conference (PINC) 2011 in Sønderborg, Denmark.

Chapter 2

Research approach

The previous chapter introduced the two domains in which this thesis is situated: User-Centered Design and product innovation in SMEs. Unexamined previously, the combination of these two domains can be considered a research gap. This chapter discusses the theoretical paradigm that forms the basis for the research approach taken and presents the research design and methodology. This chapter ends with an overview of all the research activities.

2.1 — Research aim and questions

In 2008, when this research project started, two different events formed the basis of the research aim: several SMEs had approached me with the question of how they could apply UCD in design projects and Froukje Sleeswijk Visser (2009) had noticed in her PhD research project that little is currently known about the state of UCD in SMEs. All of her cases had been taking place either in an educational setting or with large companies. This research project combines a need from practice and addresses a knowledge gap in research. These two components are intertwined throughout this thesis focusing on both building theory and providing solutions relevant to practitioners.

The project's knowledge aim is to expand existing UCD methods to fit them to the needs, context and capabilities of SMEs. The main research question is formulated as follows:

How can SMEs apply UCD for product innovation in their practice?

This How-research question implies that the answer to the question will result in a model or a description that discusses ways for SMEs to apply UCD for product innovation. In order to come to this description, the research design consists of three phases (see Figure 2.3). Each phase has its focus:

The **first research phase** focuses on **the current status of applying UCD** in SMEs. The research questions addressed in this phase are:

1. What characterizes the practices of SMEs as compared to large companies in relation to a user-centered design approach?
2. What UCD tools and methods do SMEs currently use in product innovation activities?

The first sub-question aims at making an inventory of the currently used UCD tools and methods. It allows one to find out why they are used, how they are used, as well as the challenges SMEs and designers face (sub-question 2). Based on the findings of the first research phase, new questions dealing with how SMEs can align with a user-centered approach surfaced such as: How can the strengths of SMEs be used? How to make use of UCD in a flexible way to deal with unforeseen events and at the context of SMEs? Recruiting is experienced as difficult, how can this take place?

The **second research phase** focuses on **design-led UCD** tools and methods that are currently unused but target the type of knowledge SMEs are looking for. This research phase examines how these methods could be used in SMEs and focuses on the following research questions:

3. Which UCD tools and methods are suitable for SMEs?
4. What are the barriers and opportunities for design-led UCD tools and methods in SMEs?

By an inventory of design-led UCD tools and methods, insights are gathered on how these methods can be adapted for product innovation activities in SMEs. This exploration showed that SMEs experience difficulties in making use of the existing tools and methods and getting them implemented in their product innovation practice. For this reason the focus of the research project shifted from finding out what UCD tools and methods are suitable for SMEs to the main research question:

5. How can SMEs utilize their strengths to apply UCD for product innovation in their practice?

This research question focuses on how SMEs can learn to use UCD tools and methods. In this learning process the strengths/weaknesses of SMEs and the barriers/opportunities for applying UCD in SMEs are taken into account.

This is investigated in **the third research phase**. The primary aim of this research phase is to **explore various ways in which SMEs can be supported in applying UCD tools and methods** leading to the last research question:

6.- How can SMEs be supported in applying UCD?

The following section discusses the general research approach taken to address the previously described research questions. Section 2.3 discusses each of the three research phases in more detail.

2.2 — Research approach

The majority of studies on product innovation in SMES have used a survey using one-off, quantitative postal, or telephone questionnaires. This kind of research on product innovation in SMEs is generally factor-based and does not provide insight in the complexity and unpredictable nature of product innovation in practice (Kleinknecht, 1989). It does provide insight into what factors influence the success of product innovation in SMEs but the actual motives, rationales, and experiences of entrepreneurs and small business owners remain unknown. To understand these motives as they are at the basis of SMEs being able to apply UCD methods, I move away from the 'snapshot' and fragmented profiles of small firms and their owner-managers, developed through questionnaires, by undertaking a more qualitative and longitudinal research approach (Blackburn & Stokes, 2000). Doing so, I am able to take into account the different game changers (for example someone going on holidays, the entrepreneur is sick and many others) that have an impact on product innovation projects in practice. To illustrate how UCD may take place in SMEs cases are needed explaining what goes on, what the struggles are and how these are tackled by making use of UCD. Thomas (2011: 4) underlines the importance of rich stories developed from case studies: *"[…] by looking at our subject from many and varied angles, we can get closer to the 'why' and the 'how' […]"*. A more rounded, richer and more balanced picture of our subject is developed. Studies that take place during a period of several months, like those in this thesis are rare in management literature but more common in design research. In comparison, anthropology allows for thorough in-depth exploration and immersion of the context itself. It allows for conscious and predetermined interventions within the company structure and process to develop theory on for example user driven innovation within SMEs (Asboe, 2008). In previous work I compared a design approach to that of a design anthropologist (Mark Asboe) to grasp the differences in research approaches and their according results (De Lille and Asboe, 2011). Both Mark and I focus on the involving users for product innovation in SMEs, but each using a different approach. Mark has made a choice to carry out a 'single case study'. This choice can be justified with the argument that it can function as a revelatory case, a study or a situation where the researcher has 'an opportunity to observe and interpret a phenomenon previously inaccessible to scientific investigation' (Yin 1994, pp. 38-40). Marks study can be thought of as a revelatory case, because it rarely happens that the long-term effects of user driven innovation can be studied within a company. As opposed to the single case study approach of Mark, I aimed at finding a balance between design anthropology and management research. Therefore I chose a design research approach that allows for fast projects with many results and a lot of different material generated in a wide variety of companies. In one of my studies ten cases are followed for a period of ten weeks. With four companies

of these I held informal contacts over a period of five years (through graduation projects, other kinds of student projects and occasional meetings). This approach allows exploration and descriptions of current practice and ways to enable UCD in SMEs utilizing the strengths of SMEs. To study how SMEs can apply UCD, my research approach is based on the following:

The undertaken research approach is based on **studying a small amount of cases in detail within design practice** (Easterby-Smith et al., 1999). This enables `an empirical enquiry that investigates **a contemporary phenomenon within its real-life context**, especially when the boundaries between phenomenon and context are not clearly evident' and it `relies on multiple sources of evidence' (Yin, 1994, p. 13). The transfer of knowledge from one setting to another is supplied by case study reports created by an informed reconstruction of reality (Guba and Lincoln, 2000). Studying cases is considered to be particularly useful where **`research and theory are at their early, formative stages'** (Benbasat et al., 1987, p. 369).

The complexity and variables of real practice can be taken into account by an **explorative approach**. The phenomenon under study is new and has many variables. My aim is to get insight into the characteristics of SMEs and the barriers and opportunities that play a role and what kind of role, rather than isolating and testing one or two variables. The involvement of a variety of companies, designers and UCD experts in the studies make it possible to explore the phenomenon in vivo and provides insight in a variety of contexts.

It is in the industrial designer's nature to have a drive to solve problems and look for tangible solutions based on a creative and intuitive process in which a designer deals with uncertainty, instability and conflicting situations (Cross, 2007). My approach to the research question is orientated towards solving problems and improving the situation: How can SMEs be supported in applying UCD tools and methods by utilizing their strengths? This implies that I identify the space for improvement and design solutions. After examination of the current state, a **design driven approach** enables me to take theory into account in the creation of solutions. This approach of the problem helps to think beyond the existing situation and allows generating solutions. *"Several dozens of doctoral theses build directly on design rather than borrow methodologies 3from other disciplines... There have been several milestones in this maturation. Methods like probes, generative techniques and scenarios have proved that many things in design practice can be turned into research methods fairly easily."* (Koskinen et al. 2011 p28).

In setting up data collection and analysing data, I make use of my design skills to get a grip on the data. Visualizing my thoughts while going through the multitude of gathered data supported in sense-making as well as structuring both thoughts and knowledge. Through the developed visualizations, relations and hierarchies could be made explicit which is often hard to obtain from excel sheets. Furthermore, in an industrial design process, the requirements are ill-defined and the question commutes with the solution (Cross, 1982). Designers regularly approach projects as iterative processes, evaluating their initial assumptions and refining their initial goals during various iterations (Saakes, 2010). Through recursive cycles of analysing, visualizing and reflection on the collected data I was able to grasp the multitude and variety of information. Visualizing also enabled me to communicate my thoughts with fellow researchers and engage them in an early stage in my research process.

My approach borrows from **Action Research** its dual commitment to study the situation of interest by changing it and concurrently to collaborate with people in that situation by changing it in what is together regarded as a desirable action (Gilmore et al. 1986). Action research is an iterative process involving researchers and practitioners acting together on a particular cycle of activities, including problem diagnosis, action intervention, and reflective learning (Avison et al. 1999). Collaboration between researcher and practitioner challenges the position of the researcher as an objective and detached observer, and may reduce the confirmability (or objectivity) of the research. This aspect of action research, as well as the opportunity presented by involving knowledgeable experts on UCD who could actively collaborate with SMEs made me decide not to be actively engaged in the design projects itself of SMEs. Furthermore, one of the measures taken in Action Research builds on thorough action planning. During this phase possible courses of action for solving the specified problem are generated which will be evaluated to study the effects of the actions taken (Susman and Evered, 1978). Due to the explorative nature of this research project, as well as the substantial changes that needed to be made, actions are not really planable. This caused action planning as advocated by some Action Researchers not to be applicable here.

Pragmatism provides a theoretical basis for my research. Pragmatism links theory and praxis (Greenwood and Levin, 2005) that are central to my research project (see Figure 2.1). It provides a basis to act within reach and with direct relevance to practice in an inquiring manner. The actions taken are purposeful and aim at creating desired outcomes within the boundaries of what is best suitable at the time of the study. Two parameters stand out in the pragmatic approach: knowledge generation through action in context, and participative democracy as both a method and a goal.

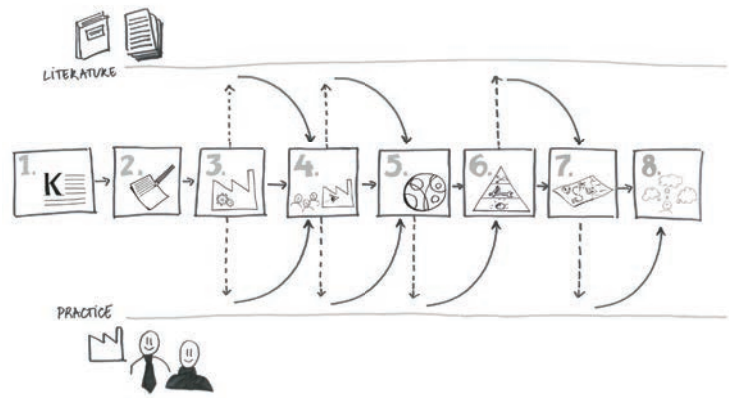


Figure 2.1: Linking both theory and praxis in different phases.

A pragmatic approach binds all previously mentioned elements of my approach: studying a contemporary phenomenon within its real-life context, where research and theory are at their early, formative stages, through the use of actions towards creating solutions.

Different levels of analysis

Throughout this research project the micro-social level of scale (looking at interactions between people) is used for analysis (Knorr-Cetina, 1981). In design research this is the more common level of analysis as opposed to the firm, or the NPD project level of analysis, primarily used in business and management research. To understand how the UCD tools and methods are used, we need to learn about the interaction between the individuals who are either providing information and knowledge regarding the UCD tools and methods and those making use of the tools and methods. The context in which these individuals interact needs to be taken into account. In the micro-social level of analysis, a continual, dynamic interaction process takes place involving designers and entrepreneurs of SMEs and UCD experts working for the SME.

To explain the level of design or development, an important part of this thesis, I make use of Stappers' (2009) overview of different meta-levels in which design activities take place (Figure 2.2 shows how it is used in the context of this thesis). This overview consists of a number of levels, each labelled after its' main actor, e.g., the SME whose aim is to design and produce a household appliance. Stappers (2009) refers to the levels as 'meta-levels', as at each level, the product of design is a tool for the actor in the level below it. Each meta-level constitutes different units of analysis. Figure 2.2 can be explained as follows:

Take for instance the level labelled 'SME'. Key elements at this level are:

- The person, here labelled 'designer' (part of the team working at the SME),
- his UCD (design) tool, exemplified by a collection of material used for probes, and
- the objective (product), exemplified by a cooking pot.

On the level below it in Figure 2.2 we see the use of the cooking pot as the tool to create an objective (a meal), by the person labelled 'user'. At each of the levels, the same elements return, each with a slightly different content. This shows the parallels between the levels at which we operate. At each level, the scheme visualizes aspects that have entered the academic discussions on design research, design practice, and design methodology in the past decades: knowledge, environment, tools and goals.

To explain the different levels depicted in Figure 2.2 in more detail in the context of this thesis with their according units of analysis I use an example of one of the discussed SMEs:

Difrax is interested in designing a new breast pump (Level of SME, team). To design the breast pump, they hire a UCD expert that supports them in involving young mothers and gaining user insights. This UCD expert has selected probes and generative techniques from their toolbox and has adapted these UCD tools to the context of the breast pump. The toolbox that the UCD expert uses has been developed by a toolkit designer at the university. This toolkit designer is a PhD student with an interest in UCD in health. The professor of the PhD student has developed the underlying theory in his research that the PhD student uses to structure, frame and develop the toolbox. Once Difrax is able to design the breast pump using the gathered user insights, a young mother can use the product at work to give her baby milk when the baby is at day-care (level of life).

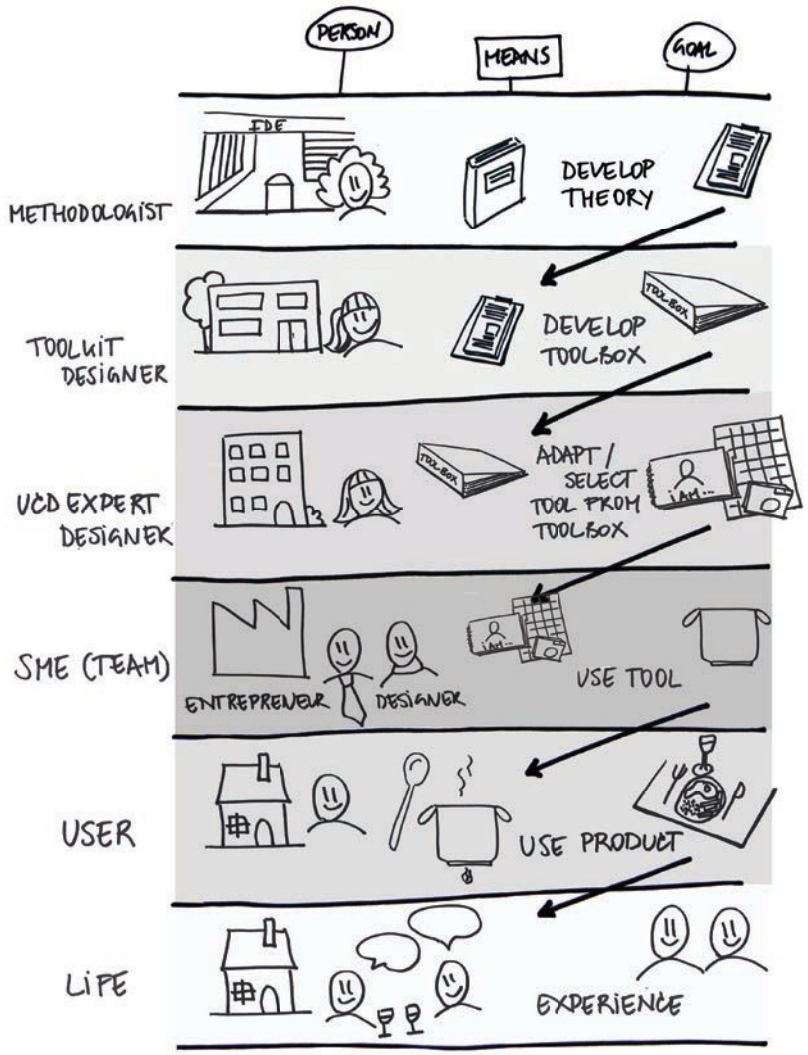


Figure 2.2: Overview of meta-levels in in this thesis

(adapted to the context of this thesis from Stappers, 2009)

In this research project, I am interested in how SMEs apply UCD methods in their practice (the level of Difrax in the example), how UCD experts adjust their tools to the context of SMEs and how the toolkit designers develops toolboxes to support UCD experts.

2.3 — Research design and methodology

The introduction of this chapter introduced the research questions and the three research phases. Each research phase has its method of data collection. I will briefly discuss each research phase. An elaborate discussion of the data collection and analysis can be found in the according chapters for each research phase.

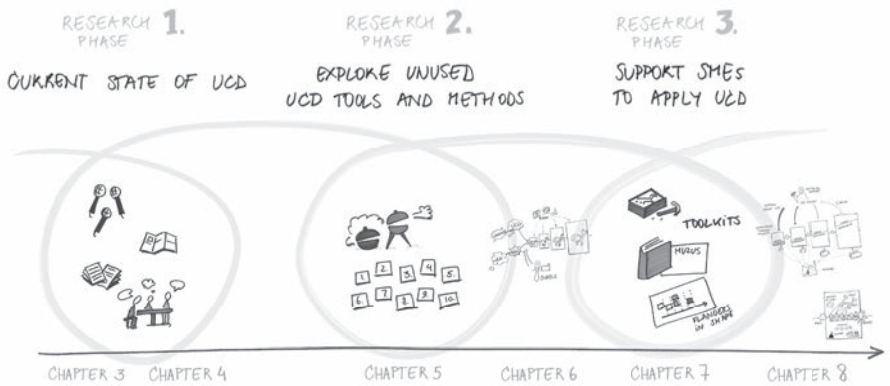


Figure 2.3: Research overview: three research phases with the according topic and research questions.

Each research phase addresses a different topic with corresponding research questions. For this reason I have chosen to use qualitative mixed-methods. For each of the research questions multiple sources of data collection and different types of data were used.

Phase 1: Immersing in the current state of UCD in SMEs

This research phase takes place at the level of the SME as depicted in Figure 2.2. A combination of methods is used to capture the phenomenon from its current use in practice (first hand) and from literature (second hand). In this phase **interviews** were held with entrepreneurs of SMEs (a total of 15). **Generative assignments** (generative techniques provide people means to become experts of their own experience and communicate their experiences; Stappers and Sanders, 2012) were sent to designers working in or for SMEs. With interviews with designers working for SMEs (a total of 21) and returned assignments (18 returned) I aimed to get an idea of their design process, the used UCD tools and methods and the desired UCD process. By three **workshops** with a total of 29 different designers working in and for SMEs I was able to get more detailed information on the aspects that surfaced during the earlier investigations.

Literature review provided insight in the characteristics of SMEs and how their product innovation process takes place. The examples from practice illustrated these findings. Both the literature and the exploration in practice lead to an overview of the current state of UCD in SMEs and revealed what the strengths of SMEs are that are useful for UCD. Based on the overview of the currently used UCD tools and methods, four design-led UCD methods are selected for further exploration. The latter have a large uptake within academia and large companies and receive great interest from designers working in and for SMEs. These UCD methods will be described in more detail in Chapter 4 and are explored in practice in Chapter 5.

Phase 2: Trying out four design-led UCD methods in practice

This second research phase investigates how the selected UCD methods of the first research phase can be used in practice to explore their suitability for SMEs. In this phase the level of analysis of the UCD expert/designer and the SME are investigated (Figure 2.2). To understand the utilization of the UCD methods in their natural context, their application is studied in the context of a product innovation project in which all parties are involved (a UCD expert, a designer and the SME). Using UCD in practice, unexpected factors influencing the design process are taken into account. I chose multiple case study as research method. The ten different cases (involving a total of 10 SMEs and 12 design agencies or UCD experts) are analysed both in-case and cross-case. The in-case analysis allows seeing what activities take place at the micro-level, what decisions are taken and how the UCD method is used/modified to make it suitable for the project. The different barriers and opportunities for each case can be determined. The cross-case analysis allows comparing the emerging patterns from the in-case analyses to see whether new patterns arise between cases, to generalize across cases and to generate a wider scope on the subject of research.

Phase 3: Exploring how SMEs can be supported in utilizing their strengths for UCD

The third research phase explores how SMEs can be supported applying UCD. In Chapter 6 I reflect on the use of the currently used UCD methods and the methods explored in the case study. These results were combined with a literature review looking at existing ways to support organizations to change their direction, adopt new processes or learn new skills. This provided a basis to formulate an approach for SMEs to support them to utilize their strengths to adopt UCD in their practice. That chapter concludes with design guidelines that enable to evaluate the suggested approach in practice.

By the coaching and observing development of two toolkits by toolkit designers, the suggested approach is validated in detail and gets a physical and usable shape. One of the toolkits is developed for use in a design agency so they can support SMEs. The other is developed to support SMEs. To observe the actions at the "Toolkit Designer" level, I supported the toolkit designers developing toolkits to be used in practice.

It is not the toolkits that are the topic of investigation. It is the design decisions that are taken by the toolkit designers in developing the toolkits that are interesting to answer the main research question: *How can SMEs utilize their strengths to apply UCD for product innovation in their practice?* As an example, the toolkit designer decides what UCD tools and methods they include in their toolkit and how this information is presented to the SME. These considerations provide knowledge on values, priorities and ways to support SMEs.

To investigate the development of the toolkits, I used **Research through Design** as an approach. This approach is based on designing structurally varied, experiential and product relevant prototypes and generating knowledge by the process of building and evaluating these prototypes. These prototypes go through cycles of building and evaluating in real-life settings (Overbeeke et al., 2006), generating knowledge. Publications of studies applying this approach generally describe an iterative cycle of building/evaluating, or action/reflection, or doing/thinking (Keller, 2005; Frens, 2006; Wensveen, 2005). This approach allows me to investigate how toolkit designers create possible ways of supporting either SMEs to apply UCD themselves or UCD experts to work for SMEs, confront it with practice and see the effect. In the setting of Research through Design in the previously mentioned studies, the researcher has been the person in charge of taking the design decisions. In this regard the researcher is both the designer and the researcher within a project.
The researcher takes measures to be able to reflect on the design decisions taken (it is precisely in the design decisions that much of the knowledge is gathered). The risk is that one of the two roles overpowers the other. In my research, I have enabled others to develop toolkits for designers (similar to the work of van Dijk, 2013). Therefore, I have not been inasmuch an active member in the Research through Design activity, but primarily observed other researchers and supported them in making informed decisions. Here a different challenge pops up: design decisions are primarily tacit knowledge and are hard to express. In Chapter 7, starting on p 214 I elaborate in more detail how I handled RtD in this particular case and how I attempted to reduce the risk of not being the person taking the design decisions. Measures that were taken to bring the underlying decisions to the surface are for example: research journals for the toolkit designers, regular meetings and by being present during team meetings.

2.4 — Validity, Reflexivity and Relevance

Malterud (2001) describes three overall criteria based on a review of literature about qualitative research: reflexivity, relevance and validity. Other criteria are either related to one of these three criteria or are not relevant to my research approach. Objectivity, for example, is in line with the criteria reflexivity, as long as the researcher acknowledges that knowledge is partial and situated, and that the researcher is explicit about the researcher's effects. Reliability is, for example, less relevant in this research project where richness of data and diverse contexts are preferred. By the use of ten different cases, each in a different context, in the first study and the design of two toolkits in different countries for different purposes, reliability is not much of an issue.

Validity

Validity is about the question whether the research findings make sense, and are credible to the research context; its users, our peers and our readers (Gray & Malins, 2004). It relates to how well the knowledge addresses the question. Validity has two components: external and internal. External validity addresses the problem of whether findings are transferable to other settings. Internal validity is related to terms of credibility, authenticity and transparency (Miles and Huberman, 1994).

Internal validity (or consistency):
I attempt to provide transparency in my research process by proper documentation and by being explicit and reflective about the different levels of abstraction in each chapter. Readers can follow the path from data to findings and judge if the findings are credible and authentic. Following measures have been taken to ensure internal validity of my findings:

- Getting feedback from participants (e.g. by discussion sessions with participants and by asking the companies to react on the case descriptions).
- Triangulating (e.g. using multiple data sources, multiple methods, and involving multiple researchers in the analysis).
- Checking for representativeness (e.g. making sure that the findings are based on representative events by reflecting upon the findings in the context of existing literature).

External validity (or generalizability):
The external validity refers to the extent to which the findings can be transferred to other settings or groups (Malterud, 2001) and can be regarded as generalizability: accepting that a general goal of research is to develop generalizable knowledge. Within the qualitative case study approach taken for this thesis one of the limitations is the necessity to focus on implementation in a small number of companies (Warmington, 1980). It is unlikely that the procedure will prove useful in every organization. In choosing the involved SMEs, I have taken measures to make sure a wide variety of companies is involved. The selected SMEs work in different markets, have different sizes, maturity levels and organization types (B2B and B2C). I was able to investigate ten different SMEs simultaneously. By developing the toolkits (Chapter 6) in two different countries, by different organizations, the generated knowledge went beyond the cases of this PhD project. To transfer the knowledge, I documented the case "stories" (based on multiple data sources) discussed in Chapter 5 and the two toolkits in Chapter 7, in detail.

Reflexivity

Malterud (2001) describes reflexivity as 'an attitude of attending systematically to the context of knowledge construction, especially to the effect of the researcher'. Reflexivity considers the researcher's background, position and attitude to have an influence on how the research is set up, how the questions are formulated and how the methods are judged.

- I used a Research through Design approach where different abstraction levels are investigated.

- I made use of the model by Stappers (2009) on meta-levels in design research to clarify at which abstraction level I investigate in each chapter.
- I involved other researchers who have participated in the cases and the design of the toolkits to evaluate the events that took place. By explicitly describing these considerations, openly discussing the observations and including many contextual details in the case descriptions, I attempted to provide transparency in the knowledge generation.

Relevance

Relevance means that the knowledge gained from each case is useful to other practitioners. It refers to whether concepts from one case or study are relevant to other settings (Easterby-Smith et al, 1999). The more variation in the different types of cases and companies, the more likely it is that the findings are applicable to a broader range of situations. For this reason, I worked closely with practitioners in the ten cases and reflected with them on a more abstract level, allowing us to determine the relevance to other practitioners. Each of the cases, and the two toolkits are followed by an evaluation of the research questions of this thesis: the UCD tools and methods used (as well as how they are used), the design process followed and how the SMEs learned to use the UCD tools and methods. Every chapter starts with explaining the addressed meta-level and ends with reflections on research questions addressed. The findings of each chapter are viewed with the knowledge of earlier chapters in mind. In the overall conclusion (Chapter 8), I evaluate the conclusions and their relevance for practice.

Summary

This chapter presented the research approach, design and methodology translated into three research phases. Each of the phases has its focus: “phase 1: the current state”, “phase 2: design-led UCD tools and methods” and “phase 3: supporting SMEs”. The aim of the studies is to provide detailed insight into the situations in real practice, leaving the phenomenon in its full complexity. By iterations of being closely involved with SMEs applying UCD in practice and observing what takes place, assumptions could be quickly tested in practice. All activities took place in close collaboration with SMEs, design agencies, and the governmental agency Syntens (whose main task is to support SMEs in innovation). The interventions are ways of generating knowledge to answer the research questions. As a useful side result, the created solutions (the cases from the Co-design Pressure Cooker discussed in Chapter 5 and the designed toolkits described in Chapter 7) can function as inspiring examples for practitioners. The next chapter investigates the first research question: What is the current state of UCD in SMEs?

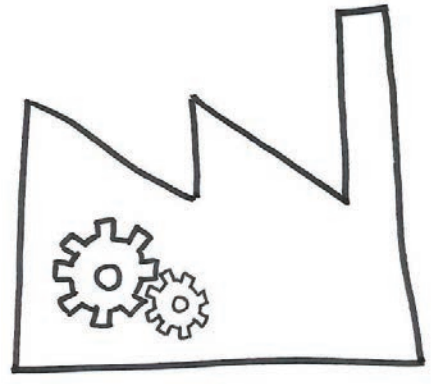
Academics:
To explore in depth the current practice of applying UCD in SMEs a case study approach is taken.
To explore how SMEs can be supported in applying UCD in their practice, Research through Design is used.

This chapter is based on the following publication:

De Lille, C, Stappers, P.J., & van der Lugt, R (2009) Searching for user involvement in SME design practice. In: Lee, K., Kim, J., & Chen, L. Proceedings of IASDR 2009: Design rigor and relevance.

Chapter 3

Product Innovation in SMEs



This chapter takes a closer look at SME's, how they are organized and what drives them. Literature from business on entrepreneurship and product innovation at small businesses was taken as a basis to explore the current state of product innovation, the ways of working, strengths and weaknesses of SME's. This is extended with examples from practice by interviewing owner-managers. This exploration forms a basis to formulate implications for applying UCD in SMEs compared to that of large companies.

3.1 — Introduction

This chapter as well as chapter 4 focuses on the "SME level" of the overview of meta-levels in design research (see Figure 3.1). The subject of this chapter is how product innovation takes place in SMEs. Chapter 4 examines how designers in SME involve users for product innovation.

This chapter starts with discussing the main characteristics, strengths and weaknesses of SMEs (based on literature). Then goes into more detail on specific aspects of SMEs: the role of the owner-manager, the current relation with users, the product innovation process in SMEs and how SMEs try to survive on the market. The gathered information allows one to explore the added value of UCD by answering the following research question:

What characterizes the practices of SMEs as compared to large companies in relation to a user-centered design approach?

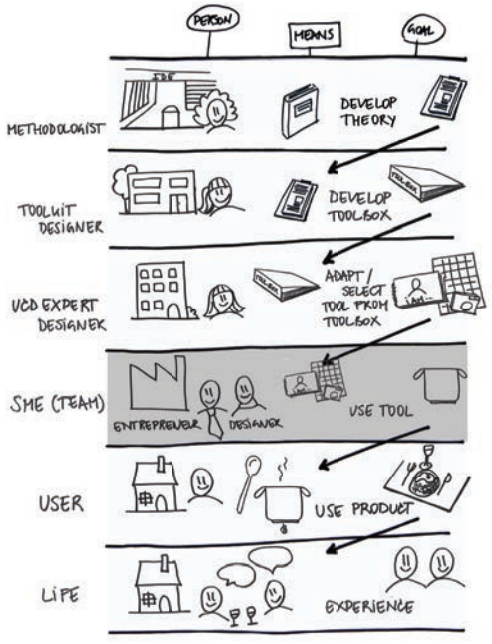


Figure 3.1: Meta level used in this chapter: How product innovation takes place in SMEs.

This research question focuses on unraveling barriers and opportunities for SMEs with regard of the topic under investigation. This construct is regularly used in design research as a means to transform a "How" research question into a "What" question (Kleinsmann, 2006 and van Kuijk, 2010)

As discussed in Chapter 1, product innovation is explored in manufacturing SMEs that are often family-owned and operate in niche markets. To get insight into the practice of being owner-managers at a SME, how they innovate, what moves them, how product innovation takes place and evolves over time, interviews were held and in some cases, longer working-relations (often by mentoring student projects working on an assignment for the SME) were developed.

3.2 — Product innovation in SMEs

SMEs play a major role in the economy. In most industrialized countries, they represent a significant portion of the industry and contribute significantly to job creation and innovative activities (Acs and Audretsch, 1993).

Literature on the role of small businesses in the economy is comprehensive. For instance: small businesses' impact on innovation (Schumpeter, 1934), the effects of government grants awarded to small businesses (Wallsten, 2000), and innovation impact on a small business' value (Lerner, 1994).

Literature on the characteristics of SMEs influencing the SMEs' capabilities for innovation is extensive as well (Nooteboom, 1994; de Jong, 2002 and Laforet and Tann, 2006). Often, as in Brown, 1998, it describes innovation in SMEs either from an economic, an organizational or a project perspective.

This thesis focuses on the organizational characteristics of SMEs affecting their innovation capabilities to explore what barriers and opportunities could influence the use of UCD. Research on the execution of New Product Development (NPD) projects in SMEs comprises the largest part of literature covered. Literature comes from business literature, literature on entrepreneurship, organizational management, innovation management and others and focuses on manufacturing SMEs.

Being a Small to Medium-sized Enterprise

SME's can be classified in terms of core characteristics, weaknesses and strengths. The work of Nooteboom (1987 and extended in 1994) will be used as a basis to elaborate further on the different characteristics of SMEs especially those influencing their innovation capabilities. The companies introduced in Chapter 1, Difrax, Tilcentrum and Gefken, as well as other SMEs share these characteristics. Not all characteristics are present to the same degree. Gefken and Difrax are both family-owned SMEs. While Gefken operates in a B2B niche market, Difrax is an example of an exception competing in a large market with companies like Medela and Philips Avent. Difrax claims they can survive in this market due to their user-centered products. Tilcentrum operates in both B2B and B2C markets. They operate in completely unrelated markets and deal with a different type of users, but the way of working is similar, giving them comparable challenges and objectives. The focus of this research project will be on manufacturing companies of finished products hereby excluding suppliers. Within these manufacturing companies all possible variants of designing the products in-house or out-house exist. The designer (external or internal) has a background in either mechanical engineering or product design. This is also the case for manufacturing the products. For example, Gefken has employees working on both manufacturing and design while Difrax has a design department and outsources manufacturing. Tilcentrum has no internal design or manufacturing; it is the entrepreneur who comes with the ideas and who outsources both design and manufacturing.

Niche markets

Most SMEs commence by serving some kind of niche market (Cawood, 1997). They enter the market as single product or technology-led company without the finance to broaden their product range even if this is strategically desirable (Storey, 1982). With the limited number of users, niche markets are often not interesting for competition. Once that market grows, competition may enter. To defend or increase its market share, the SME has the option of competing on cost or differentiation by superior service or more innovation. In many cases once SMEs realize that competing in cost is no longer viable they are confronted with the challenge of innovation. This challenge forces them to return to their roots and maintain the flexibility to take innovative steps (Cawood, 1997).

Types of SMEs in terms of innovation

SMEs excel in small-scale innovations, making new combinations and making small adjustments to products. Product innovation is risky and with their limited resources SMEs are likely to focus on one kind of product innovation. There seems to be a paradox; on one hand, due to their flexibility, SMEs have the opportunity for more radical innovation, on the other hand, due to limited means and risk-spreading, bankruptcy is close. Only a minority of manufacturing SMEs is willing to take the risk of radical innovation. The majority will make small adjustments to products to keep up with the changing desires and needs of consumers and clients. As a result product innovation in SMEs is more ad-hoc. This can decrease the chances for success (Erie, 2004).

Innovation Management literature often claims that every company has to renew continuously to keep its head above water. Based on their attitude towards product innovation, SMEs can be divided in 5 different groups. Erie (2004) argues this division is across industries among Dutch SMEs:

1. The innovative vanguard: This group pays a lot of attention to innovation, does R&D and delivers new products. New knowledge is developed, either in the company or in collaboration with others. This is the smallest group of all five.
2. Innovative followers: This group innovates by collaborating in knowledge-transfer projects. These SMEs acquire up-to-date knowledge without contributing to this knowledge.
3. The minimal risk takers: This group wants to innovate with minimal risk. These SMEs aim for making adjustments to keep up with new product developments. There is knowledge transfer with proven value. Really new products are not developed in this group.
4. The impulsive Potentials: This group has the potential to innovate, but currently doesn't do so. This group needs impulses of how and what and will then move towards innovation.
5. Maintaining status quo: This group does not innovate and will not do so on the short term. These are companies that are either not able or not willing to innovate. This group is the largest. Erie indicates, based on interviews with branch-organizations that these organizations do not take these companies in consideration for active involvement. They do attempt to inform them of possible opportunities.

A majority of the innovative work is done by the innovative vanguard (Erie, 2004). Difrax and Tilcentrum are examples of SMEs that are part of the innovative vanguard. Gefken is part of the group of impulsive potentials. To illustrate this type of division in groups, here is an example within the niche market of children's seats for bicycles (based on an interview with the owner-manager of YEPP).

> Yepp is a new company in the market of children's seats for bikes. They came to the market with a new concept for a seat. Till then, children's seats had not changed much for decades. The YEPP seat focused on several usability issues parents were dealing with. For example: removing the seat easily from the bike (by adding a mounted removal system on the bike and a handle on top of the seat), protection of the children's legs and enable water to drain from the seat so it stays dry.
>
> The market leader in children's seats (Bobike) responded promptly. In 6 months times they brought out a good competitor product for Yepp's seat. Bobike took several of these issues along for the redesign of their own seat. At the same time they focused on retaining their visual style to preserve their brand identity and recognition.
>
> Yepp was competing in this niche market (and is part innovative vanguard). Bobike responded to the action of Yepp (as a Minimal Risk Taker).

Figure 3.2: The "classic" bike seat from Bobike

Figure 3.3: The attack from YEPP

Figure 3.4: The response of Bobike to YEPP

As the previous example describes, even though Bobike does not innovate proactively, they respond to changes in the market to keep up with new product developments. The group of minimal risk takers, to which Bobike belongs, is quite large (Erie, 2004). They mainly focus on maintaining their business and innovate in peaks (see Figure 3.5). Only when the product stops selling, or for example when the SME decides to enter a new market, they recognize the urge to innovate. From the outside it may give the impression that these SMEs do not belong to any group as depending on the moment in time they have a different product innovation attitude.

Figure 3.5: Innovation activities of SMEs changes over time. This behaviour makes it hard to classify SMEs into categories (based on YEPP example).

A large part of manufacturing SMEs are certainly engaged in innovation (Erie, 2004). It is just not formally registered as such in business operations or implemented in formal product innovation projects. The strategic attention for product innovation is small (compared to that of large companies). SMEs experience their practice as a struggle to survive in their market: maintaining their market share and if possible growing. SMEs do have a potentially large innovation capability (Cawood, 1997).

Innovation capabilities

There is quite some literature where the characteristics influencing SMEs' innovation capabilities are discussed (Nooteboom, 1994; Pavitt, 1991; van de Vrande, 2009). Within the context of this chapter, innovation capabilities are regarded as the ability to integrate key capabilities and resources of the firm to successfully stimulate innovation (Lawson and Samson, 2001)

The '*Small Scale*' character of SMEs is inherent to their limited number of personnel (Davig and Brown, 1992; Gibcus and Van Hoesel, 2004; Nooteboom, 1994) as it is the basis for the classification into SMEs. The lack of variety and specialism has a large impact on the innovation capabilities of SMEs. SMEs have advantages in terms of flexibility and a more effective use of their external networks (for example branch associations and regional entrepreneurial networks) that may compensate for a lack of financial resources (Vossen, 1999). Thanks to their lack of hierarchy and small scale, SMEs have nearly no bureaucracy and a good overview of the innovation activities taking place.

Employees

As most employees are informed or engaged in the product innovation activities and feel responsible about the future of the company, they are motivated to make the SME successful (Erie, 2004). Employees deal with much variation in work as the limited amount of employees does not allow specialist depth. One of the interviewed companies had four employees: the owner, someone responsible for finances, sales and administration, a designer and a warehouseman (manufacturing is out-sourced). There is a division in responsibilities and each employee has several responsibilities. Because of the informal structure and innovative activities (Brouwer and Kleinknecht, 1996; De Jong, 2002) SMEs often struggle with the knowledge within the company being primarily tacit. Employees in SMEs are loyal to their company and work for the same SME for a long period time. Over the years they gather a lot of knowledge, experience and practice creating unique skills. Whenever one of these employees resigns or retires, the knowledge and expertise is lost. The problem of this tacitness comes on top of the problem that in many SMEs there are few functional specialists (Laforet and Tann, 2006).

Communication

In comparison to large companies, SMEs have less bureaucracy and more informal structures, improving trust within the company. Open communication and cooperation among staff supports the innovation processes in small firms (Hausman, 2005; Birchall et al., 1996; Chandler et al., 2000 and Beaver and Prince, 2002). Decision-making is faster and there are fewer filters to eliminate radical novelty (Nooteboom, 1994). In the case of Difrax, the designer and sales manager are often working in the same room to discuss, support each other and stay up to date on one another's work.

With close relations and short communication lines with users and clients, SMEs can obtain (Madrid-Guijarro et al., 2009; Scozzi et al., 2005; Hausman, 2005) quick feedback during the decision making process. The SME is able to act upon their needs and desires in a short timeframe.

The owner-manager of SMEs

SMEs often emerge from an idea of the owner (Bougrain and Haudeville, 2001; Guimarães et al., 1996; Hadjimanolis, 2000). For example, Gefken started as a company making cases for music albums. From this initial idea they moved to a wider scope of making protective and presenting cases. The owner of Tilcentrum started in his garage, making a lifting aid for an acquaintance. These owners-managers are very committed to their company. They are not trained managers, and manage their company based on intuition, emotions and the will to succeed. They feel responsible for their employees, their users and their clients. One of the interviewed owner-managers says:"I need to make sure orders keep on coming in, because I am taking care of all my employees' families". Having a lasting company matters a lot, but is hard to achieve, as the owner-manager tends to focus on one task at the same time vision due to his or her lack of management experience (Ennis, 1999).

(Freel, 2000), Davenport and Bibby (1999) talk about the 'entrepreneurial dynamism', that leaders in small firms can instil in the behaviours of others in the organization. Leadership and vision are valuable in being able to engage employees in innovation (Vermeulen et al. 2005). In addition, Motwani et al. (1999) argue that leaders must demonstrate active strategic commitment to research and technological change. Whatever the resources are of the SME, even if dedicated funds are scanty, there are ways to progress if the commitment of the owner-manager is gained (Cawood, 1997).

Many SMEs are family-owned. Difrax, Tilcentrum and Gefken are all family-owned companies. Being managed by an owner-manager, or being a family-company has other implications compared to SMEs managed by an entrepreneur. These SMEs are not only working hard to survive on the market today, they also keep an eye on the longer term. As these companies are not listed on the stock market, the owner-manager is able to act independently from for example shareholders (Nooteboom, 1994). This enables the owner-manager to balance short and long term activities.

In most cases the owner-manager is at the basis of all new innovation within the SME and makes all decisions. The level of involvement in developing new products, processes and ways of working of the owner-manager is an indication of the level of innovation in the SME (Laforett and Tann, 2006). As the owner-manager takes decisions on all aspects of technical change, they can get overly concerned with the technical aspects of their innovation at the expense of successful commercialisation of the product (Freel, 1998 and Cawood, 1997). With their overview of what goes on in their company they can quickly act upon occurring problems.

In SMEs there is a difference between entrepreneurs and owner-managers. Entrepreneurs are engaged with the company but can be appointed managers with no strong affiliations to the company as owner-managers do. Entrepreneurs tend to have more managerial experience and are often hired for this experience. Most of the companies discussed in this thesis are managed by their owner, to maintain the use of one term, I will use the owner-manager as

reference to that person that manages the SME and is in charge of the decisions on product innovation.

Next to the responsibility for technical aspects of change as well as the attitude of owner-managers towards others in the organization, the owner-manager's attitude towards exploring market opportunities and satisfying user demands is crucial for innovation to occur (Mazzarol and Reboud, 2006). If a key user or client is positive about an innovation idea, the owner-manager of the small enterprise is likely to start developing the new product (Mazzarol and Reboud, 2006). Some small enterprises are reactive and only innovate on users' requests (Millward and Lewis, 2005). Owner-managers tend to focus too much on the product, not investigating to what extent the market needs the product (Laforett and Tann, 2006). An owner-manager often knows how to improve a product but not if it will be viable or if more and different products are desired. Acquiring this information is ultimately the task of the owner-manager (Erie, 2004).

Knowing the users

As SMEs commonly operate in niches and have direct contact with users, they potentially gain valuable impulses in the form of user feedback (Tiwari and Buse, 2007). SMEs' closeness to their users seems to enable better opportunities for market pull innovations (Rothwell and Dodgson, 1994; van de Vrande et al., 2009) and they have close contact with their users' needs (Carson, 1995; Millward and Lewis, 2005). If existing users are targeted, innovation seems to have more chance at being successful in comparison to not looking at users at all (Adams and Walbank, 1983); without support from existing users, innovation often fails (Cannon, 1985). Cooperating and working closely with users and clients during innovation is common in small enterprises (Belotti and Tunälv, 1999; Soderquist and Chanaron, 1997; de Jong and Marsili, 2005). Contact with key users can provide valuable, hard-to-obtain qualitative data about new market conditions (Dallago, 2000; Mosey et al., 2002). SMEs generally do not consider themselves as innovators instead they see innovation as solving users' problems (Johanssen and Christiansen, 2009; van de Vrande et al., 2009).

The feedback of users on their experiences with existing products provides knowledge and validates the direction of the NPD, reducing the risk that resources are invested in erroneous solutions. This continuous and intense feedback provides fast and accurate marketing information direct from the targeted users (Dallago, 2000; Mosey et al., 2002; Nooteboom, 1994) in an economic and flexible way (Zontanos and Anderson, 2004). Existing users that are supporter of the SME are potentially the first buyer of the new product, providing fast, trustworthy and accurate feedback, further decreasing risk and uncertainty. Such feedback fits well with the flexible, search-oriented, dynamic and iterative innovation processes present in small enterprises (Larsson, 2001; Lynn et al., 1996). Close relations with existing users enables SMEs to work in the following order during their innovation processes (Lynn et al. 1996):

1. Identify existing users who want or need a potential new product based on an innovative idea
2. Get support from them
3. Execute NPD in close interaction and communication with these users
4. Sell the new product to these users.
5. Sell the new product to other users.

Moultrie et al. (2005) observe that some literature claims that relations with users are very good in SMEs while others claim the exact opposite. This discrepancy is due to the large number of SMEs and the wide diversity of companies being defined as SMEs. The level of user involvement is nuanced and is not the same for all SMEs. There are large differences between the companies. To illustrate this, here are examples of some of the interviewed owner-managers of SMEs:

> Difrax and Tilcentrum actively invite users to give input and work alongside developing new products. They make use of their personal and professional network to invite users.
>
> **Tilcentrum** provides training for nurses to their lifting aids. This way, Tilcentrum has the opportunity to get input from the nurses. Apart from this, the owner-manager of Tilcentrum has good relations with his clients. On the other hand, they lack input from stakeholders like municipalities and health insurances. These stakeholders have a large 'stake' in the acquisition of their products.
>
> **Difrax** takes the involvement one step further, they employ part-time several stakeholders: a dietician, a paediatrician, a maternity nurse and a children's physiotherapist.
> De Jong Duke (manufacturer of coffee machines for offices) does not involve users, they consider their own employees as users (as they too drink coffee) and test new prototypes with their own employees. Still they have good relations with their clients, suppliers and wholesalers.
>
> **Eijffinger** makes wallpaper and fabrics for interior decoration. They argue that users only know what is fashionable and interesting at the moment while their collections need to be prepared for a longer time in advance. For this reason they consult for example interior design experts and trend watchers. Yet, in an interview, they gave the following example: "We are currently selling our products in Asia, and we noticed that we sell certain products very well, but we have no idea why." When asked about getting to know the market and what makes this market different from their home market, they started to see opportunities by involving Asian users. In their case, involving users does not serve primarily for developing new products, rather to get to know new markets.
>
> **Gefken** knows their clients very well; their company is built on custom-made flight cases. Gefken focuses on "Your wish is our command". They do not proactively look for opportunities to be ahead of their clients' needs. Gefken lacks knowledge of the users of their cases.

These examples give an idea of the considerations of SMEs on their users and clients. There is a large variety to which degree clients and/or users are involved. The examples suggest there is a difference between B2B SMEs (where clients are often well known and the user is not) and B2C SMEs (where there is more focus on the user).

Moultrie et al. (2005) developed a design audit tool for SMEs to explore how design and involving users is integrated in the practice of SMEs. Moultrie uses the gathered insights to discuss segmentation of SMEs and creates a classification of SMEs based on their use of design (Table 3.1). Moultrie et al. observe that there is, in general, insufficient or little user involvement. Closely related with underperformance in marketing activities was the general reluctance to actively involve users (or clients) in product creation. "Efforts to really understand the motivations of users were often half-hearted, and used as justification for decisions already made. Several companies expressed reservations about involving users to assess original concepts due to concerns about intellectual property and commercial confidence. This fear was often not justified as rapid competitive response was in most cases unlikely and the benefits of user feedback far outweighed any potential risks." Moultrie et al. (2005).

Even though SMEs are often considered to have a lot and close user contacts, in practice this is limited to half-hearted attempts or is reserved to the few companies that make products where user feedback has substantial influence and is of considerable importance (Difrax and Tilcentrum). Often, only companies that are part of the "innovative vanguard" group have taken steps towards active involvement of their users.

Level 1:	Level 2:	Level 3:	Level 4:
No obvious market segmentation – What is market segmentation? – No clearly defined market segments – Not sure who buys our products or why	Price based segmentation – Segmentation based on price: 'top end', 'middle' and 'entry level'. – Some overlap in products – No accurate data on market size and share	Performance based segmentation – Segmentation based on product functionality or performance – Clear understanding of the profiles of users in different segments – Understand the competitors in each segment	Benefits based segmentation – Segmentation based on the benefits offered to different types of users – Deep understanding of user needs in each segment – Reliable data on each segment

Table 3.1: Classification of SMEs: how much does the SME know about their market and their users? (Moultrie et al. 2005)

Even though SMEs are often considered to have a lot and close user contacts, in practice this is limited to small try-outs or is reserved to the few companies that make products where user feedback has substantial influence and is of considerable importance (Difrax and Tilcentrum). Often, only companies that are part of the "innovative vanguard" group have taken steps towards active involvement of their users. In literature there is back and forth regarding the actual relation of SMEs with their users. In some sources, they speak of SMEs being well-connected, and having close relations with their users (Carson, 1995; Millward and Lewis, 2005, Belotti and Tunälv, 1999; Soderquist and Chanaron, 1997 and de Jong and Marsili, 2005.) But at the same time, other sources speak of SMEs being internally oriented and lacking know how of what actually goes on in their market (Moultrie et al., 2005). The entrepreneurs that were interviewed give a more nuanced perspective: with some key-users or clients they tend to have close relations, but these few good contacts do not make up for knowing their entire market well. In many cases such as in the example of Tilcentrum discussed in Chapter 1, Tilcentrum knows the head of the hospital, as well as some nurses through the training they facilitate as well as some users that approach Tilcentrum for specific questions. Tilcentrum does not have a general view of its primary users (the people being lifted) or other direct stakeholders such as the technical staff.

The process of product innovation in SMEs

Product innovation is the most significant factor that can be used by smaller enterprises to compensate for any disadvantages caused by their small size (O'Dwyer et al., 2009). Mosey (2005) suggests that SMEs, by repeatedly introducing innovative new products, open up new market niches, that are essential to their survival. This opening up of new market niches takes place by delivering new products in areas where scale effects are not yet in force or/and in niche markets with customized products, where scale efforts do not apply. Innovation in SMEs is more likely to be more effective downstream from fundamental, science-based technologies. Or in different words perhaps, small business is probably better in application, in development and in introduction to the market (Nooteboom, 1994).

SMEs innovate, but they do not necessarily follow a traditional technology or a R&D-focused strategy (Acs and Audretsch, 1988). Inherent to their nature, innovation in small enterprises is rarely strategic (Belotti and Tunälv, 1999). Mazzarol and Reboud (2006) state that small enterprises do not use systematic and formal approaches to choose which innovation ideas to realise. To the contrary, innovation processes in small enterprises are informal and weakly structured (Hadjimanolis, 2000; Johanssen and Christiansen, 2009; Lindman, 2002; Mazzarol et al., 2010; Subrahmanya, 2005). SMEs may carry out their R&D activities 'without a formal R&D department or a formal budget and often even outside regular working hours' (Kleinknecht, 1989, p. 216). As R&D activities take place informally, a clear overview of how much time spent on R&D per product innovation project is hard to provide. Different sources of literature (Moultrie et al. 2007; Bougrain and Haudeville, 2002) and interviews with SMEs indicate this can take from just two weeks (like for example in the case of Gefken) up to six months (for example in the case of Tilcentrum), and in very rare cases up to a year or longer (occasionally with Difrax). SMEs often conduct ad-hoc R&D or have no dedicated R&D staff, using resources from different departments of the firm. Finally, a different management structure (Rothwell, 1989) and a less bureaucratic environment

(Link and Bozeman, 1991) allow a higher responsiveness to innovative opportunities by small firms and new entrants into the industry, through activities that are not at all related to accounted-for formal R&D expenditures.

Motivations for innovation

Small enterprises use a variety of internal and external sources of innovation ideas (Barañano et al., 2005; Hartman et al., 1994). The most important sources of information for innovation are their key users, clients, suppliers and competitors (Bierly and Daly, 2007; Dankbaar, 1998; Hartman et al., 1994; Macdonald et al., 2007; Hyvärinen, 1990; Brouwer and Kleinknecht, 1996; Roper, 1997; Appiah-Adu and Singh, 1998; Oerlemans et al., 1998). In particular, a strong user orientation appears to be closely linked to the success of small firms in developing innovative products and services (Appiah-Adu and Singh, 1998). Employees are also mentioned as an important source of innovation ideas by Johanssen and Christiansen (2009). Innovation in SMEs is considered to be a collaborative effort that needs the 'involvement of frontline employees'. Those who are in sales and service delivery have the best view on unsatisfied needs of users and new initiatives of competitors (Hyvärinen, 1990; Martin and Horne, 1995). Frontline employees can be involved and empowered to occupy themselves with innovative behaviour (Davenport and Bibby, 1999). Of lesser importance are trade associations, consultants, universities and government (Macdonald et al., 2007).

Löfqvist (2012) distinguishes four motivations for SMEs to realise innovation ideas into new products. These are:

1. Client finances the NPD project
2. Threats against the business (the risk of losing clients)
3. A specific client or user request for a new product
4. A strong and clearly defined client problem or need.

These motivations are externally oriented, towards existing users, clients and the market, whereas the other factors, which have a less decisive influence, are more internal. The internally oriented factors are related to whether an innovation idea was possible to realize but were not decisive for its realisation.

Innovation in SMEs starts differently compared to large organizations. Large organizations plan innovation, make use of strategy and do trend analysis to decide on the projects to start. SMEs often react upon external and internal impulses. These impulses can take different shapes and often have to do with sudden urgencies. Sales might have dropped, a patent has expired, a law changes, the company starts exporting to new countries and many others. All of these urgencies make the company aware of changes that affect their daily business. Once they realize action needs to be taken they start looking for ways to tackle their problem. With their small size and flexibility SMEs have a relative freedom to act upon impulses in the market. The following examples from interviews illustrate a variety of impulses that make SMEs decide to start developing new products:

Loeff's Patent is an SME that makes archiving solutions from cardboard for companies. They produce three different systems depending on the size of the archive. The company is built on a patent from Mr. Loeff. One year ago this patent expired. The company realised that in order to maintain market share, they had to develop new products.

Schilte is an SME that makes school and day-care furniture. Recently Dutch law changed in favour of schools, day-cares and local art and music academies to share locations. As a result of this law more and more different types of schools are grouped into one large building. Schilte realized that these kinds of schools have different needs for furniture, creating new opportunities for product development.

Eijffinger realized, when exporting to the Asian market, that this created different requirements for their products. They decided to further investigate this market and possibly develop new offers for the Asian market.

Acklin (2012) proposes an Innovation Management model for SMEs (Figure 3.6), starting with these impulses. The entire model is based on different stages of the innovation process where internal and external actions take place stressing the balance necessary for innovation in SMEs inherent to their nature.

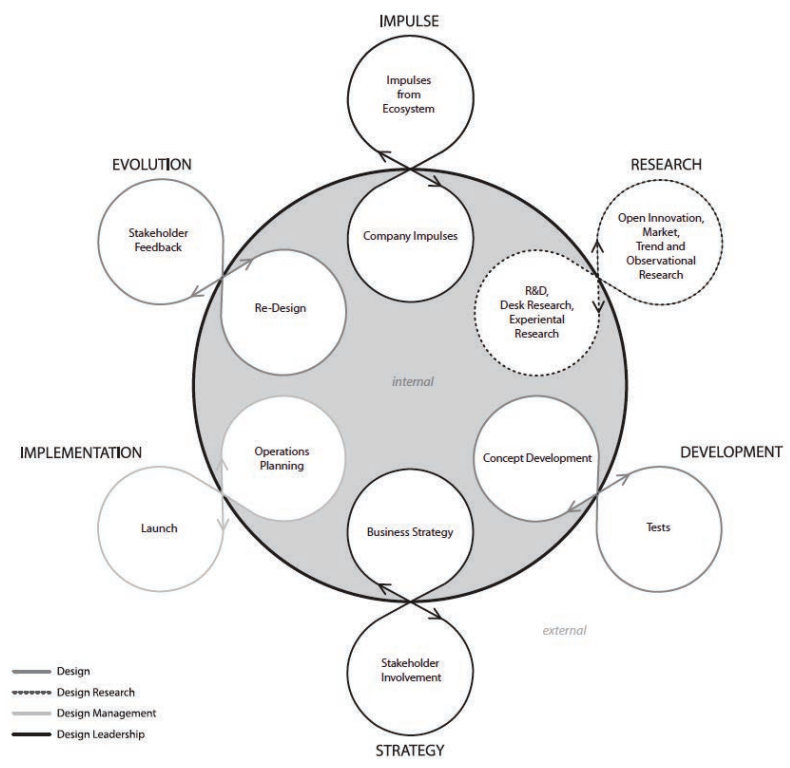


Figure 3.6: Innovation Management model of SMEs (Acklin, 2010).

The model of Acklin is based on the management of design in general for SMEs, and provides insight into what aspects and phases generally take place.

Based on the interviews with entrepreneurs I would argue that design management or innovation in general never takes place this structured in SMEs, it is very adhoc, and depending on the present situation in the SME. The model does not depict any sense of time, as urgency arises the entrepreneurs mention, projects can be put on hold and as easily continued several days, weeks or months later. This timing is very much depending on the available resources. The entrepreneurs do confirm the impulse-based process. Many of their decisions are based on internal or external impulses guiding entrepreneurs in terms of innovation.

Barriers for product innovation

Although SMEs have several advantages for performing innovation, Tiwari & Buse (2007) and Madrid-Guijarro et al (2009) identified from a large body of international studies several major barriers in innovation for SMEs. Some of these barriers are:

- Financial bottlenecks:
  As SMEs have limited finances and can only tackle a few product innovation projects simultaneously (in comparison to large companies), they are struggling to determine in which projects to invest. Many product innovation projects can be started, as they only require little investment (only working hours of staff to develop a concept for a new product idea). As soon as one of these projects needs further investments (for example buy production capacity and materials) a larger barrier needs to be crossed as financial resources need to be assigned. This is one of the major decision-making moments within product innovation in SMEs.

- Limited internal know-how to manage the innovation process effectively and efficiently: As mentioned earlier, managing product innovation is the responsibility of the owner-manager. As this manager often lacks training in management, managing the internal innovation process effectively and efficiently is difficult (Adams, 1982; Bosworth and Jacobs, 1989; ACOST, 1990 and Moore, 1995).

- Perceive no need to innovate:
  SMEs act primarily on impulses (either internal or external) for product innovation. When the SME does not get an impulse, does not recognize an impulse or as long sales are doing well they will perceive no need to innovate. As an example, Markant is a SME producing office furniture. To increase sales, they recently moved to a new showroom. Currently they perceive no need to innovate as they say: "We are still increasing our sales every year, so why should we invest in getting to know our users better for product innovation?"

- Missing market know-how:
  SMEs lack the knowledge to meet user's needs and to enter foreign markets (Freel, 1999). As in the earlier discussed example of Eijffinger, they recently entered the Asian markets and ran into surprises due to lack of knowledge of the market.

- Weak external contacts:
  SMEs are very internally oriented (Srinivasan et al. 2002) and have weak external contacts. Literature suggests that the more innovative a company is the more external contacts it has. In the words of an owner-manager interviewed by Massa and Testa (2008): ''We don't need an external actor to promote technology transfer: if the entrepreneur is smart he is able to use stimuli from suppliers, users and consultants. Interacting with an external party … is time consuming! And for an entrepreneur time is the most valuable resource.''
- Lack of skilled labour:
  SMEs have a limited amount of employees and are focused on the primary goal of manufacturing. For this reason, SMEs perceive technical skills to be of primary importance to increase their innovative activity, respectively followed by marketing, managerial, financial and exporting skills. There does not appear to be, what Green and Ashton (1992) refer to as, an external "skills shortage", rather, at least in the minds of small firms, an internal "skills gap" (Freel, 1999).

Being successful at product innovation in SMEs

Barriers for product innovation are well documented in literature. Less is known about the specific opportunities of SMEs regarding product innovation. Different factors determine whether a SME is successful at innovating or not. Successful companies have a clear sense of mission and purpose and a strong commitment to innovation as well as an owner-manager that is strongly committed to the company and to innovation (Pavitt, 1991; Heunks, 1998 and Laforett and Tann, 2006).

Many of the factors influencing the success of innovation come down to the ambitions and the attitude of the company towards innovation. A positive attitude correlates with a continuous attention for innovation opportunities and provides employees with support for innovative behaviour. This, in turn, strongly affects the decision to innovate and the way innovation is carried out in SMEs (Kim et al., 1993; Hoffman et al., 1998; Hadjimanolis, 2000). Next to the importance of attitude towards innovation, market anticipation and user focus drive innovation in SMEs (Laforet and Tann, 2006).
Table 3.2 summarizes the previously described characteristics and the related strengths and weaknesses.

Characteristics of SMEs	Strengths	Weaknesses
Being an SME:		
Innovation capabilities: - Few hierarchical levels	Little bureaucracy Internal flexibility	Lack of structure in undertaking product innovation
Employees: - Integration of tasks in worker - Much variation and improvisation in work - No staff functionaries - Long employment at company	Motivated management, commitment	No dedicated staff or specialisation possible Technical myopia Vulnerability for discontinuity Loss of knowledge if employees leave the company
Communication: - Short communication lines - Tacitness of knowledge - Few and simple procedures	Little filtering of proposals Fast decision making	
Owner manager/entrepreneur: - Intertwined ownership and management - Much authority and many functions in one hand	Motivated staff Dedicated to company	Ad hoc management
Knowing the user: - Direct contact and close relations	Users provides feedback for NPD	Limited view on user
Product innovation: - Limited resources - Limited products and markets - Small production volume - Project structure	Easy to start new project, react upon the market	Possible lack of finance Lack of means for growth Little spread of risk

Table 3.2: An overview of characteristics, strengths and weaknesses of SMEs (based on Nooteboom, 1994 with added findings from the literature review)..

3.3 — UCD in SMEs compared to UCD in large companies

The previous overview of product innovation in SMEs provides insight in how SMEs are organized and what drives them. The literature from Innovation Management is primarily focused on unraveling success-factors for innovation in SMEs, because of the undertaken research approach, many of the strengths of SMEs are overlooked and detail into the actual practice of SMEs is missing presenting a biased perspective. The examples of the SMEs based on the interviews with entrepreneurs do shed some light in this respect. For example, where literature argues: "an owner-manager can completely block out all initiative for innovation" can be regarded as "Only one person needs to embrace innovation, whereas large companies need a more complex process to achieve consensus."

The interviews with the entrepreneurs indicate there is a large group of SMEs that has high potential for product innovation but does not fully use this potential. This thesis will focus on enabling two groups of SMEs to apply UCD: the innovative vanguard that already focuses on product innovation and is willing to learn something new, and those SMEs not making use of their full potential and who need an impulse to act ("the "innovative followers" and the "Impulsive potentials").

How UCD takes place in large companies is extensively covered in literature as UCD, over the past decades, is developed at large companies and investigated in this context by academia. How UCD takes place in SMEs is rather unknown.

Rothwell (1985 and 1989) provides an overview of the main differences between large and small businesses: SMEs tends to be strong in efficient, final and exemplary causes (labour, entrepreneurship, motivation, flexibility, design, ideas) (Dutta and Evrard, 1999), and large business in material, formal and conditional causes (resources, knowledge, science, method, control of external conditions). Typically, the basic technology and opportunity arise in a large firm, but product/market opportunities are first taken by SMEs (Nooteboom, 1994). Despite their disadvantages, most often attributed to resource constraints (Freel, 2000), SMEs are somehow forced to utilize product innovations as a means of competitive strategy to a higher degree than large firms (Fritz, 1989). Our inclination to think that SMEs must be always and in all things either better or worse than large business may be a naturalistic bias inculcated by some intuition that causality has only one dimension. This points to a possible complementarity of small and large business: they are good at different things and in different ways, in different stages or aspects of innovation.

An overview of the characteristics of both types of companies in relation to product innovation can be found in Table 3.3. This overview provides a basis for further elaboration on the application of UCD in SMEs.

3.4 — Implications for UCD in SMEs

One of the main outcomes of this exploration of the current state is a different perception of SMEs. When it comes to SMEs, the largest issue is often neither time nor budget but rather ability and focus. What existing literature often overlooks are the specific strengths of SMEs, their flexibility, their short communication lines, their flat organizational structure reducing necessary communication and more support from management, and the engaged owner-manager. SMEs are not limited in product innovation; it differs from large companies and can have high potential once these differences are taken into account.

Considerations based on the current product innovation practice in SMEs regarding UCD:

The first phases of product innovation projects are not always easy to distinguish. The start of a project is in many cases implicit, in the head of the owner-manager. Vision and idea are often intertwined. The start of a project can have different causes: a vision, an encountered problem or an idea. Because of this there if no clear focus or question to start from. This has implications for the use of UCD methods as they are often built on well-defined questions dealing with for example (in the case of Tilcentrum): "How do obese patients experience being lifted? Or: How can lifting be improved while manoeuvring in aisles?"

Product innovation projects are often put on hold when money has to be invested. The timing of the moment of investment depends on the in-house capacity of the SME. For some SMEs, not employing designers, this moment already occurs in the ideation phase. For others it occurs at the end of the development phase when the production is initiated.

In SMEs product innovation takes place at different levels: marketing, sales, design and production. Users can be involved at those different levels (for example not only providing input for product innovation but also for marketing and sales) and bring results applicable on both short (for the specific project) and longer term (broader company).

Currently SMEs are often not aware that they lack knowledge on a group of potentially interesting stakeholders. UCD offers an opportunity to address these stakeholders by raising awareness and by providing an approach to act upon it.

Different preconceptions exist with regard to what a UCD approach for SMEs should look like. These are all primarily based on our perspective on large companies. The previously mentioned strengths and weaknesses (table 3.3) are discussed with regard what these imply for a UCD approach in SMEs:

Product innovation in SMEs	Product innovation in large companies	Implications for a UCD approach in SMEs
Being an SME:		
Characteristics due to size: - Few hierarchical levels - Flexible organization capacities - No bureaucracy - Good overview of innovation activities	- Many hierarchical levels - Rigid organizational structure - Variety of innovation activities at the same time	Different employees can be involved amongst all levels and functions of the company. SMEs have a flexible structure, UCD methods should facilitate flexible use.
Employees: - Integration of tasks in worker - Much variation and improvisation in work - No staff functionaries - Long work life at company	- Dedicated staff for product innovation and user research, often organized in departments.	No dedicated staff for user involvement. UCD methods need a low threshold for use (skill and knowledge).
Communication: - Low degree of formalization - Short communication lines - Tacitness of knowledge - Few and simple procedures	- High degree of formalization - Bureaucratic rigidity - Communication suffers from size, silo's in the organization and formalization	No need for formal reports and presentation to exchange information of user insights. Priority is not in communication rather in utilization of results.
Owner manager/entrepreneur: - Intertwined ownership and management - Owner-managers focus on product overlooking exploration of market - Not trained as managers, manage based on intuition and will to do well - Much authority and many functions in one hand	- Delegated management control between board of directors and shareholders - Management has experience and training	The owner-manager is necessary in involving users and starting a product innovation project.
Knowing the user: - Strong local/regional focus and user needs orientation - Close relations - Short communication lines - Able to act in short time span upon needs and desires	- Strong (inter)national focus and looser ties with users - Dispersed contact with users	SMEs can make use of their existing contacts with users for product innovation.
Product innovation: - Limited resources - Few products and few markets - Small volume of production - Project structure - Focus on maintaining existing business, innovation when possible oriented towards longer term - Innovation is rarely strategic - No systemic and formal approaches - Projects take from two weeks up to six months, on rare occasions longer. - React on internal and external impulses - Need for involvement of frontline employees	- Resources can be spread over number of projects - Large market with large production volumes - Focus on mid to long term. Often driven by shareholders and public opinion. - Economy of scale, resource abundance - Product innovation is organized and planned - Part of vision and strategy of the company - Structured into fixed processes	SMEs lack the resources for large-scale projects. Therefore UCD methods need to fit the short timespan available and little budget. UCD methods are used ad hoc with little time for preparation and need a large degree of flexibility. SMEs start new product innovation projects based on impulses, awareness is needed that these impulses can be addressed using UCD methods.

Table 3.3: Overview of differences between SMEs and Large Enterprises based on Bos-Brouwers (2009) with the added implications for UCD.

Consequences for a UCD approach for SMEs based on their weaknesses:

- An owner-manager with different interests can completely block all UCD initiative. **Without the support of the owner-manager, UCD will not take place in SMEs**. A UCD approach needs to include the owner-managers, this will enable the UCD approach to fit the SME and reduce the need for consensus as is the case in large companies.
- SMEs have none or a few dedicated designers. These designers are often responsible for the entire design process including detailing their designs for production. As there are no dedicated user researchers, the level of knowledge on UCD methods and tools is expected to be basic in comparison to the entire departments on user research at large companies. For the same reason applying **UCD needs to have a low user threshold and expertise level.**
- **Innovation in small enterprises is rarely strategic.** SMEs do not use systematic and formal approaches to choose which innovation ideas to realise. Innovation processes are informal and weakly structured. This is in contrast with the current use of many UCD tools and methods as they rely on structure and often have a specific place in the design process which is necessary in large companies to be able to deal with them. SMEs require a different approach for UCD as they have a different approach for innovation.
- Doing **user research is no separate phase** within the design process and certainly not a required deliverable in a stage-gate process as it is the case in large more formally structured companies like for example Philips. A UCD approach for SME therefore will take place throughout the design process of new products, this implies a different use of UCD methods.
- SMEs work in projects with a short timespan that they tackle using a great deal of flexibility. UCD in SMEs therefore is limited to short spurs on a repeated basis originating from a specific need at a given moment in the design process. **UCD will need to be flexible, usable in a short amount of time and more ad-hoc building on the impulse-driven nature of SMEs.**
- SMEs have limited resources hence limited resources for UCD. Extensive studies with large amounts of users taking place internationally are simply not possible.

Consequences for UCD of strengths of SMEs:

- **An engaged owner-manager** makes sure anything is possible. For instance extending deadlines and assigning the resources necessary to explore the potential of UCD. This owner-manager is often able and willing to be directly informed/involved on what the users want. He is the main enabler at SMEs to include users in the design process.
- Due to the flexible and flat type of structure of SMEs, **communication often takes place informally**. In many large companies great effort is spend to communicate the results of user research to the design department, the marketing department and other internal stakeholders. SMEs have a big advantage in this respect, as the person who has contact with the users in many cases is the designer and the communication lines to the marketing and sales representative and the owner-manager are short. It enables designers to act quickly and focus on the design rather than reporting.
- With **close relations and short communication lines** with users and clients, the SME can obtain quick feedback and is able to act upon their needs and desires within a short timeframe as they can easily start new projects.
- SMEs have employees that deal with a large variety of responsibilities. **Different employees of the organization can be involved** in UCD at all levels and functions.

This chapter presented considerations regarding UCD in SMEs with respect to their product innovation activities. Several consequences based on strengths and weaknesses with regard to UCD as an approach for SMEs and are formulated based on the literature review and illustrated by examples from practice. The next chapter looks at the current state of UCD tools and methods in SMEs.

For Academics:
SMEs and large companies are different regarding product innovation and involving users. SMEs are not only about barriers and difficulties in product innovation like limited resources. They also have opportunities such as dedicated owners, flexibility and involving employees across the organization.

For SMEs:
Examples of how SMEs deal with product innovation and involving users.

For Students:
Examples of how SMEs deal with product innovation and involving users. Realise that SMEs are different and therefore have different requirements.

This chapter is based on the following publications:

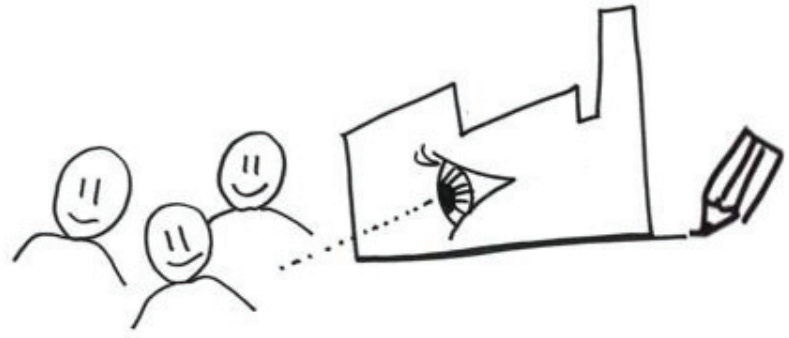
De Lille, C, Stappers, P.J., & van der Lugt, R (2009) Searching for user involvement in SME design practice. In: Lee, K., Kim, J., & Chen, L. Proceedings of IASDR 2009: Design rigor and relevance.

De Lille, C.S.H. (2009) Gebruikers betrekken tijdens een kort ontwerptraject. Tijdschrift voor Ergonomie, p24-30 2009-4.

De Lille, C., Buur, J. (2010). Participatory Innovation in SMEs. Workshop presented at the Participatory Design Conference 2010, Sydney, Australia.

Chapter 4

UCD skills of designers working in or for SMEs



Based on the overview of the characteristics of SMEs presented in the previous chapter, the implications for UCD methods and tools are formulated. This chapter explores the current state of UCD in SMEs through interviews, generative assignments and workshops with designers. This analysis of the current state leads to an exploration of design-led UCD methods for designers working in or for SMEs. The application of these methods in practice will be further discussed in Chapter 5.

4.1 — Introduction

Academia, some large companies and specialist design firms are ahead in the shift towards User-Centered design innovations in the fuzzy front end. They are the pioneers of the User-Centered design movement, starting about 20 years ago (Sanders, 2005). Examples of these large companies are primarily companies in digital products instead of product design such as Microsoft, Intel, Apple, IBM, and Philips. Examples of the leading design firms specialized in User-Centered design are IDEO, SonicRim, Maya, and Adaptive Path. They are supporting other companies in various tasks ranging from applied ethnography to engineering or the entire design process. They are extensively developing methods and communication tools to perform User-Centered processes, where research and design are increasingly integrated. Academia plays a major role in developing new User-Centered methods. In Europe, academic practitioners often collaborate with industry to gain knowledge about improving the User-Centered design process (Sanders, 2005). These developments usually take place in collaboration with large companies. By this collaboration there are more and more diverse methods available for the

industry.
Even though there are many UCD methods to choose from, Cardoso (2005) and Goodman-Deane (2008) argue that many methods have a mixed and limited acceptance in design practice. Some methods are still underused and difficult to understand by development teams and organizations (Seffah, 2004), and not yet widely adopted or are only required in specialised circumstances. The many case studies in literature and handbooks on User-centered design suggest that the use of emerging methods to generate user information is common practice.

These authors address application in academia or in leading large companies but do not cover 99% of the other product development companies in Europe: Small to Medium-sized Enterprises. Some literature suggests rather the opposite. Several authors in research address the urgent need for designers at SMEs to make direct contact with users (Kujala, 2003; Zahay et al., 2004; Wakeford, 2004; Porter and Porter, 1999; Fulton Suri and Marsh, 2000). User research in the fuzzy front end is often restricted by the limited skills and budget of SMEs. For example, designers find it difficult to dedicate time to conduct additional user research. They fear that they might 'lose out' when spending extra time and money on user research. Designers are under pressure to generate concepts and to respond rapidly to design briefs (Bruseberg and McDonagh, 2002).

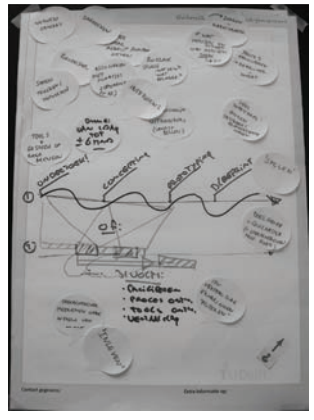
The current use of UCD methods in SMEs and resulting issues is analysed in section 4.3. This section highlights what needs to be taken into account when using UCD methods in SMEs. This discussion of the present state is a stepping stone for section 4.4 where a closer look is taken at newer and unfamiliar UCD tools and methods as designers show great interest in using these methods in their practice. Based on this discussion four UCD methods are suggested for further exploration.

This chapter focuses on the current status of applying UCD in SMEs. The research questions addressed are:

1. What UCD tools and methods do SMEs currently use in product innovation activities?
2. What are the barriers and opportunities for applying UCD tools and methods in SMEs?

4.2 — Method

Design agencies are the front-runners of innovation enablement (Design Council UK, 2011). They support other organizations in product innovation. In the context of this research project, design agencies play an important role, as they are in many cases the ones being hired by SMEs to take care of the design of new products, providing a new perspective on their current business. Also, to get a general idea of UCD in SMEs, I conducted ten semi-structured interviews at Dutch leading design agencies that involve users in their design process on a regular basis. These design agencies were contacted through my network and with the help of the Dutch Design Association (BNO, Beroepsorganisatie Nederlandse Ontwerpers). By interviewing these designers, I attempted to get an idea of 'what could be'. The interviewd design agencies already had prior experience tackling various challenges when applying UCD methods for SMEs. By involving them first, I wanted to formulate recommendations for designers working in SMEs. During the interviews, the designers made a 'poster' as a basis to show what UCD means to them in their daily practice (see Figure 4.1 for some examples). As a starting point thy drew the design process of one of their projects and explained their corresponding involvement with users.



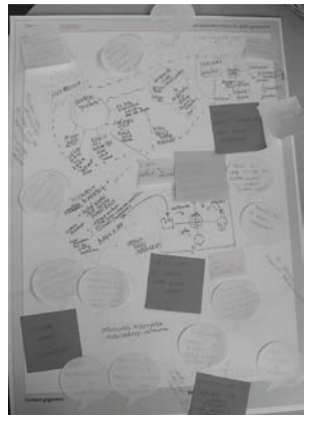
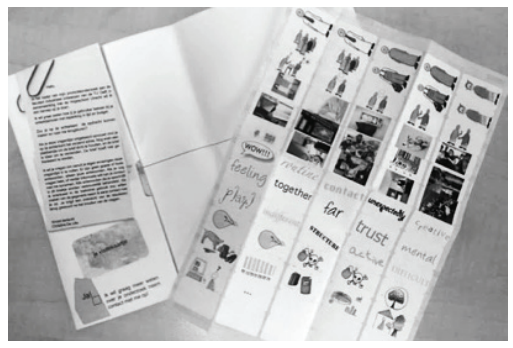


Fig. 4.1: The posters generated during the interviews with designers at design agencies. Each poster seems completely different at first sight, but they each use a similar design process and methods during the process.

To support the insights gathered during these interviews and get a more general overview of UCD in design agencies working for SMEs, generative assignments (Figure 4.2 and 4.3) were sent to 100 members of the Dutch association of designers (BNO, Beroepsorganisatie Nederlandse Ontwerpers). The selected design agencies represent the general population of design agencies in the Netherlands: from single-employed agencies (which consists of about 95% of all agencies) up to agencies with 80 employees. The design agencies are all specialized in product design, but this can range from packaging, medical products to industrial products. The generative assignments that were send to the selected were based on generative techniques to make them tell their story within a set scope (Sanders, 1999). A selection was made based on the BNO member database to include a wide variety of product design agencies (employees from 1 up to 100).



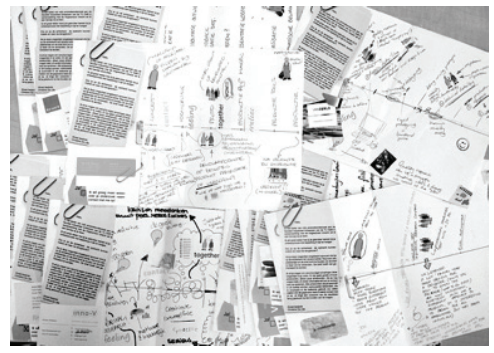


Fig. 4.2 (left): The materials sent to the designers: instruction on the side of the template and a set of stickers.

Fig. 4.3 (right): The 18 assignments that were received. A wide variety of using the provided means with very different visual languages.

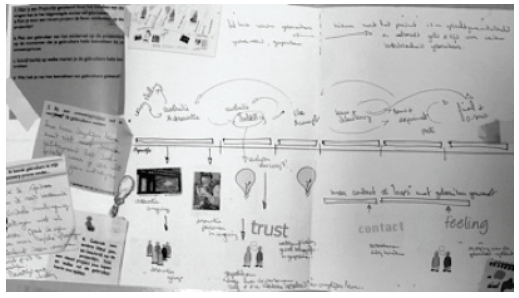


Figure 4.4: Two visually very different generative assignments but telling a similar story, using the same design phases and methods.

18 out of the 100 generative assignments (coming from independent designers up to large design agencies, see Figure 4.4 for two examples) were returned providing a base for an overall view of the current state of UCD. The assignments had several aspects providing interesting insights:

- mapping out the current design process for one of their existing projects
- elaborate on the type of information they want to obtain from users,
- clarify what UCD methods are used and when during the design process
- what their ideal UCD process would look like

The input gained from the assignment varies comprehensively and shows a broad spectrum of concerns.

Based on this exploration, I organized and facilitated three workshops to gather more in depth knowledge of the current application of UCD by designers and the barriers they face. A total of 29 different designers working in and for SMEs were involved. These designers had professional experience in designing ranging from 3 years up to 23 years. Some of the designers came from the design agencies returning the generative assignments, they had indicated they were interested in having more in-depth discussions on the topic. Each of these workshops had a different subject.

1. General perspective on UCD. How do designers deal with users? (5 participants)
2. Mapping the use of UCD methods and tools. What aspects of working with UCD still challenge them? (11 participants)
3. How do the designers make use of UCD in the time and budget driven context of SMEs (flexible, ad-hoc, in short time spans)? (13 participants)

Each of the workshops was videotaped and transcribed. I analyzed the transcripts using paraphrasing to make the interpretation explicit and thematic categorizing. This approach borrows from grounded theory and is also similar to that of category building and affinity sorting. It is a common method of analysis when using design-led methods where designers look for surprising news about users and enable users to be the experts of their experiences. In a similar way I let the designers be the experts of their experiences related to the use of UCD methods. My analysis is based on letting the data be leading in categorizing using the following questions posed to the participants:

- How and when do SMEs start using UCD?
- What UCD methods are currently used?
- How and when are the UCD methods currently used?
- What kind of barriers do the designers encounter when using UCD methods?
- How does the desired UCD process of designers in SMEs look like?

4.3 — Exploring current use of UCD methods and tools in SMEs

The previously mentioned research questions were the starting point for exploring the current state of UCD in SMEs. During the execution of the interviews and workshops, others emerged from the designers:

- Where and how do you recruit users to be involved during the design process?
- Where to find, information on UCD and what sources of information do designers use?

These questions illustrate the kind of challenges they are facing. These subjects will also be addressed in the following paragraphs.

4.3.1. — Starting with UCD in SMEs

As discussed earlier in Chapter 3, SMEs originate from an idea of the owner-manager. As time goes by and the company grows, the needs, context and type of users may change. De Jong and von Hippel (2008) mention the use of lead- user innovation within SMEs. Many SMEs start from a lead-user idea, or have good contacts with some of the lead-users for their products. Gefken for example, started by producing cases for vinyl records and became market leader. Now they broadened into multi-purpose cases (presentation, transportation and others). They have indirect contact with their users through their clients, but lack a deeper understanding of their target audience. Over time, the contact with the initial users might dissolve or change focus. Usually it is either up to the owner-manager or a designer to take the initiative to know more about the users (Mazzarol and Reboud, 2006). The interviewed designers from the agencies indicate this can have different reasons. For instance, the company is looking for new opportunities or new markets or is making losses. They claim that realising there are opportunities and value in investing in user contact is a first step in designing a new product. The second step is taking action. How to proceed remains difficult. Even in a small organisation other employees might need to be persuaded of the necessity.

Because of misunderstanding and bad experiences, designers and owner-managers are hesitant to involve users. Some of the interviewed designers see themselves as experts, with the education and knowledge to design new products. They claim that “Users only come with standard ideas, or with impossible ideas” or “Brainstorming with designers is more productive than with users” or “users cannot and should not take decisions on the choice of a concept”. The designers tend to take the insights from the users literally or are not able to gain the knowledge they are looking for from users. These designers lack design research skills. These designers indicate they need more design research skills.

Today, designers make use of knowledge present in the company or consult experts within their network. These experts are easy to contact and are able to quickly give information on the product or the product's use. When given the opportunity and time, the designers would like to have actual contact with real users and how to involve them during the design process.

In the interviews with owner-managers of SMEs discussed in Chapter 3, the owner-managers indicated they seek information about the value of user involvement. They check with their personal networks, governmental organizations like Syntens in the Netherlands, and attend meetings for branch associations. Another way to gain knowledge on UCD skills is to hire staff experienced in UCD. This requires dedicated resources and is a difficult decision to take for SMEs. In the interviews, the owner-managers indicate they prefer to initiate student projects where the students bring knowledge on UCD from their training under the supervision of a teacher.

At the interviews and workshops, designers and owner-managers acknowledged the difficulty to persuade other members of the organisation. The designers often needed to convince the owner-manager, and the owner-manager experiences difficulties in finding the right person to get users involved. They used the following arguments:

- "*Involving users and getting more acquainted with them is a kind of relationship marketing.*" (one of the participating workshop designers. According to the designers, users feel involved and one develops a better understanding of their needs and desires, which helps creating better product concepts. Especially in a B2B context, getting to know more about both the client and the end-users improves the relation between the client and the SME.

- Knowing what your users and clients think of your existing products, what they need, and how they think about possible future products helps SMEs to limit the risk in bringing new products to market. It offers a better chance for success and a better fit with the needs of clients and users.

- For certain types of products it is a necessity to know who the users are, what their requirements are, what they need to do with the product and the context of use. For medical products, children's products and products dealing with safety, regulations dictate what user information needs to be collected in order to comply with regulatory requirements and get approval for market deployment. Indes, is a design agency designing products that need compliance with regulations such as those for medical products. They became experienced in doing user tests and making prototypes to check functionality and use of a product. Regulatory tests are often starting points for further involvement of users in the design process. Tilcentrum for example also deals with users on a regular basis due to regulations as they design products for a medical context. Other kinds of regulations designers need to deal with are for example in the context of products for children, for workmen and aviation.

- Using feedback from users and clients as a starting point helps in creating a good fit between the to-be-designed product and the targeted users. It gives inspiration for the design process as it helps to make choices and formulate arguments.

Much of the available information on UCD is diluted and spread over different sources. There are many attempts to create toolkits showing an overview of what is available, but actual in depth examples of UCD projects are missing. The interviews and workshops revealed that it is this type of examples that designers and SMEs claim to need to either convince others of the benefits and use of UCD, or as an inspiration and information source to apply UCD.

Concluding, bad experiences, misunderstanding and preconceptions are the main reasons designers are experiencing difficulties to get started with UCD within an SME. Designers need to overcome these barriers to take action and actually try out UCD. Internal and external experts from the existing network provide easy access to user information. The SMEs have different reasons to involve users; initially mainly aimed for marketing.

4.3.2. — Current UCD process and UCD methods

A senior designer participating in workshop 2 said: " The overview of methods hanging on
the wall here, that's every designer's nightmare!" The poster, made by KAIST (Korean Advanced Institute of Science and technology, 2009) listing a matrix of 24x42 entries (each cell divided into 4), the designer is referring to is depicted in Figure 4.8. It is a table with many different columns and a lot of rows whereby each box is filled with numbers. It gives no extensive information on the UCD methods and lacks examples. DThe poster does serve as a good overview of what is possible, but does not provide the information to designers to make actual use of the methods mentioned in the poster. Designers try to structure the process of involving users, but quite often they lack the knowledge and experience to find an adequate process and method (Tidball et al., 2009).

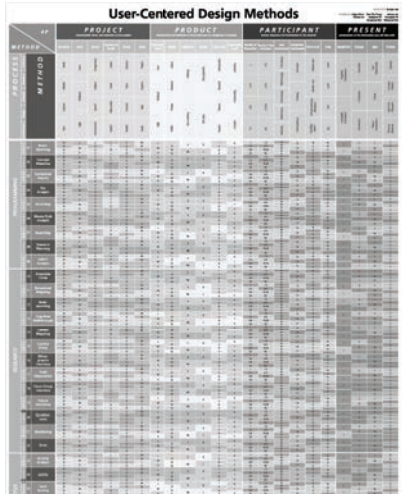


Figure 4.5 Poster developed by KAIST which was on one of the wall during workshop 2.

The participating designers of the workshops describe the UCD process as follows: Designers focus on qualitative research because quantitative research is usually executed by a sales representative or by an external agency. The Internet is an important source of information (reports from trend watchers, forums, representative organizations, etc.) to prepare for user contact and is in most cases the starting point of any project. Designers often try to experience the to-be-designed product as a user first, later on they start to contact users within their own network, or visit a shop to observe user behaviour. Contacts with users take place within short notice as many design projects are very ad hoc and are often informal due to the many responsibilities of designers in SMEs. The more experience a designer has with user involvement; the more structured the use of methods and the process takes place. This involvement of users reflects the nature of the companies the designers are working for.

The designers structure the design process generally in four phases with their corresponding deliverables: analysis, ideas, concepts and detailing. Their take on the purpose and character of user feedback evolves along these phases. User involvement is very much oriented towards the current context and use of products, mostly to improve existing products. Interaction with users during the design process usually takes place when testing a prototype and occasionally at the first stage of the design process.

In some cases they talk with people in their personal environment or talk with colleagues that either have knowledge on users coming from their type of job (customer service, sales representatives or technical support) or from their work experience. Occasionally, users are contacted to give feedback on scenario's or paper prototypes during the design. If this is the case, designers want to be inspired and surprised by users. Designers describe the obtained feedback with words like "creative", "unexpectedly", "feeling" and "contact". Most mentioned UCD methods in the first phase are visiting users, panel groups, talking to experts, interviews and observations. These moments of contact with users take place based on impulses using improvisation on the spot. Designers do not take, or do not get the time to prepare for these moments. This should not be regarded as a disadvantage, rather it merely reflects the nature of SMEs and also enables SMEs to respond quickly to their users and clients.

When users are involved in developing ideas and concepts, designers describe that moment as "play". They want to play with the ideas together with the users to get feedback and confirmation they are thinking in a right direction.

The final detailing stage of the design process is described as "structure" and "routine". This final step is considered a necessity before a prototype can be put into production. It is the last possible moment to make changes and limit the risk of failure.

UCD methods

SMEs have limited time and budget and want to reduce risk. They only invest in methods
that have proven value. Usability testing is common practice and is generally understood. Traditional user involvement methods like interviewing, observation, prototyping and usability testing were the most common methods that came forward during the discussions. Designerly methods like design probes, design games and generative techniques are rarely applied. Newer methods used in large companies, such as probes, personas and generative techniques are still unestablished, often lack a sense of rigour and seem childish.

When trying to select a UCD method, a wide variety of issues surfaced:
- a method is often project dependent, there is not a one-fits all method
- actual contact with users is time consuming and difficult to achieve
- recruiting users is difficult
- there is a lack of knowledge on newer methods
- there is no adequate source of information on new methods

Sanders et al. (2010) divided UCD tools and methods into four categories. This categorization is based on the goals for which the methods are used:
- let users MAKE something
- let them DO something
- let them SAY something
- or use the UCD methods to COMMUNICATE the findings.

Designers generally use a limited number of DO and SAY methods (based on the overview of methods the designers composed in all three workshops). Some design agencies mentioned the use of MAKE methods. Most designers get acquainted with one kind of method and way to communicate their findings. Once a suitable one is found, designers are reluctant to change their way of work even though other methods might exist that better fulfill their needs. Sanders (2010) argues that the best results are achieved when two or more types of UCD methods are combined. Designers argue they are already struggling to make use of one kind. The deficient use of MAKE methods as well as the combination of types could be related to the earlier stated perception of the designers and other stakeholders regarding the input of users. They state missing UCD methods that enable users to provide more in-depth information.

Designers working in SMEs that participated in the workshop mention they recruit users in their own network (family, friends and colleagues), the customer database or Internet forums. Only one designer indicated they exceptionally use a research agency with a database of respondents. Sometimes users that participated in previous projects are re-contacted. "Often we really struggle to convince users to participate. You almost need to pay them. Once started, users often like to contribute and financial compensation is no longer needed" (an independent designer at workshop 2). SMEs do not have the same financial means as large companies to hire research agencies having

user panels. Involving users remains cumbersome for most designers and is the reason why it is the first thing being dropped: "Involving users takes a lot of time, and some do not show up. So you have to take that into account as well. In many cases we simply have no time or budget for it" (senior designer at workshop 2).

4.3.3. — Desired UCD process according to designers in SMEs

Several of the designers in the workshops explicitly said they would like to have more time for UCD in the analysis stage of the design process. Planned contact with users formerly unknown to the designers is rare (Goodman et al. 2006). Designers participating in the workshops would like to change this and increase the frequency of user contact, have actual users involved and not in one location but at for example in the case of Tilcentrum in private homes as well as at physiotherapists and in different kinds of hospitals. This way the product can be designed iteratively.

The kind of user involvement and frequency depends on the importance and type of project. In design projects where existing products are "tweaked" (making the next generation of the product: an existing product in an existing market) little to no contact with users takes place. SMEs assume they know what users want and what the product must be like. This is the case for all new orders at Gefken. Every time, an order of cases is different, but the same set of specifications is used. Clients select properties from a catalogue that are based on the capabilities of the company and prior orders.

The following four cases illustrate how SMEs have actively involved their users in the development of new products. Ducky Beau hired an external design agency for support. Difrax usually involves users themselves but occasionally seeks external support. Berg Toys does the same but recently had student with UCD knowledge to explore new opportunities. Tilcentrum has no in house design capacity and relies on student projects.

Ducky Beau
Ducky Beau makes children's clothes. Their standard line of clothes changes seasonally and is designed by a designer taking all design decisions. Occasionally feedback is asked from colleagues or friends. When they decided to design a new line of clothes for premature babies, different medical experts were consulted (nurses, doctors etc.). Throughout the design process, nurses from the premature care department at hospitals as well as parents of premature babies were involved. Two requirements needed to be met: Babies in incubators need medical care as well as the comfort of being with their parents to bond.

Difrax
The existing customer panels of Difrax are generally used for confirmation of ongoing product development, to get quick feedback or make an inventory of issues at users. Difrax decided to use contextual inquiries (Beyer and Holzblatt, 1998) during the design process of the breast pump to have more elaborated contact in the context of use.

Berg Toys
Berg Toys is an outdoor toy manufacturer. They are specialised in making go-carts and trampolines. Previously they invited users from their own network to come and test newly developed concepts. Recently, a graduation student (Cornelis de Kruijf), started to explore new opportunities for Berg Toys in schools (See Figure 4.6). Berg Toys started to develop a new product line in collaboration with children, parents and teachers as a result of this exploration. It is a combination of their current steps with a set of construction materials to customize the functionality. The construction materials are also used in the classroom.

Figure 4.6: An exploration of the current use of Berg Toys and the developed concept by Cornelis.

Tilcentrum
Tilcentrum realised obese patients poses new challenges to nurses and technical staff in hospitals. Tilcentrum expected this would require a whole new range of products. They lacked knowledge on when and which kind of lifting was necessary for obese people in hospitals. Tilcentrum asked students of the Utrecht University of Applied Sciences to unravel the journey of obese patients in hospitals and come back with ideas to support both the obese patients and the nurses. Extreme obese patients are very reclusive and private and for this reason hard to reach. The students mapped the entire journey of obese patients using existing real life documentaries (see for an overview below), interviewed caretakers, nurses, physiotherapists and care organizations. During their exploration the students found out there are two body types of obese people influencing the functionality of the to-be-designed lifting aids (see Figure 4.7). One key problem was selected to work out and develop a product for. By prototyping, the students developed a way for patients to be transferred from the operating table to the hospital bed.

Activity	% Requiring Assistance
Bathing	90
Dressing	87
Toileting	84
Skin care	82
Feeding/food (shopping or preparing food)	66
Getting out of bed	54
Feeding/food (eating)	25
Oral hygiene	11

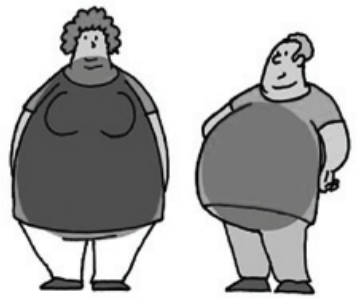


Figure 4.7: Images of the gathered insights for the Tilcentrum project.

4.3.4. — Problems and pitfalls when using UCD methods

The key obstacles designers encounter when involving users in their projects boil down to the skills and knowledge on UCD of the designer, time, budget and flexibility to adapt to the working context of the designers, all interrelated. Once there is more time for a project, more budgets are available and less flexibility needed. Under tight time and budget constraints, flexibility is required to accomplish all project goals.

When it comes down to time, many issues are brought up related to the involvement of actual users (one of the designers at the workshops): "Involving users is people-work, it is time and labour-intensive and requires a lot of organizing". Depending on the importance of the project and the amount of information needed, involving users in projects can span from a couple of hours up to a research study taking several months.

UCD tools and methods have to fit the flexible context SMEs operate in. SMEs do not have the scale and budget to make use of market research agencies. They need to make use of their own network to actively involve users. If users cannot be contacted and involved within the project's time span, designers need to be flexible and find other ways to quickly access user information. Designers can for example make shop visits or use existing contacts of customer care of the SME to have quick and flexible contacts with users.

4.3.5 — Conclusions

Many SMEs are acquainted with some types of user research. This is primarily limited to some of the fields depicted in Figure 4.8 of the earlier presented landscape of UCD methods: usability testing, lead-user innovation and human factors and ergonomics. The used methods in SMEs are primarily located in the lower left corner where users are regarded as subjects, reacting upon questions of the designer (De Lille, 2009). SMEs active in for example healthcare and safety are more accustomed to take human factors and ergonomics

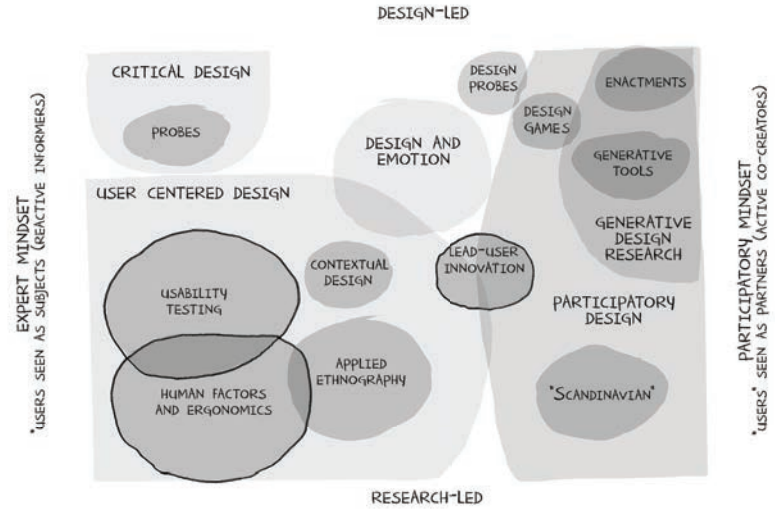


Figure 4.8 Landscape of Design Research (Sanders & Stappers, 2012) with the currently used approaches by designers working in or for SMEs.

into account. In these sectors regulations e.g. ISO 9241-210 mandate user involvement and the use of user tests in certain contexts. Companies such as Tilcentrum can only sell their products if they comply with the ISO standards to ensure safe products.

SMEs tend to stick to familiar methods to acquire user information such as: interviews, observations, and occasional conversations. Literature indicates that the available methods are often underutilized (Bruseberg & McDonagh-Philp, 2002; Cassim, 2005; Goodman et al., 2006; Hanna, Ayers, Ridnour, & Gordon, 1995; Kujala, 2003).

SMEs indicate they are interested in knowing more about their users but state they lack the knowledge on how to do so. The designers state that UCD methods are generally presented as a rigid structured construct. Designers of SMEs from the workshops want to understand what the benefits are of investing

in UCD and actively involving their users. During the workshops, designers came forward with the idea that they would like to share their experiences. They have the impression they all run into the same problems. Whenever a problem occurs during a design process, the Internet is their first and main source of information. The designers claimed they needed more information on usable methods. For instance example cases on how methods can be implemented, hints on how to deal with unforeseen circumstances, ways to check whether they are doing okay and showcase material for potential clients to demonstrate the added value of user involvement. They asked me if this was not an idea to start with: an online platform where designers could get feedback from experts from academia and fellow designers. To limit the risk of product innovation, they look for flexible, alternative ways to obtain this information.

4.4 — Exploring design-led UCD methods in SMEs

Some SMEs intuitively took steps to actively involve users. Many of the designers, participating in the workshops, were interested in the design-led methods to explore new opportunities for ideas and products rather than looking for proof of concepts (top right hand side of Figure 4.9).

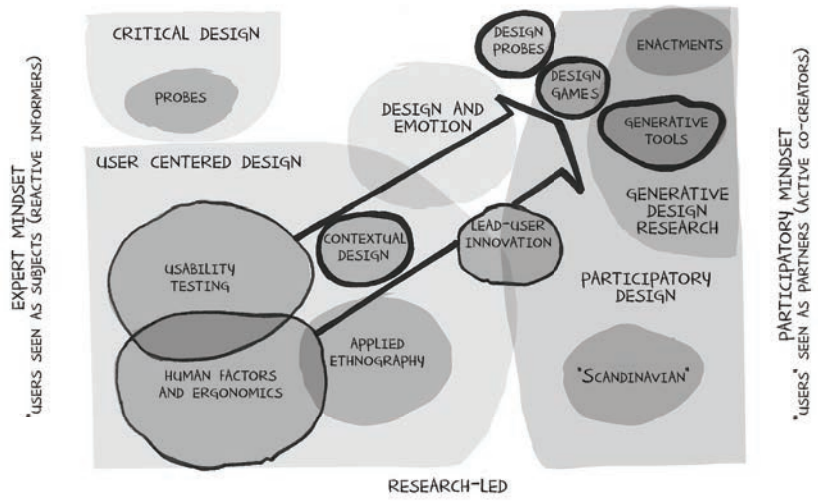


Figure 4.9: An overview of UCD approaches, each with their according methods shifting from those familiar to SMEs to more design-led.

They wondered how and if these methods would be suitable in the context of their work. However, designers only understand the value of design-led methods if they have some prior experience with research-led methods. In the following section some of these UCD methods will be discussed in more detail. UCD methods more on the participatory and design-led side that will be further discussed are:

- Contextual Design (Beyer and Holtzblatt, 1998),
- Design Probes (Mattelmaki, 2006),
- Generative techniques (Sanders, 2000; Sanders and Stappers, 2012) and
- Design games (Brandt, 2006 and 2010).

The method Contextual Design is selected as a means to show designers working in or for SMEs how they can make use of interviewing and observing in a more structured and elaborate way in earlier stages of the design process. This method is closely related to the UCD methods SMEs are already familiar with and provides a transitional stage towards more design-led methods. Probes and generative tools had great interest from the designers as they provide users the means and the time to reflect upon their own experiences. Some design agencies in het Netherlands have already developed their own design games (Sunidee and Flex I the Innovation Lab), for this reason design games are also included for further exploration.

Figure 4.9 shows a move from the familiar methods towards design-led methods. On this path next to the four mentioned design-led methods, 'Applied Ethnography' and 'Design and Emotion' are also present. These two approaches will not be further explored as I consider them less interesting for SMEs. Applied Ethnography builds on dedicated researchers using ethnography to investigate more fundamental questions. SMEs do not have the opportunity to hire dedicated researchers and are aim for immediately applicable information. Therefore Applied Ethnography will be disregarded. 'Design and Emotion' aims at putting rich experiences at the centre of the to-be-designed product. There are no specific methods, processes or research designs of 'Design and Emotion' that support SMEs to make use of this approach. I expect 'Design and Emotion' to be out of the scope of SMEs due to the required level of skill and expertise.

Each of the four selected methods will be further explained by how it works, the underlying mechanisms, the process designers follow when using it, illustrated by an example.

4.4.1 — Contextual design

Contextual Design has its origin as a method for designing IT products by promoting the integration of contextual data about the use of products (Beyer and Holtzblatt, 1998). It provides a process to generate, analyse and create inputs for design. Contextual Design gives a clear and explicit structure to collect, structure and apply contextual information. The way the visit to the user context is structured and recorded supports the team's interpretation session. Contextual Design emphasizes shared understanding of team members by sharing their perspective and insights of the context of use.

Figure 4.10 (left): At an interpretation session, the design team immerses in the data (Picture from Beyer, Holzblatt, 1999)

Figure 4.11 (right): Example of a workflow map as a means for contextual design (The Interaction Design Foundation, 2011)

Process:

The design team conducts one-on-one field interviews with users at their workplace. A contextual interviewer observes users as they work (See Figure 4.13 and 4.14 for examples). Step by step he asks about the users' actions to understand the motivations and strategy. Through discussion, the interviewer and user develop a shared interpretation of the work. Staying in context enables the interviewer to gather concrete data and facts on how the work is done and the user's experience through interviews and observations.

Team interpretation sessions bring together a cross-functional team to hear the complete interview and extract the insights and learnings relevant to the design problem (Figure 4.10). An interpretation session lets everyone on the team bring in his or her unique perspective to the data, sharing design, marketing, and business implications. By the discussions, the team captures issues, draws work models (see for example figure 4.11), and develops a common view on the user's data and needs. Work models provide a coherent way of structuring all the detailed data, revealing underlying structures without overlooking the details (Beyer and Holtzblatt, 1998). The common view developed based on consolidated data is further converted into solutions by structuring it according to a system, and making iterations with users through mock-ups.

Figure 4.12: A visual overview of the process of contextual design
(adapted from Beyer and Holzblatt, 1998).

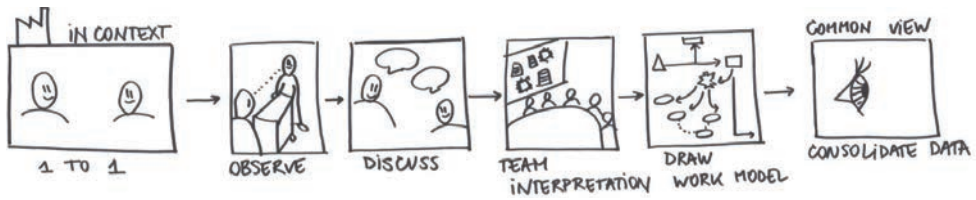


Figure 4.13 (left): In this project doctors were followed during their daily routines. Based on the interviews and the observations it was revealed that doctors spend almost 50% of their time on administrative tasks and not on helping patients. Using this as a starting point, a product was designed that reduces the time to be spent on administration. (from a student project at Utrecht University of Applied Sciences)

Figure 4.14 (right): In this project ground personnel at the local airport was observed during their daily routines to get an understanding of the emerging problems and how they could be addressed.

Examples:

4.4.2 — Probes

Probes are designed to provide in depth details about participating people to better understand how to respond to their needs. Probes often are applied prior to interviews or other ways of user investigation. It is a stimulating tool, enabling the end user to investigate and report on his own environment and behaviour. By sensitizing people, they are better able to express tacit and latent knowledge (Mattelmäki, 2005). Designers gain an empathic understanding of the context of use and using probes can help to spark new design ideas.

Probes are collections of evocative tasks meant to elicit inspirational responses from people – not so much comprehensive information about them, but fragmentary clues about their lives and thoughts (Gaver et al., 2004). Probes often consist of a set of assignments, ranging from completing a time line and mapping the environment to answering questions (See Figure 4.11 for examples of assignments). A design probe is not a nicely packed survey but a deliberate composition of exercises and media (Gaver, et al. 2004) such as instant- or digital cameras and voice recorders. Probes are intended to be completed by the user on their own time, in their own environment, at their own pace, without the presence of any member of the research team.

The returned materials are inspirational input for a design team and aim to empower the designers' imagination. It's not the intention to extensively analyse or summarize them. Their authentic and personal tracesof people's everyday reality are an open brief for design. The open and aesthetic probes leave space for interpretation and inspiration for designers. The probes process and the raw data allow versatile interpretations. Designers make their own interpretations of the users' world, without aiming to evaluate or validate. According to Gaver et al (2004) the personal interpretation of each designer in a team is the results of a probes study. Dealing with user experiences in the probes method is not so much about representing data, but the process the designers go through.

Process:

The process of designing the tasks and materials (See Figure 4.15 for an overview), communicating with the users (e.g., when giving the package) and the returned probes in their original form, enhance sensitivity for the actual users within the design team, and serve to eliminate stereotypes (Mattelmäki, 2005). The understanding is embedded in the dialogue between the designer and user. 'The real strength of the method was that we had designed and produced materials specifically for the project, for those people, and for their environments. The probes were our personal communication to the elders, and prompted the elders to communicate personally in return' (reflection on the cultural probe study with elderly by Gaver et al., 1999).

Figure 4.15: A visual overview of the process of developing and using probes.

Each probe usually starts with an introduction describing the purpose of the probe, what is expected from the users and the contact details of the designers.

First, users asked to share some 'basic' information. Next, there is a warm-up exercise with easy accessible information. Gradually, each new assignment goes one mental level deeper.

In many cases users are asked to take on different subjects to give the designer an insight of the person and his environment.

This kind of assignment is used so that users can map important things close to them. It gives insight in underlying relations. (See Figure 4.19 for a filled in one)

Figure 4.16: Overview of common structure used in probes. , this example comes from a project I conducted for an SME

Examples:

Figure 4.17: These probes are used in the context of building contractors.

The probes are designed to visually appeal to their context. (Marijke Verhoef and I in a project for an SME)

Figure 4.18: Probe for kids at school, through small exercises, they show the designer what is important in their world of play in order to develop a new set of characters. (JP vd Vliet, a graduation project under my supervision)

Figure 4.19: Probe for people that have making dollhouses as a hobby. This visual map shows what is important to them in their daily life. (31 Volts, for one of my cases)

4.4.3 — Generative techniques

Similar to probes, generative techniques (Sanders, 2000) make use of the designer's skills to create eliciting assignments and exercises. Key difference is the intense and personal interaction between designers and users. Therefore the number of participating users is kept low (6-20).

Generative techniques use the creativity of people to become aware and express their own experiences (Figure 4.20 provides an overview of possible techniques). By Make and Tell, many of these methods can be suitable for generating a holistic view of people, including people's everyday experiences in their full complexity. These people are respected as complex, rational, emotional human beings, having values, motivations and needs (Green and Jordan, 1999) as they are the experts of their own experiences.

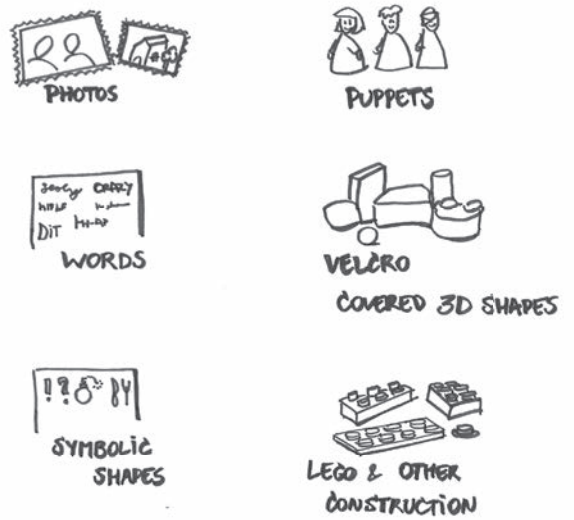


Figure 4.20: an overview of ingredients that can be used for generative techniques (Sanders and Stappers, 2012)

Process:

Users performing the assignments make use of classical 'design' means, e.g. collages, to explore, document, and interpret their everyday experiences. They are asked to 'make' expressions and become more aware of their daily experiences. In 1:1 interviews or in-group sessions they are asked to explain their creations to the designers. What users say when discussing their creations can provide new insights. In many cases, the users are asked to prepare small exercises, are sent some questions or other means to sensitize them before coming to a session.

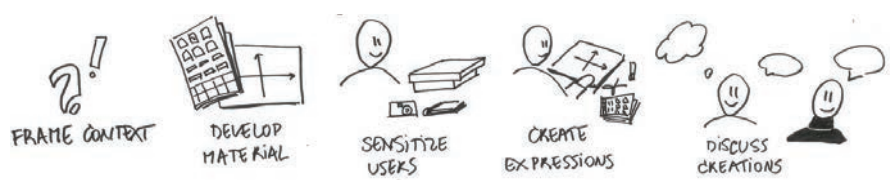


Figure 4.21: A visual overview of the process of developing and using generative techniques.

Examples:

Figure 4.22 (left): Participants are immersed into their own world of experiences. The provided material helps them bring their thoughts to the surface.

Figure 4.23 (right): Material provided to users can be very diverse. For example images, words and tinkering materials.

4.4.4 — Design games

Design games can be used either to provide structure in gathering user insights (such as the Flex design game, Figure 4.24 and 4.26), or to create shared understanding among the participants of the game (for example when different stakeholders play the game together, Figure 4.27). Design games enable to generate design ideas with configurations that are created using game pieces on a game board. Purposefully, neither game pieces nor game-boards refer to any real-life situation (unlike previous UCD methods). Everything is abstracted and stylized to eliminate the functional knowledge and experiences that designers have and usually bring to work. The games provide the possibility to create an environment that can be manipulated and is well bounded. Games are frequently described as a play with props following specific rules and often with an element of competition. Outcome is decided by chance, strength, skill or a combination of these. For example in sport games like football and tennis strength and skill are decisive whereas luck determines the outcome of card games, board games and any kind of lottery game. Participants in design games have different interests, skills, expertise and preferences. Rather than utilizing them to compete, the aim is to take advantage of them and jointly explore various design possibilities in a game setting (Brandt, 2010).

Design games do not sensitize users, and due to the speed and use of game elements the focus does not lie in gaining tacit and latent knowledge (as is the case with probes and generative techniques) but rather creates an environment where users feel comfortable to share experiences in an abstract setting.

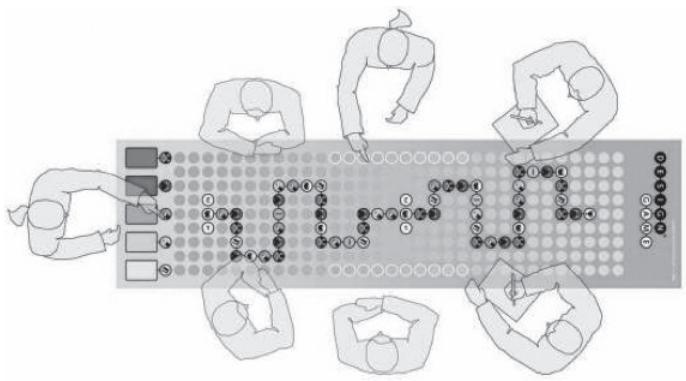


Figure 4.24: The board of the design game of Flex I The Innovation Lab. The coloured boxes on the left are the placeholders for questions and assignments. Two teams sit on either side of the board. Each team consists of two users and one designer.

Figure 4.25 A visual overview of the process of developing and using a design game.

Figure 4.26 (left): Design game at work developed by Flex I The Innovation Lab. Designers and users play the game sharing insights and developing ideas. In the first half of the game the teams are answering questions to gain knowledge on the topic. In the second half of the game this knowledge is used to collaboratively develop ideas.

Figure 4.27 (right): Design game developed by Monika Havn. Using a design game to initiate a dialogue about the early signs of dementia. Royal Danish Academy of Fine Arts, School of Design.

The design of an exploratory design game project depends on the scope, the participants and available resources. Exploratory design games involve users directly in both collaborative inquiry in existing situations and participatory design of possible futures (Brandt, 2010). Brandt (2010) describes how different types of game elements can aim for other kinds of experiences:

- Game pieces like images and video snippets from field studies provide deeper knowledge of users and use situations, which the designers remember.
- Open-ended fragments or questions allow for many different interpretations leading to a more open and creative dialogue.
- Design games based on luck focus on how to get out of habits and have new experiences. In one example a dice was used with various questions so that the players got questions randomly. Another example is to combine words and/or images that normally do not fit together and evoke new ideas.
- Using stylized game materials elucidate the participant's intentions and interests, as they are not implicit in the provided materials.
- Game rules like turn taking help levelling the stakeholders playing the exploratory design games.

The choice of game pieces can depend on resources. They can vary from text and images on paper, photographs, and from 3D cardboard models to digitized video-recordings.

Process:

The process of applying design games is explained making use of the Flex Design game as an example (Figure 4.24). The process starts with determining focus of the game, formulating questions and exercises related to the subject of interest. Typically, three to five potential users are involved for each game. These people are invited to play exploratory design games with designers and other stakeholders (e.g. companies). Generally two to four design games are played for each subject to create a basis to start from for the design process. The ideas generated during the design game are analysed and consolidated by the designers. In some cases the outcome is presented to the users and the other participating stakeholders for feedback.

Examples:

4.4.5 — Using design-led UCD methods within SMEs

The described exploration of the current state of UCD in SMEs took place in 2008. The current state of UCD in SMEs might have slightly altered at the moment of writing. I still receive many similar questions from designers, so I do not expect the situation to have radically changed.

The four described UCD methods have not yet found their way to SMEs. So why are designers from SMEs unfamiliar with these design-led UCD tools and methods?

- These UCD methods are relatively new. Probes were first described by Gaver in 1999. Sanders first started to use generative techniques around the same time.
- As these newer UCD methods are only taught to students at the academic institutions since the '00s, only recent graduates have knowledge on these methods. It will take time before this knowledge gets to SMEs. For example, in the case of the faculty of Industrial Design Engineering in Delft, probes and generative techniques were introduced for the first time in the curriculum of Master students in 2004. Only students that graduated in the past 10 years have some knowledge on these two techniques.
- SMEs tend to employ people for a long period of time. Only if they have employed someone recently graduated, they could have in- house capabilities to use probes.
- Design agencies hired by SMEs seldom have expertise with design-led UCD tools and methods. Exceptions are agencies like Flex, who developed its design game, and Muzus, specialised in probes and generative techniques. They employ some of the first graduates who had been taught these newer methods.
- Today there are limited opportunities to learn more about the discussed methods. There are only some workshops and classes organized for alumni and designers in general. These initiatives come from networks of designers or universities.

Further exploration of the four design-led UCD methods brings up the following questions, thoughts and barriers:

HOW do I expect designers to apply design-led methods?

- Limited number of users, reduced time spent on elaborate analysis and communication of the results will be a good fit for SMEs.
- In some SMEs usability testing of designed prototypes is already taking place.
  It is a natural starting point to gradually explore more possibilities of using UCD methods earlier in the design process. I expect them to start evaluating existing products and then move gradually to contextual design for input for the design process.

WHAT are some of the barriers for using UCD in SMEs?

- Designers struggle to find up to date information on how and why to use design-led UCD methods.
- Designers working in and for SMEs experience difficulties in getting in contact with different kinds of users (such as the different kinds of stakeholders in the example of Tilcentrum discussed in Chapter 1 p 19).
- Analysing obtained information is a challenge for designers. More specifically, taking time for analysis is often neglected.
- Designers mention they need support of an expert to check the set- up of their research as well as to review the method selection. This becomes more important as they move to more design-led methods.
- For the designers, formulating a project focus can be difficult as design-led UCD methods need a broader perspective of the user-context to enable the user to reflect on their experiences.

4.5 — Implications for UCD in SMEs.

At the moment, SMEs primarily use quantitative market research methods or more established UCD methods such as interviewing, observation, prototyping and usability testing. These methods are commonly used and generally well understood. From what the interviewed designers and the designers of the workshops said, I can conclude that gaining more tacit and latent knowledge from users makes sense for the designers working in or for SMEs. The currently used UCD methods mainly confirm what they already know and do not deliver insights that inspire and surprise them.

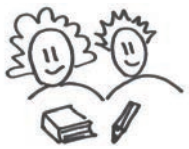
Design-led UCD methods that address these levels of knowledge (for example, in the area of participatory design) are still underutilized, as many SMEs find it difficult to assess the credibility of such methods. Exceptionally SMEs use methods such as probes, storyboards and generative techniques. Yet, methods of early user participation provide SMEs with new opportunities for markets and products. They support moving from "validating" and "proof" concepts to exploring opportunities for new products and markets that are more future-oriented. Based on early user insights, they limit the risks for SMEs as they enable them to move from users to participants and from clients to partners. The four discussed methods (probes, generative techniques, contextual design and design games) could help SMEs to anticipate and respond to changes in the market. To understand how they can be used in SMEs, they need to be explored in more detail.

Designers experience resistance to actually start trying out UCD (not only design-led methods) due to a lack of knowledge on the use of UCD methods in general and because they need the support from the organization (primarily from the owner-manager). They seek justification to take time for UCD, and verification if they are correctly applying the methods.
Designers struggle to recruit users for participation. Recruiting takes place ad hoc and under time pressure with little means. Therefore designers usually involve people from their own network.

To limit costs, SMEs sometimes make use of trainees to do the actual user research. *"Trainees can do it too under my supervision, and cost less"*. Student projects can take advantage of university knowledge. To further confine time and budget used, some SMEs rather involve external or internal experts (such as technical staff doing installations or repairs for the user, or the customer service department). This is an example of how SMEs look for opportunities to increase flexibility. Their design processes are often informal and adhoc and UCD methods have to fit in this context. Designers are curious to know how design-led methods could be used when they need to deal with unforeseen circumstances.

These implications based on the contact with designers working in or for SMEs add to the findings discussed in Chapter 3. They provide more details on the current application of UCD in SMEs. The following chapter will explore how the design-led UCD tools and methods could be suitable for SMEs.

For Academics:
SMEs currently make use of UCD methods such as interviewing, observing, usability testing and involving lead users. Designers working in and for argue they need UCD methods that enable them to attain more tacit and latent knowledge. For this reason the next chapter will explore the possibility of applying design-led UCD methods in SMEs.



For Students:
Examples of how SMEs deal with involving users. Be aware that SMEs often do not know design-led methods and need to be informed about their use.

For SMEs:
Examples of how other SMEs deal with involving users. Be aware that there are design-led methods that can support you to attain tacit and latent knowledge.

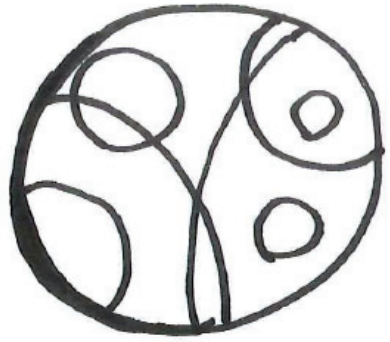
This chapter is based on the following publications:

De Lille, C.S.H. Van der Lugt R., Bakkeren, M. (2010) Co-design in a Pressure Cooker. Tips and tricks for SMEs. Libertas Publishing, ISBN 978-94-90560-03-4

Van der Lugt, R., Bakkeren, M. and De Lille, C.S.H (2009) Co-design in een Pressure Cooker. In Product. 2009 (November) p14-16.

Chapter 5

Discovering the world of UCD



Chapter 4 discussed four design-led UCD methods: probes, generative techniques, contextual design and design games. In this chapter, the practical application in SMEs of these new methods is investigated in ten different cases. This allowed me to inform designers at SMEs, let them experience first hand and to observe the deployment of these UCD methods in reality. The cases lead to an overview of barriers, enablers and learning lessons on using these UCD methods in SMEs as well as insight in whether they are suitable for SMEs or not.

5.1 — Introduction

SMEs have many strengths and capabilities and are applying UCD methods to some extend. UCD methods actively involving users in the design process are rather unknown to SMEs. A better understanding of this subject is needed. In this chapter, ten cases, using the selected UCD methods, were designed in such a way they reflected the current practice of manufacturing SMEs. The SME's design team was followed from design brief to concept. Throughout this design process they involved users using UCD methods and were supported in applying those methods by design agencies and UCD experts.

Research questions:

The main two research questions dealt with in this chapter are: *"What are the barriers and opportunities for design-led UCD tools and methods in SMEs?"* and *"Which UCD tools and methods are suitable for SMEs?"*

This chapter deals with the meta-levels indicated in Figure 5.1. As SME's lack the skills and knowledge on design-led methods, UCD experts support them and are therefore also a topic of investigation. These experts are from practice but have close ties to academia. The UCD experts are consultants or small agencies with a background in design but with a specialisation in User-Centered Design. They are hired especially for their expertise in UCD and in order to remain competitive and up to date, they collaborate closely with the Faculty of IDE in Delft (through involvement in research projects, teaching courses at the faculty or joining in student projects as a mentor). This chapter looks at different meta-levels:

- the "UCD expert" which adjusts their tools and methods to the context of SMEs,
- the designer of both the design agency and the designer employed by the SMEs
- and how they collaborate to gain insights from the "user" level.

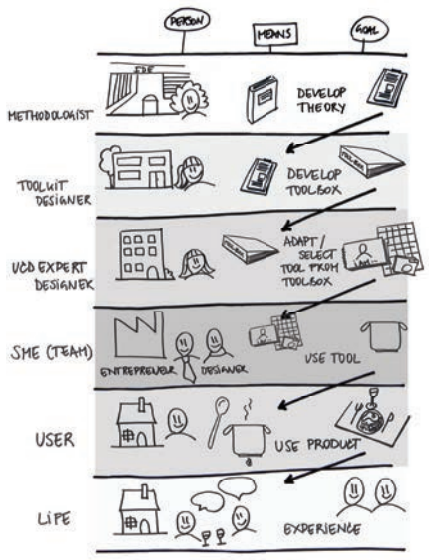


Figure 5.1: Meta-levels used in this chapter. I investigate how SMEs can be supported in designing new products through the help of a UCD expert and a design agency.

5.2 — Set-up of the cases

The cases are restricted in time and budget to mimic the circumstances of UCD in SMEs. As a result, the UCD experts were challenged to make use of the strengths of SMEs and the existing knowledge of and relations with users of the SMEs. The UCD expert needed to adopt and adapt their way of working to be able to involve users in the design process in ten weeks time.

The birth of the project:

In 2008 Mechteld Bakkeren from Syntens (a governmental organization supporting SMEs for innovation) and Remko van der Lugt (Utrecht University of Applied Sciences) met to discuss opportunities to raise awareness of UCD for SMEs and gather more knowledge on how UCD can take place in SMEs. Syntens had experimented before with a Pressure Cooker format of one day, in which SMEs collaborated with designers to formulate and develop new opportunities. I was asked to join Syntens and Remko to develop a format whereby SMEs could experience UCD over a longer period. This collaboration resulted in the Co-Design Pressure Cooker project: in Spring 2009, ten parallel SME-case studies were carried out over a period of 10 weeks financially supported by the Province of Utrecht.

The time span of ten weeks for product innovation is even for SMEs rather short. Most SMEs take half a year to develop a product from design brief to concept. Choosing a shorter time span for this research project helped in maintaining the momentum of the cases. Events that occurred (either positive or negative) were magnified such as the difficulty of recruiting users and analysing the information gathered. Due to the 'Pressure cooker' effect some aspects were more pertinent, others took place easier and choices had to be made swiftly. This enabled easy data collection of the cases as researchers could be present on the important moments throughout the case.
Bevan (2009) distinguishes the following criteria to assess the most appropriate methods to apply in UCD projects:

- Constraints: time, cost, skills available, access to stakeholders and other
- The nature of the task: complexity, amount of training required, consequences of errors and time pressure.
- The nature of the product: whether new, complexity.
- Context of use: range of contexts, how well understood.

The choice of the set-up of the Pressure Cooker, already kept many of these criteria comparable for all cases. The 'constraints' as well as the 'nature of the task' needed to fit in the 10-week time span of the cases. At that time this choice appeared to be obvious. The difference in use of UCD methods took place based on the 'nature of the product' and the 'context of use'. By having similar circumstances for all cases, the use of the UCD methods for a wide variety of products in different contexts could be explored in order to come to best practices for UCD projects.

UCD methods used for the cases

The previously discussed constraints in time and budget have an influence on the use of UCD methods in the cases. As UCD experts need to adopt and adapt their way of working to the practice of SMEs I expect 'downsizing' and 'customizing' to be key aspects in the use of the selected UCD methods.

- Downsizing adapts a method so it can be used in a shorter time span. As an example, observing security officers during an entire day is not possible. By using for example probes, security officers can be asked to keep track of their own experience during the entire day and reflect on it. The probes can then be used as a basis for an interview.
- Not all methods are a standard 1 to 1 fit and may not be the most appro-

priate way to get the required information from users. In customizing, the UCD methods are adapted to the context, users and brief of the case.

In the Pressure Cooker project I will take a closer look at what room is available and the aspects that can be changed in the use of a method.

Aim of this project is to use each of the four previously discussed methods in at least 2 cases in order to see how the methods can be used by different companies, for different purposes and in different user contexts. In some cases a combination of methods is used. Probes and generative techniques are two methods that are often used together.

Ingredients of the Co-Design Pressure Cooker

This research project focuses on product-producing Dutch SMEs with in-house product development departments. The selected SMEs carry out the complete design process, from concept design and development up to implementation of consumer products.

With the help of the governmental organization Syntens, who has a large network of SMEs in the region, a selection was made of appropriate SMEs to participate in the project. SMEs already in touch with their users, interested in doing so, or having an opportunity for UCD were invited.

The cases started off with a design brief, put together by the SME with help of Syntens and myself. The design brief had to deal with a question or a problem that could be addressed in the time span of the project (ten weeks) and could be tackled with UCD methods. In collaboration with Syntens, I matched the UCD method, the design agency and UCD expert.

To make the cases comparable, the following elements had to be part of every case in the use of the UCD method, in order:

- Framing the design brief
- Formulating questions for the user study
- Direct contact of designers with the users
- Collecting and analysing user insights

Each of the SMEs was teamed up with a design agency to support them at the UCD research and make concepts based on the design brief. This enabled the designer at the SME to get a fresh perspective on how future design projects could be tackled and get away from their standard way of working. In some of the cases, the design agency lacked knowledge and skills on the selected UCD methods in which case they were teamed up with an UCD expert. The Syntens advisor was in charge of strengthening the relation between the SME and the design agency, monitored the process and directed when necessary. The advisor also took care of the aftercare, supporting the SMEs in making use of the results obtained through the Pressure Cooker project. See Figure 5.2 for an overview of the different team members.

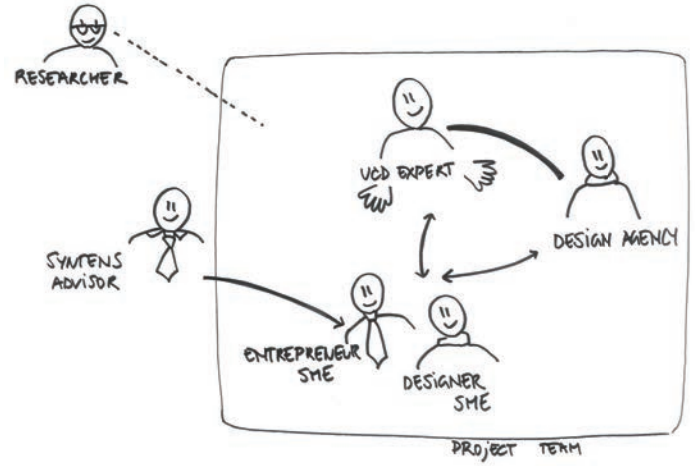


Figure 5.2: The team of each case is supported by a Syntens advisor and observed by a researcher.

During the ten weeks of the project, the teams met on different occasions. In between those meetings, actions took place, either in team or on an individual basis. The design process using the selected UCD methods was expected to take two to four days. Based on the information gathered a concept for a product was developed.

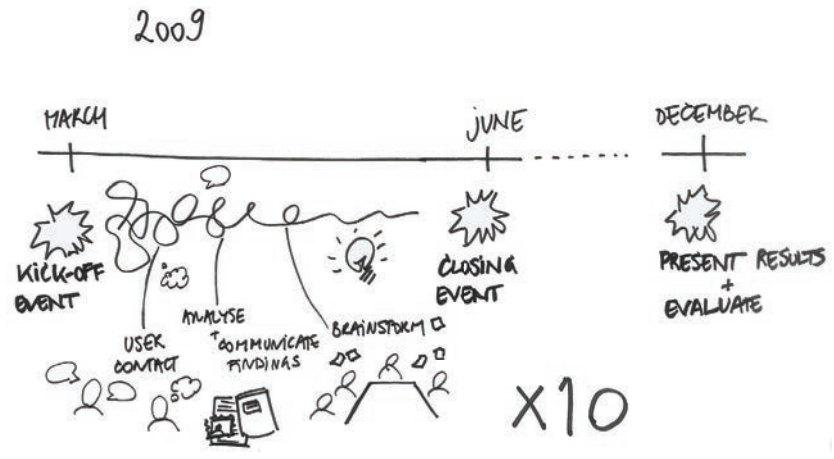


Figure 5.3: The process of the Pressure Cooker: going from design brief to product concept in ten weeks.

Selecting UCD Methods for each case

The design brief of the SMEs provided the basis to select a UCD method. To select a UCD method for each of the cases, an overview was made of UCD experts with experience in one or more of the four UCD methods. For each UCD method at least one expert was involved during the Pressure Cooker project. The following UCD experts were selected:

- 31 Volts: experts in probes and generative techniques.
- Flex | *The Innovation Lab*: developed their own design game in collaboration with Blauw Research.
- WeLL Design: make use contextual design for deeper understanding of users.
- P5 consultants: make use of contextual design for deeper understanding of users.
- Barry Koperberg: make use contextual design for deeper understanding of users.

The following two pragmatic criteria were used in the selection of the UCD experts for the cases:

1. Does the design agency/UCD expert have prior experience of the context of use of the SME?
   For example: WeLL Design has experience in doing user research in medical contexts and developing medical products. For this reason they were matched with Jansen Medicars who develops trolleys for operating rooms.
2. Has the design agency/UCD expert the capabilities and knowledge of UCD methods that are interesting and relevant for the design brief? The context of use, the type of information looked for by the SME and the type of users play an important role.
   For example: Flex | *The Innovation Lab* has developed a design game (see for a more elaborate explanation section 4.4.4). Users are invited to their office to play the game (in order to let the company observe the users in an adjacent room by means of a see-through mirror). This design game does not take into account the context of use. In those cases where the context was important the design game was less suitable.

This paragraph described the set-up of the cases. The following paragraph elaborates on how data was collected and analysed during the cases.

5.3 — Data collection and analysis through collaborative research

All cases took place at the same time. Each case was followed by a researcher. These researchers all have a background in design and a basic set of research skills (some were experiences designers with interest in research, others were design students in their final year). In total there were eight researchers. Two of them followed two cases at the same time, the other researchers each had one case. These researchers were in charge of observing the events as they took place, make notes and photos, interview the team members and collect case material.

Data was collected through a combination of different qualitative methods such as interviews and observations. For the collection of data, Yin (1994) proposes three ways to ensure validity in multiple-case studies by triangulation, which I adhered to:

1. Data triangulation: data was collected from the different kinds of participants, and through different types of collected means
2. Investigator triangulation: during the cases different researchers were involved to observe the actions taking place. These researchers were involved in a joint analysis.
3. Analysis triangulation: wherever possible, the collected data was analysed in different kinds of ways.

By combining different methods to elicit knowledge, different kinds and a large amount of information was achieved by balancing the limitations or blind spots of a single method with another one. The data was collected during the ten cases taking place over a period of 10 weeks extended with a reflection moment for all participating companies after 6 months.

I will elaborate on how we collected data and analysed it using each of the above-described levels of triangulation. Figure 5.4 displays how the data was collected. I will elaborate on the different aspects of this figure in the following paragraphs.

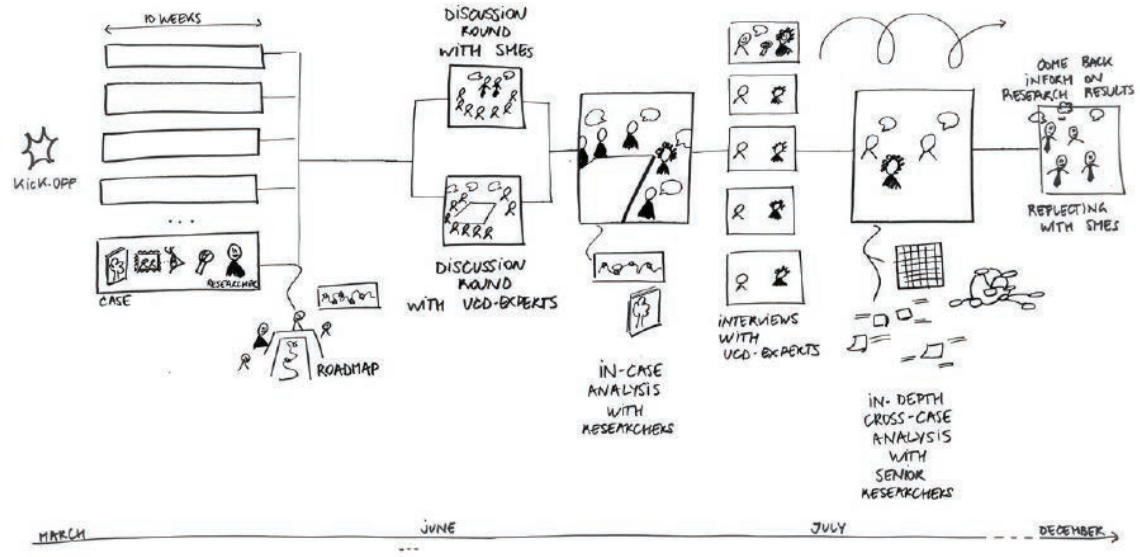


Figure 5.4: An overview of how data was collected during the cases

1. Data triangulation:

The data collection consists of different means: recordings (audio and video), transcripts, photos, reports, presentations, email conversations, notes in notebooks and reflective journals.

- At the end of the case, every team made a physical 'roadmap' to illustrate their process (for example Figure 5.7 and 5.8).

- At the closing-event of the project, two discussion rounds took place:
  - With all the entrepreneurs and designers of SMEs to elaborate on their experiences (Figure 5.9)
  - With all the design agencies and UCD experts on using UCD methods for SMEs (Figure 5.10).
- Each UCD expert was interviewed in one-on-ones to get into more depth about their experiences and learn more about their perception of the suitability of the selected UCD methods for SMEs.

These different kinds of data collected through different methods (observing and interviewing) and from different kinds of participants (researchers, SMEs, design agencies and UCD experts) allowed me to triangulate the data on the level of data sources.

2. Investigator triangulation:

Each of the 10 cases, had a dedicated researcher. I developed a generative research journal (making use of similar mechanisms as probes enabling the researcher to reflect in context) in advance based on my research questions (see Figure 5.11). The researcher observed the case as it took place using this journal. The researchers took pictures and collected case material. All researchers participated in an analysis workshop to share observations and experiences and compare across cases. A comparison across the cases was facilitated as data was collected in the same way across cases. In this way investigator triangulation took place between the cases.
I interviewed the UCD experts reflecting on the case itself, the application of the UCD methods and comparing the case to their normal practice. By interviewing the UCD experts and following the cases from a larger distance I was able to obtain an overall perspective across cases ensuring triangulation within the cases.

3. Analysis triangulation:

In order to interpret the collected data, I used different approaches. First through a thematic content analysis (Figure 5.5), the previously mentioned research questions were explored through the following themes:

- attitude of the SME,
- aim for UCD
- barriers and enablers for UCD methods,
- use of UCD methods,
- downsizing UCD methods,
- customizing UCD methods

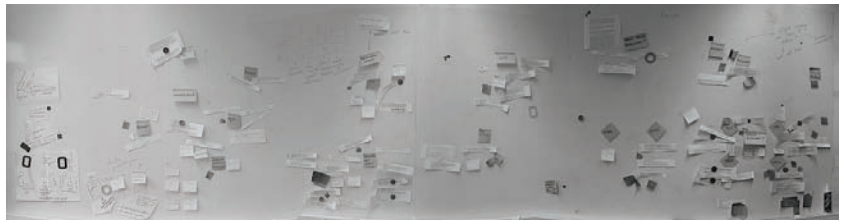


Figure 5.5: Thematic content analysis of the cases

Using tabular diagrams I was able to move from observations, interviews and discussions for each of the individual cases towards thematic cross-case information. The themes were determined based on the conclusions presented in Chapter 4, forming the starting point of the analysed cases.

In a next step, the transcripts of the interviews and the discussion and the notes of the observations and other field notes of the researchers were coded according to the following themes: company, team and project with their according codes (See table 5.1). The analysis according to these codes was the input for creating causal diagrams to unravelling patterns and relations in the use of UCD in SMEs (Miles and Huberman, 1994) as displayed in Figure 5.6.

Theme	Code	Explanation of code
Company	Company culture	What is the culture of the company with UCD? What is the priority of a UCD project for the company? How does the company in general deal with activities and events?
	Entrepreneur	Often the owner of the company, driving force for innovation, leading with big influence on all processes within the company. What elements does the entrepreneur cause? Which characteristic of the entrepreneur has influence on the project?
	Innovation practice	How is innovation handled within the company? What starts innovation? What is the innovation history? What influence do these innovations have on the company?
	Company structure	Is the company conservative, or very innovative? Is it a start-up, or family company or? Is it technology driven?
Team	Attitude towards UCD of team	Has the company a flat structure or is it very hierarchical? Does the company have different departments?
	Motivation for UCD of team	What motivation does the team have to start this UCD project? How does this motivation change during the process? What can/will alter this motivation?
	UCD skills	What are the skills of the design team? What methods do the team members know? What skills have team members gathered in the past?
	Communication	How is knowledge shared in the team? What influences this process?
	Collaboration	How do the team members work together?
Project	Project goal	What is the purpose of the project? What goal does the project want to achieve? What is the focus that the team gives to the project? (very closely related to the motivation of the company and the team involved, but on a project level)
	Implementing results	How are the results of the project implemented within the company? How does the knowledge transfer take place? What does the project mean for the future of the company?
	Process	Descriptive actions that go on in the execution of the project. E.g. the fact that diaries are used, and in which way, or that workshops were the most important elements of the process.
	Selecting UCD method	How is the method for UCD selected? What is the reasoning behind the method selection? Why is the method altered?
	Recruiting users	How are the stakeholders recruited to be involved in the project? What problems occur?
	Game changers	What aspects are of great influence during the execution of the project? What unanticipated events (process step or insight) can make or break this project?

Table 5.1: An overview of the used themes and codes.

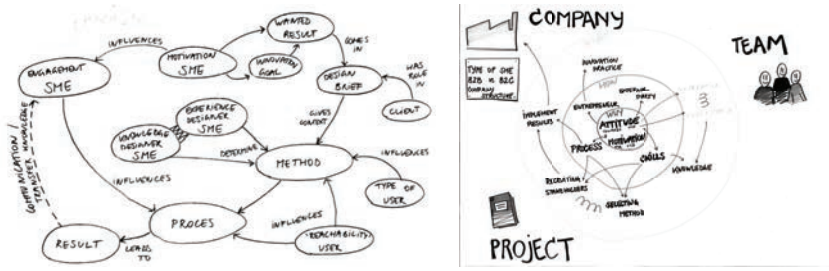


Figure 5.6 Using factor-based coding and causal diagrams to analyse across the cases. Different formats enabled to explore different levels of analysis and unravel relations amongst codes.

Structuring the gathered knowledge was a collaborative effort. During planned activities of analysis I invited other researchers to participate. To analyse the cases of the Pressure Cooker project ten different researchers were involved (eight of which were actively involved in the collection of data, two were invited to support the analysis). For the cross-case analysis, both promotors were involved. Whenever a research phase was finalized other research colleagues were invited to support reflection on the findings. In the analysis, I started by coding, breaking down, and categorizing the data with the support of both promotors. We identified the constructs of interest, and then specified their sub-dimensions and properties through the identification of major themes.

To come to a shared understanding of the study at the closing event, all cases were evaluated by means of a roadmap of the process (see figure 5.7 and 5.8). Through the group-procedure of making the roadmap, discussion was facilitated and knowledge became explicit. Later on, these roadmaps were used as a basis to compare all the cases.

Figure 5.7: One of the project teams making their roadmap. Through discussion, the team made their different perspectives explicit.

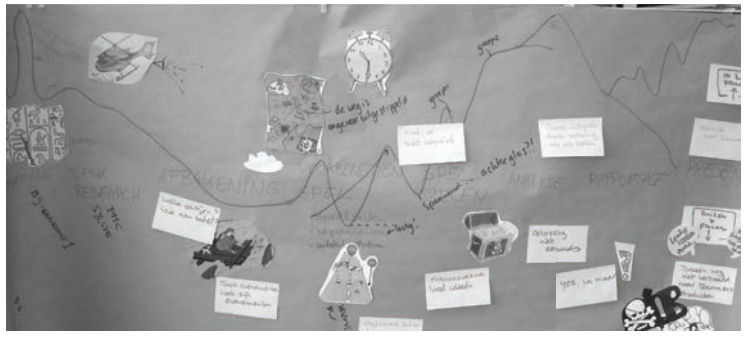


Figure 5.8: A roadmap made by one of the project team. The roadmap depicts important moments as well as 'highs and lows'. Most roadmaps display a difficult start.

Figure 5.9: Discussing the Co-Design Pressure cooker with the entrepreneurs and designers from the SMEs. What did they learn? What did they get?

Figure 5.10: Discussing the Co-Design Pressure Cooker with the designers and UCD-experts. Some of the addressed topics were: how is working with SMEs different from their usual clients, to what degree was active user involvement achieved?

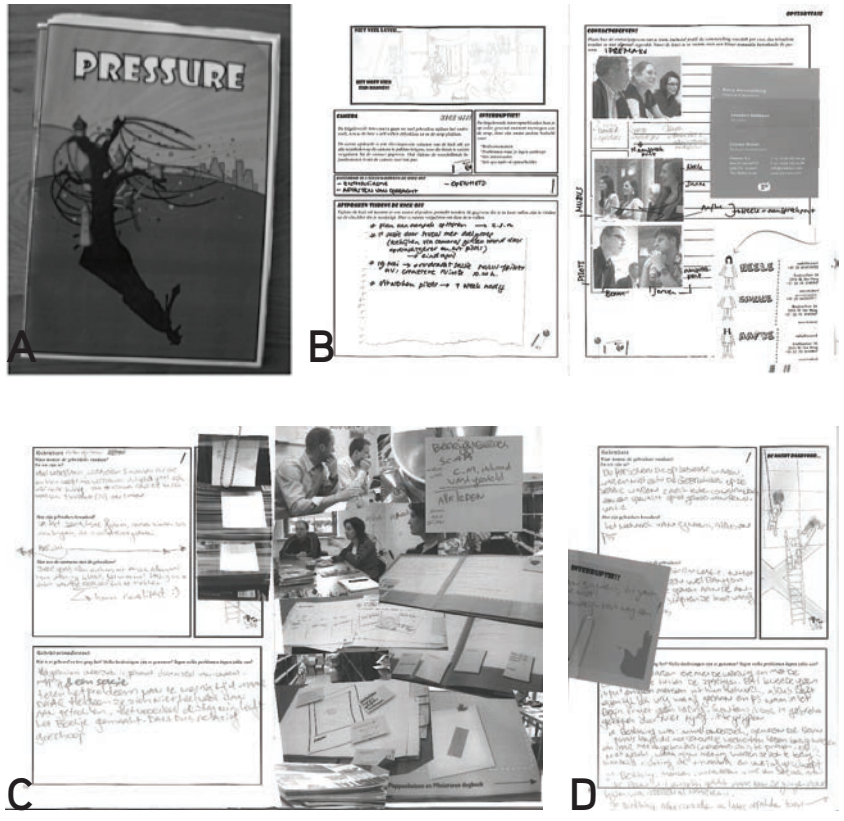


Figure 5.11: The research journal for each of the eight researchers. The front cover (A), inside the journal an overview of the team (B), making notes with accompanying pictures of the moment (C). A red card indicated something important happened at that time (D).

Figure 5.12: Case analysis with all the researchers using the roadmaps.

5.4 — Ten cases

On the following pages each of the cases will be discussed in detail. Each case has four phases:

- starting with the case,
- involving users,
- developing concepts and
- results.

The descriptions contain the following elements:

- background on the SME,
- the design brief,
- a description of the process,
- the UCD method used,
- overview of the gathered user insights,
- what stands out for the specific case
- the enablers and obstacles the project team encountered.

Table 5.2 on the following page provides an overview of all cases, the type of product they dealt with, the composition of the team, why the SME participated in the Pressure Cooker and what makes the case interesting. ‘The team’ refers to the involved employees of the SME, the design agency as well as the UCD expert.

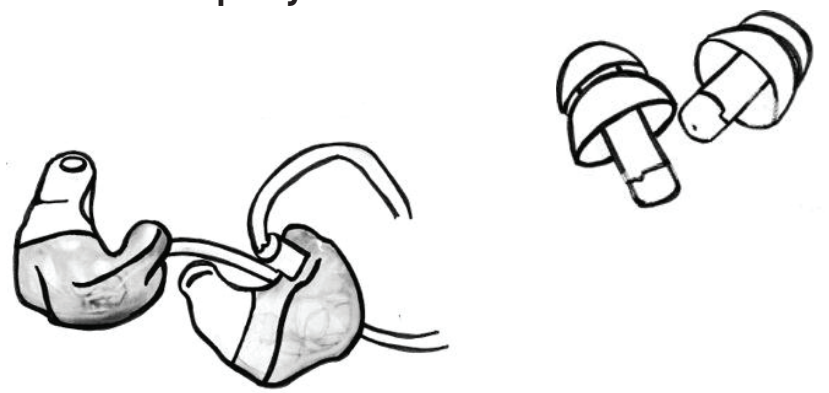
SME	Type of product	UCD method	Design agency	UCD expert	Motivation of SME	Interesting because...
Alpine	Hearing protection	Probes, Genarative techniques	Koen&Co	Muzus	Tone of voice for sales, Get to know the users (better)	Involving users can have a strategic impact on the company.
Alrec	In-store displays	Probes, Contextual design	Vormers	P5 consultants	Get to know the users (better), How to deal with clients?	Getting to know the users provides a strategic advantage during pitches for clients.
Bammens	Garbage collection	Design game	Flex | *the Innovation Lab* and Blauw Research		Get a fresh perspective on their current business, get to know a different context for their current products	User insights confronts SME with other directions for the future: do they want to move away from their current practice?
BAT continental	Renovation equimpent for buildings	Contextual design	P5 consultants and Aldus Bouwinnovatie		Develop a closer relationship with users. Get to know the users better.	Complex industry, lack of overview on design brief and stakeholders and lack of engagement prevented team to apply UCD methods.
Difrax	baby products (mainly plastics)	Probes, questionnaires	WeLL Design		Explore and experience other ways to involve users in the design process.	Learning to extend existing constacts with users.
Jansen Medicars	Medical carts for surgery	Contextual design	WeLL Design		Evaluate an already present concept within the company, check whether the current way of development provides concepts desired by the various stakeholders	UCD offers a means to collaborate with other companies to develop a long-term vision for the entire context of use.
Premaxx	Baby products (mainly fabrics)	Probes, Genarative techniques	Pilots Design	Muzus	Explore new opportunities in the market	The problem of the users as assumed by the SME appeared not to be a problem at all.
Scala Publishing	Magazines	Probes, Genarative techniques	Crown communication	31 Volts	Get to know the user (better), explore new ways of involving their users	Co-designing the 'product' through a close relation with users.
Schilte	School furniture	Contextual design	Scope design	Barry Koperberg	Explore new opportunities in the market	Getting to know a new context that opened up die to a change in legislation.
Verheul Trappen	Custom-made stairs	Contextual design	Koen&Co	31 Volts	Find opportunity to get returning customers. Explore new opportunity in the market.	Building a long-lasting relationship with users through services.

Table 5.2: Overview of the cases, their type of product, the team composition, the motivation of the SME to participate and why the case is interesting.

Case

Alpine

Involving users can have a strategic impact on the company



Alpine specializes in hearing protection. At first they targeted road workers but now produce hearing aids for a wide variety of applications. The company as a whole however, is still oriented towards the worker on the road. This case investigates the use of hearing protection by musicians. In order to bring the needs and desires of musicians to the surface probes and generative techniques were used.

Background:

Alpine is the largest producer of universal hearing protection with an acoustic filtering system. With only 11 employees, Alpine sells its products in 32 countries. Their products are used for: protection for road workers, playing music, sleeping, motorcycle riding, hunting and shooting sports, protection for kids, travelling, going out at night and renovating. Alpine produces and designs hearing protection in-house. The products are sold through wholesalers and music stores.

Usual target group of Alpine: streetworkers (left) and making custom-sized ear protection (right).

In 1994 Alpine started producing hearing protection for road workers. As the company grew and other applications of hearing protection were added, Alpine lost contact with their users. Now they wanted to get back in touch with their different target groups, more specifically with musicians.

> The entrepreneur of Alpine: *"I firmly believe in the importance of involving users, just like the large companies are already doing. You cannot ignore your users. I believe there is nobody that doubts this. My question is to which level co-design can be applied by small companies and what it can bring to us."*

Not only the musicians are an important stakeholder for Alpine, also the owners of music shops are a valuable kind of stakeholder to look at. They sell the hearing protection to musicians and in doing so are the first representative of the company. The initially goal was to include both types of stakeholders throughout the process. Due to time and budget constraints, Muzus and Alpine chose to only get more in-depth insights from the musicians.

> The entrepreneur of Alpine: *"We know how professional musicians handle hearing protection tools and we would like to expand our knowledge on amateur musicians' perception and experiences with these tools. This knowledge is required to better adapt our supply and marketing to the target audience."*

Alpine had no experience in User-Centered Design (UCD). They teamed up with Muzus (a user-centered design agency) and Koen&Co (an industrial design agency). Muzus has four employees, all with a design background and experts in the use of probes and generative techniques.
Koen&Co is specialized in consumer products and electronics casing made of plastic. They also employ four people. Koen&Co has no experience in involving users as they focus on engineering and production of products. They are part of the project team to translate the user insights into new products.

Starting the case

Muzus took the lead in the first half of the design process and suggested the approach. Then they held a creative session to communicate the insights to the Koen&Co. From this creative session onward, the design agency took the lead. Muzus was involved in the design process to safeguard the user perspective during the concept development.

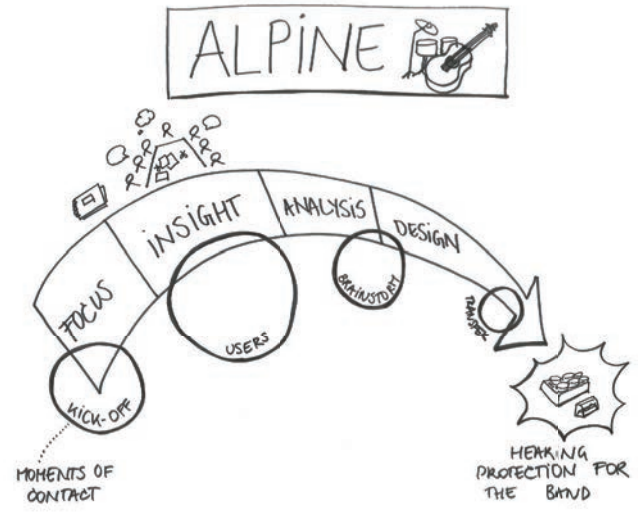
Face to face meetings with Alpine and Koen&Co took place at four different moments of the design process:
- at the kick-off of the project to discuss the design brief,
- when the musicians went to Muzus to discuss hearing protection,
- once the insights from the user session were analysed, to brief the design agency and
- at the end of the design process to communicate the developed concept.

The first moment of contact was all about getting to know each other and framing the questions from the design brief. Muzus took time to further explore the current understanding of Alpine by asking questions like "Why did you choose this target group?" and "What it the actual question you have?".

Muzus says about the kick off meeting: *"When you have more time to get to know the context, the company and the product you get a better sense of what is of interest. Normally we do this more extensive, but now there was a specific question that we only could question to a limited degree."* At first, Alpine was giving Muzus a free hand for the project. They were relunctant to provide a lot of input and and make the most out of the project. Alpine: *"We have given you our design brief, we wait and see what comes out."* Alpine was not prepared to spend more time discussing the design brief. As the case progressed, Alpine recognized the value and became more engaged.

Involving the users

Muzus chose to use the UCD methods they have experience with: probes and generative techniques.



An overview of design process of the Alpine case with the four key moments indicated.

The probes enable the users to reflect upon what making music means to them. The UCD method provides rich information on the context of use by pictures taken by the users. The generative techniques bring tacit and latent information to the surface. Based on these insights the users co-design their future hearing protection using the material provided by Muzus. The user-group dynamics enabled the users to build on one another's stories. Muzus made use of their own personal network to find musicians willing to participate. This proved to be difficult and laborious especially finding a good balance and diversity amongst the users. Muzus rebuilt a band by inviting musicians each from a different band and with different musical backgrounds as well as having a different musical contribution in the band (e.g. singing, guitar, drums, pianist). By putting together a new band, the dynamics between the different members of a band became explicit.

Using probes as preparation for and generative techniques during the workshop with users.

Both the entrepreneur and the sales director of Alpine were present during the workshop. They observed the workshop from another room using a live stream video after the workshop, during the evaluation, they had the opportunity to ask questions to the users.
Muzus provided Alpine with a structure to make notes during the workshop. The notes and observations of Alpine were discussed with Muzus after the workshop.

> The entrepreneur of Alpine about the workshop: *"Being able to actually meet our users, being able to ask them questions directly and observe them is fantastic! I realized how important the rehearsal room is for musicians and how hearing protection has an important value for these musicians, not for protection, but for having an improved music experience."*

Muzus analyzed the acquired insights and put together a report with quotes, pictures and sketches from the users grouped into themes as observed and defined by Muzus. They use quotes because: *"They represent what moves users, it contributes to the communication of the user experiences and building the story."* (Muzus). Next to a report, Muzus made four personas. Each persona represented one type of band member.

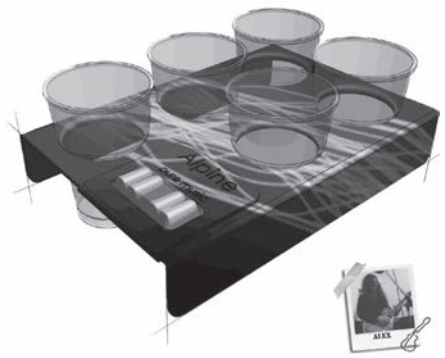
Communicating the user insights at the start of the creative session using a report and persona's.

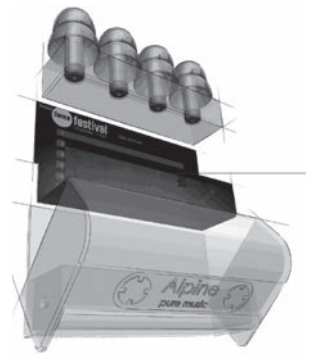
Developing concepts

In a creative session Muzus communicated the results of their analysis to Koen&Co and Alpine. As Koen&Co was not present during the contact moment with users, Muzus had to deal with a large company approach, putting extra effort in the communication of results to ensure the design agency could make use of the gathered insights. Muzus: *"We spent a lot of time in the transfer of the insights. We not only wanted to hand over the user insights, we wanted to make a big step towards concepts together. Communicating the insights in person is essential to us to give all relevant information. Using the quotes and the pictures, the designer gets empathy for the users."*

The observing researcher: *"Muzus had the feeling that they needed to defend the user perspective and remind the designer about the user. They noticed the designer needed a clear briefing. The designer did not like to go through the user insights himself."* The main purpose of the creative session is to move from general directions and themes towards a number of concrete product ideas. During the creative session the marketing manager of Alpine was present next to the entrepreneur and the sales director. Alpine argues that the point of view of marketing is important during the discussion, as the ideas can be checked for feasibility. During the design process itself the marketing manager can simultaneously think about marketing.
For Koen&Co it was quite a challenge to convert the large amount of information chunks into a few concepts within two weeks time. Even though the designer of Koen&Co thought the creative session was very productive, he had hoped to converge towards concrete concepts at the end of the creative session. Koen&Co was especially struggling to determine the most promising ideas.

During the creative session the team realized the main point is not to start with a new type of product, but how the existing products are presented to the new users. A new website was required with a different message. Next to this different user approach, other concepts were developed, some focused on musicians practicing as a band, others on musicians visiting music festival. For musicians it is not about blocking sound and protecting their ears, it is about improving the music experience. Hearing protection that enables to better hear the music, allows to better practice together. This shift in thinking about the functionality of the product had a big impact on the SME.





Concepts for hearing protection at music festivals or during band practice.

Results

The case resulted in a number of concept sketches. Besides the sketches, several directions and ideas were left untouched providing many future opportunities. Alpine: *"There is one really good concept and one worth considering. We are going to see if we can put the good concept on the market."* The marketing manager of Alpine: *"I have never been in straight contact before with users. We do too little with our markets. The only contact we have is feedback from wholesalers and on fairs. "*

The results from this case are used in an elaborated quantitative research

project in 500 music stores. The input gathered from the questionnaires from the follow up study, is used in further plans aimed at music stores and in rehearsal rooms (the insight to do this stems from this case). Alpine sees and confirms the value of having real contact with users. They acknowledge they had lost touch. Muzus: *"One of the people of Alpine told us that this case was a good wake up call for them. They realised that there are opportunities to sell directly to users using a webshop [1], excluding the wholesalers. This way they are able to get direct feedback."*

> The entrepreneur of Alpine: *"We got more opportunities than expected and a huge market we underestimated. All of this with new enthusiasm for what we do. We now realize that gearing your marketing to your target audience is as important as the very product itself."*

Next steps

Evaluating the case, Alpine indicates that in the future they would prefer a shorter, more intensive project with a better briefing and more focus. As they became aware of what UCD can offer, they are now motivated to invest more time to speed up the process and attempt to get the most out of it. Alpine realized that a broad range of opportunities came to surface of which only a few have been further developed.

[1] In 2012 Alpine had a wide range of products available on special, dedicated website each targeting a different kind of users.

User insights gathered during the case:

The following themes are important in the life of amateur musicians:

— Music is passion
— Music is an outlet, limitations are not part of it
— A lot of practicing but the thrill comes from performing
— Making music is about developing, finding the right tune, adjusting to one another
— Making music is a lifestyle to be proud of.
— Musicians invest in their equipment
— Band members each have their own role in the band
— Communication and playing together is important
— Making music is both hard work and having fun

Hearing protection is about:

— Becoming aware
— No worries
— Limitations
— Emergency solutions

When using hearing protection, it needs to be:

— Preferably multipurpose
— Aesthetic
— Comfortable
— Easy to take along
— Quality

The following aspects are interesting for product development:

— The previously mentioned aspects
— Direct feedback on the volume level (simple and payable dB meter)
— Fits the style of musicians (fitting colours, finish and material)
— Good communication, sufficient knowledge on awareness is lacking
— Buying is an individual activity, using is with the band (pack for the band?)
— Importance of marketing
— Rehearsing rooms have an important role in raising awareness and selling hearing protection. It is the place where the need for hearing protection is the highest
— Informing on festivals seems a good fit, but the necessity to buy might not be obvious
— The appearance of the package is more important than Alpine thought it was.
— Alpine might need to consider a separate website for musicians as they need to be approached differently
- Hearing protection can also be seen as improving the sound experience. The hearing protection enables one to hear music better.

Examples of user quotes:

"As the drummer I am often the bogeyman of volume. It is a lot of emotion that goes along. I can never go 100%. Especially when I am having fun this is a struggle"

"Listening is so important. It is the way we feel each other, how we communicate and under-stand what the others are doing."

"In the past I was not aware of what sounds does to your ears. After having my ears tested I was shocked. Now I am more careful with my ears."

"After practice I am often a little drowsy. Not that a I hear a peep or something, but I do hear rustle."

Muzus used a report to communicate the insights to the designer and Alpine. Quotes and pictures from the users are grouped according to themes like "quality, hearing protection, lifestyle".

Obstacles during the case:

The designer of Koen&Co did not attend the user workshop. As a result he lacked information during the creative session where the concepts were developed.

Due to the time restriction the team could only focus on one type of user. The involved users lacked the diversity Alpine was looking for.

Koen&Co had difficulties dealing with the gathered insights. He did not like to go through the insights himself and struggled to identify what insights to consider and take along.

Enablers in the case:

Muzus has a design background. They are able to analyse the gathered insights with the aim and use of the insights in mind. They use their design skills to communicate the insights in a rich and inspiring way.

The presence of a marketing manager during the creative session helped to not only look at the insights from a design perspective but immediately think about the influence they have on the company marketing.

Alpine became more and more enthusiastic about the case as it progressed. At the end they were engaged and interested. This had a positive effect on the creative session.

In addition to the entrepreneur of Alpine, two other employees were involved (out of a total of 11 employees). This created a lot of support for the case internally in the organization.

Considerations regarding the use of UCD:

Musicians are an easy target audience for participation in the design process. Musicians are creative people that enjoy talking with others about their passion. Muzus remarks that Alpine tends to take the insights too literal, they needed support in dealing with the gathered insights.

Alpine realizes what advantages probes bring to them. They get information from the context of the users, and the users get time to reflect and formulate their thoughts.

The creative session proved to be a good way to communicate user insights and kick-off the concept development. Muzus however, still had to support the designer during the design process. He was unsure how to make use of the insights, missed a sense of security and "feel" with the users. This was due to the fact he had not been present during the workshop with the users.

Muzus changed their standard way of work to fit within the time and budget limitations of the Pressure Cooker project. Their main changes were: less users, only one group of users in one workshop, standard approach (no custom developed generative techniques), basic report, and a shorter analysis.
At the creative session the marketing manager of Alpine was present next to the entrepreneur and the sales director. The viewpoint of marketing proved to be important, as the ideas can be checked for feasibility. During the design process, the marketing manager can adapt the marketing story to the users, which is as important as the product itself.

The entrepreneur of Alpine mentioned that due to the less formal character of the Pressure Cooker and the limited necessary investment, they gave the designer more freedom. If the case had been more formal and more expensive, they would feel more involved and compelled to 'control' the project.

Summarizing the case:

Alpine lacked knowledge on a, for them, unknown group of users. They were approaching these new users in the same way as before. Design probes and generative techniques gave insight in how musicians experience making music, and what hearing protection means in their context. Muzus decided to invite users for only one workshop whereas usually they organize multiple workshops with users. Muzus also standardized their format and materials as much as possible in order to fit the tight budget. By doing parts of the process with the other team members, they could save time on analyzing and communicating the results to the SME.

Two aspects were important for this case: first, due to the collaborative nature, the SME was closely involved as the entrepreneur enabled different employees to actively participate. Furthermore, during these collaborative moments, different employees of the SME recognized the value of the user insights for their work, beyond product innovation. Due to the involvement of different employees of Alpine, the user insights were also used for strategic considerations. For example, different marketing and retail channels for different user types.

Probes and generative techniques proved to be suitable to the context of SMEs but not to be applied by SMEs themselves. These UCD methods do require a skill level that is too high for SMEs to reach without a dedicated UCD expert. The SME specifically appreciated the different perspective beyond their usual way of thinking, the rich insights obtained through the use of the methods as well as the personal contact and stories of the users. The SME became more and more interested in the case along the way and recognized how they could make use of the results across the organization.

Case

Alrec

Knowing the users also provides strategic advantages

Alrec In-Store is one of the main producers of in-store displays in Europe. Clients are brands ranging from Bacardi, Bosch, Canon, Diesel, Geox to Playstation. Alrec has good relations with their clients and retailers but would like to involve the user in developing new products. This case investigates the buying process of "do-it-yourself" users of Bosch. To bring the needs and desires of these users to the surface probes and workshops were used.

Background:

Alrec In-Store, founded in 1958, is a larger SME with more than 200 employees. Alrec develops custom Display, Shop-in-Shop and Brandstore solutions for brands at retail to turn shoppers into buyers. Alrec covers the entire supply chain: development, manufacturing, distribution, installation, maintenance and recycling. Alrec develops concepts for serial production and one-off projects.

Impression of type of products Alrec makes.

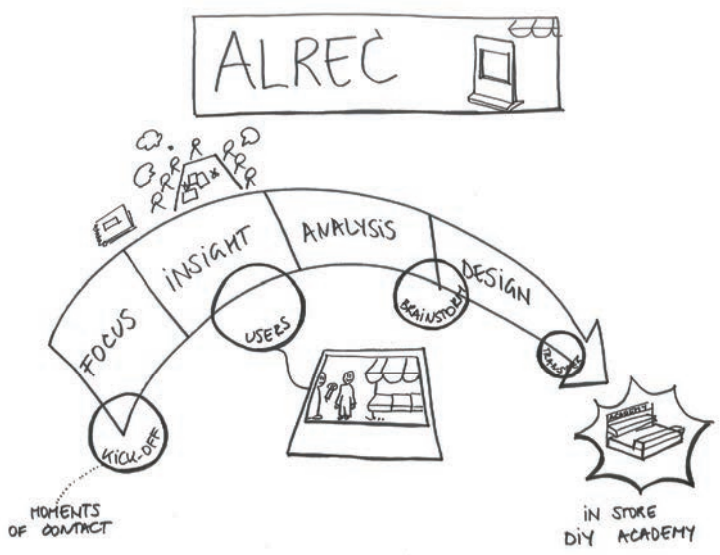
Today they respond to requests of clients, and once approved, the development of In-Store solutions takes only a couple of weeks. For the development

of the solutions Alrec involves retailers to know their design specifications to ensure a fit in the shop. Alrec aims to *"Increase sales by engaging targeted consumers in an interactive shopper experience during the final 5 seconds of their purchase decision journey."* Alrec has good relations with their clients and the retailers, but the person that walks around in stores and is influenced by their displays is unknown. The consumer is not involved in the design process investigating how they can be engaged for an interactive shopper experience. Alrec does not know how their in-store solutions conform to the entire shopping experience. Alrec is interested to learn what contribution a user can bring to the design process. They recognize the added value it can bring to their products and their clients. Many of the projects of Alrec are developed in a short time span and start at short notice. Alrec decided to use an earlier case for Bosch as the context for this case. With the Pressure Cooker project they could see how UCD delivers different results.

> The entrepreneur of Alrec: *"We expect to get a new business case that we can show to future clients. With the aid of the graphic design agency we will be able to move from offering a product to an experience. The main difficulty will be to make use of the user input while keeping our clients into account."*

To support Alrec, P5 Consultants and Vormers were teamed up with Alrec. P5 Consultants is a two-person consultancy with a background in industrial design and human factors. They are experts in contextual design. Vormers is a communication agency of about 25 employees with expertise in in-store solutions. They supported Alrec in translating the gathered user insights into an experience on top of a product.

> Project manager Alrec: "Developing the right design brief was very important to us: what did we want as a result? We have been on the phone regularly to discuss the brief. From the start we were actively involved. From the moment your design brief is determined, you become more motivated."



An overview of design process in the Alrec case.

Starting the case

P5 consultants took the lead at the start of the design process and suggested the approach. Once the user insights were collected and analysed, Vormers was brought in for the development of an in-store solution for Bosch. There were regular meetings with Alrec during the process:

- at the kick-off of the project to discuss the design brief,
- to further discuss the brief and get to know the company,
- to support Alrec to approach users, for the session with the users at the Alrec office,
- to inform Alrec once the insights from the user session were analysed and
- at the end of the process to discuss the developed concepts.

P5 Consultants used this opportunity to try out probes in combination with contextual design. The probes enabled users to reflect on their buying process and use this as an input for a workshop where they shared their insights. Contextual Design was used to gain insights from the retailers in context. In two separate workshops users co-designed a new in-store solution for Bosch.

Due to time and budget limitations, P5 consultants did not recruit users as usual. They made concessions in the recruiting rather than in the use of the UCD methods. Normally P5 Consultants recruits users for a project. Here, as they involved employees from Alrec that regularly perform "do-it-yourself" (DIY) activities, the project manager of Alrec approached the employees. This caused a snowball effect as employees involved people from their personal network. For each of the workshops about 5 users were invited.

> P5 Consultants: *"I was worried the employees of Alrec that participated could be biased, but it turned out not to be the case. By the use of probes we were able to let the employees step out of their world and focus on their own personal experiences as users. If we would have invited Bosch employees to do the same, they would have been biased."*

Involving the users

All users received a virtual coupon to buy a new DIY tool. With the help of a probe they were asked to keep track of their buying process: the sources of information they used, what they were looking for, how their decision changed and how they felt during their buying process. This was used as input for the two workshops and formed the basis for developing in-store solutions together.

> Project manager Alrec: *"We realised that by the use of probes we were able to get information from users that we could not get by asking users straightforward questions without preparation time. It was great to get a survey of all decisions taken in the buying process"*

> Manager of Alrec: *"During the workshops users were thinking along in developing in-store solutions. This really brings valuable underlying needs to the surface!"*

After the two workshops, P5 consultants supported Alrec in approaching retailers to interview them and consumers that were visiting the shop. They experienced difficulties in preparing for the interviews and get the time and the approval of the shop owners to film and interview users in the store. Only in two stores they were able to have interviews. Normally P5 consultants conducts 5 interviews in and with companies. The insights gathered from the interviews confirmed the findings of the workshop.

The probes were used to support the users in tracking their buying process.

The two workshops with the users started by discussing their probes. This provided a common basis to continue from. In the next step the group co-designed the interior of a shop.

> Project manager Alrec: *"The users got for example a display and were asked 'What do you want to see here?' Or we gave them different items such as tools and accessories and asked how they would like to have them organized, what kind of information they needed. By continuously asking questions, the users were able to develop the in-store display together with us. The arguments of their choices taught us what was important. You could see P5 Consultants had been doing this before, they were experienced in this"*

P5 Consultants analyzed the abundant information acquired during the workshops. As everything was recorded with two cameras, they compiled a video with short clips. The information was transformed into a collection of user quote cards.

The two workshops with users where the probes were used as input to co-design in-store displays.

Developing concepts

The initial idea was to also invite the retailers and clients of Alrec for a workshop. As the interviews at the shops already proved difficult, the team instead decided to invite designers from Alrec and Vormers. In this workshop P5 consultants presented the results of the two workshops and the interviews with the composed videos and the quote cards.

> P5 consultants: *"Usually we create an extensive presentation where everything is presented one by one. In this case we had to draw conclusions "on-the-go". Alrec soon started to scale the quote cards according to "good and valuable". Because of this, some insights were ignored and the analysis became a one-on-one translation of the quotes."*

Afterwards, the team realised that the analysis had been taken too lightly and that the meeting was too short for its purpose. The team indicated they regretted the lack of time taken for the analysis. Vormers: *"Usually we get a real clear briefing and direction from our clients. In this case we got a big cloud of information that we still had to narrow down. This asked for a big adjustment for us. We realised too late that we had to take more time for the analysis with P5 Consultants. But we were also more inspired by the abundant insights."*

Results

Vormers developed based on the conclusions from the analysis session an integral concept for a Bosch Academy. In order to explain the concept to Bosch, they also proposed different kinds of media such as leaflets and posters.

The Bosch ACADEMY, an integral concept where DIY'ers can find information about the types and use of tools and a flyer communicating the use of the concept.

Next steps

Alrec will present the concept to Bosch. Manager Alrec: *"Bosch will surely appreciate the overall concept. It has many tangible aspects to it. There might be the chance that Bosch thinks the overall concept is a bridge too far, but the tangible ideas of product placement etc. compensates this."* The manager of Alrec indicates the case has showed how they can use this user perspective for future clients: *"We can now say that we know what their users look for. This gives us a strategic advantage."*

At the end of the Pressure Cooker, Alrec approached P5 Consultants to be a coach for future projects, as they wanted to learn how to perform contextual design in the future. The approach of the case lead to changes within the practice of Alrec: more attention to the user and other points of focus in designing in-store solutions such as providing information and supporting the buying process.

Insights and quotes gathered during the case:

Subjects:

— Profile of handyman

— Criteria of choice when shopping

— Furnishing

— Communication

— Needs of shopper

— Needs of retailer

— Personnel

Shopper quotes:

"This is great because I immediately have an information desk with someone that guides you in your search"

"I always look for this guy because he really thinks along with me and can give me advice on the job to be done"

"It's strange that you get directed to the internet for more information when you are in the store."

"It took like forever until I got someone that knows what he is talking about!"

"I want to feel how much the sanding machine vibrates!"

"It's just not logical how the machines are positioned, all the different qualities are messed up"

"Its annoying you can not take flyers and other physical information with you home."

"It s so badly lit I can not read what is on the bottom boxes"

"I'd like to have sanding paper colour coded so you immediately know what kind fits in your machine.

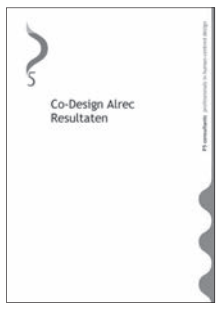
Retailer quotes:

"The appliances only work when there is a sales person"

"It is important to be able to see through the in shop store"

"Good to have someone specialized that can answer questions"

"It can quickly turn into chaos when people can try out products"



P5 consultants shared the insights with Alrec using videos, quote cards and a report.

Obstacles during the case:

Due to budget and time limitations, no recruiting of users as usual for the UCD experts. They involved employees of the SME as user.

Limited input from retailers due to restrictions in interviewing and filming users and retailers in context.

Limited analysis due to time limitations and perception of SME. They experienced difficulties thinking on a more abstract level beyond the user quotes.

Enablers in the case:

The SME quickly realised the potential of the user insights.
The SME was engaged and involved from the start of the project. They collaborated with the UCD expert to adapt the case to the time and budget restraints.

Probes supported the employees of Alrec to get into their experiences as a user and prepare for the workshops.

The designers did not attend the workshops. The videos compiled by the UCD expert enabled them to get the user insights.

Considerations regarding the use of UCD:

The main challenge of the analysis lies in taking the users insights to a more abstract level and the manager, who wanted to go into the development of concepts. The UCD expert played an important role in overcoming these difficulties and **forcing the team to take time for analysis**.

The UCD expert took **extra time to visit the company to frame the design brief**, to get to know each other and set the right expectations. The UCD expert argues that it made it easier to set up the rest of the process.

The UCD experts **took the opportunity to use probes**, an unfamiliar UCD method, to support employees in tracking their buying process and disregard their work environment.

The **employees of the SME** were invited to reflect upon their personal user experiences which proved to be a valuable source of information. The UCD expert took measures to prevent bias and enabled employees to become users by the use of probes.

The SME realizes the **advantages probes bring**. They get information from the context of the users, and the users get time to reflect and formulate their thoughts. Making use of probes is a big hurdle to take. The SME lacks the skills to do so, the help of a UCD expert is mandatory.

The active involvement and participation of the SME created a good vibe. The **SME took over part of the tasks/responsibilities of the UCD expert**, which accelerated the process.

The UCD expert needed to **change the initial plan** and accept that fewer retailers could be involved. They decided to transform the workshop with retailers into a joint analysis and brainstorm session.

The UCD expert used **video as a way to represent the user** during analysis and brainstorm and to communicate the user perspective to people not present at moment of contact.

Summarizing the case:

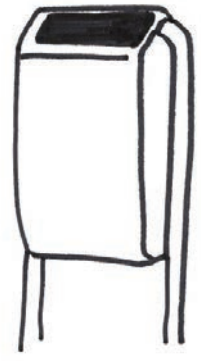
Alrec realized they were missing the user perspective when designing their products. They know their clients and the retailers where their products are placed well, but lack information on the buying process of users. Alrec made us of one of their past projects to explore how they could apply UCD in the future. P5 Consultants invited employees of Alrec with DIY experience to participate. With the help of probes, employees were able to disregard their viewpoint as an employee and keep track of their personal buying experience. This was used as input for two sessions with users. Interviews with retailers in collaboration with Alrec took place. In a brainstorm session with Vormers the insights were communicated and ideas were formulated that were further developed by Vormers. The main changes P5 Consultants made to their usual process are the use of probes to support the employees, reducing the number of sessions with users, the time for analysis and an extra loop to check the insights with users.

Probes proved to be suitable to be applied in the context of SMEs. The SME was already taking first steps in interviewing themselves with the support of the UCD expert during the case. However, applying Probes and organizing brainstorm sessions require too many skills for the SME to apply themselves, but do bring the type of information the SME is interested in. The SME specifically appreciated the different perspective beyond their usual way of thinking and the opportunities the user insights bring towards their clients. At the end of the case SME approached the UCD expert to coach them while taking further steps in doing user interviews (of both end users and the retailers).

Case

Bammens

User insights give SME future directions



Royal Bammens BV is specialized in garbage collection. They produce steel bins and containers to collect garbage on streets, from households and companies. They are interested in exploring how garbage is collected in other places. This case investigates a new market for the company: garbage collection at events. Design games were used to uncover the needs and desires of visitors and event organisers.

Background:

Royal Bammens BV, since 1850, delivers solutions for household and corporate garbage and litter and is market leader in the Benelux for aboveground and (semi-) underground garbage collection solutions. Bammens is a Dutch company with 161 employees located in Maarssen. Development, production, installation and maintenance takes place at one location. Bammens has the ISO 14001 environmental certificate.

Product manufactured by Bammens (left) and context of this case: temporary events (right).

Royal Bammens sees market opportunities in garbage collection at events. For events like village festivities, sport competitions and concerts, garbage

collection systems are not adequately integrated. For instance, garbage collectors such as roll containers do not suffice for events. There is rarely co-ordination or co-operation between the producers of garbage collectors, the garbage collecting company, rental organizations for things like temporary sanitary facilities and the organizers of events. How to prevent mountains of garbage after festival and events? This question was the starting point of two design games organised by Flex | *the Innovation Lab*: one for event organisers and one for visitors.

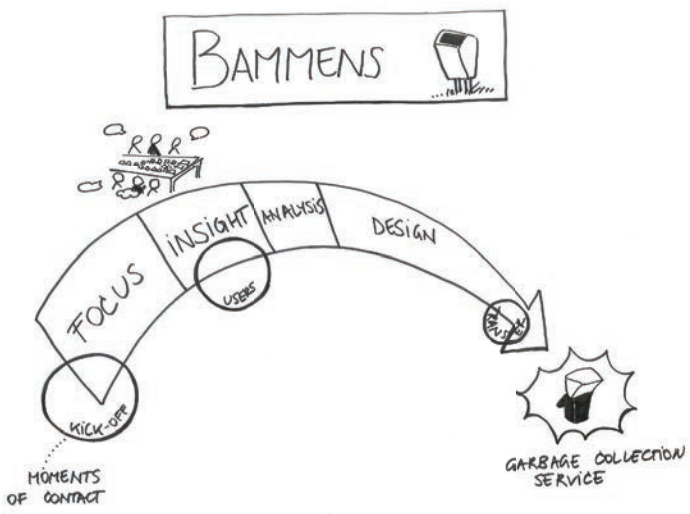
> The Product Development Manager of Bammens: *"When the Syntens advisor approached us about the project we saw the opportunity to explore a new market. We deliberately kept the brief rather general, to be able to grasp the full range of this market."*

Bammens had no experience with User-Centered Design (UCD) and teamed up with Flex | *the Innovation Lab* (a design agency) and Blauw research (a research agency with whom Flex partners for their market research capabilities). Flex | *the Innovation Lab* has twenty-five employees primarily with a design background. They iteratively developed their own design game. Blauw Research has 120 employees in three locations (Rotterdam, London and Nurnberg) Blauw Research focuses on qualitative and quantitative market research using for example gamification, social media research, communities and Lego® Serious Play®.

Starting the case

Flex | *the Innovation Lab* and Blauw Research took the lead throughout the entire design process and suggested the approach. There were face to face meetings with Bammens at four different moments of the design process:

- at the kick-off of the project to discuss the design brief,
- when the visitor design game was played
- when the event organisers design game was played and
- at the end of the design process to communicate the results to Bammens.



An overview of design process of the Bammens case with the three key moments indicated.

The kick-off meeting was about the partners getting to know each other and framing the question of the design brief. Flex | *the Innovation Lab* and Blauw Research took time to further explore the current understanding of Bammens by asking questions like "Why did you choose this target group?" and "What it the actual question?"

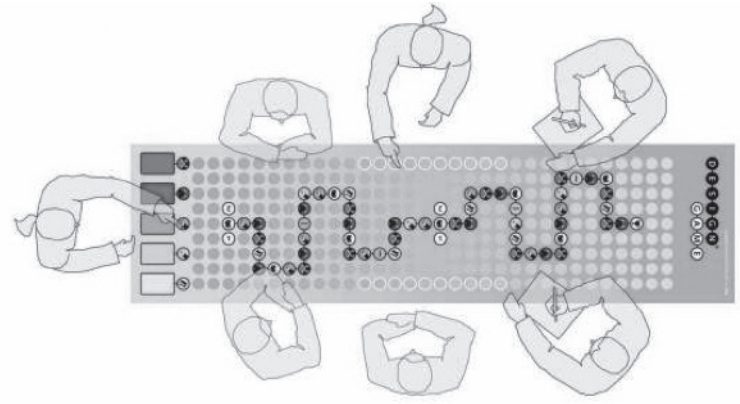
> Flex | *the Innovation Lab*: *"We had a very elaborate kick-off meeting with many people of Bammens (ed. Total of six people from Bammens attended). It was a quite long meeting, we had twice the time compared to the other cases. It was an intensive discussion to get the boundaries of the design brief clear. It turned out they did not know the market well. It was for them a first exploration. That is fine, but we like to have it focused."*

After the kick-off meeting Blauw Research explored the market of events by doing desk research, defined the different types of relevant users and developed a design brief with Bammens. Then Blauw Research prepared the two design games by looking for users in their network and preparing the questions of the design games. With the limited time available they did not manage to visit Bammens, all contacts were by email or phone.

> The researcher from Blauw Research: *"The Design Game is almost like a machine; you put the questions in the machine, add users and turn it on. The questions are very important. During the game, we anticipate on the answers and if necessary make adjustments to the questions."*

Involving the users

Flex | *the Innovation Lab* chose to use the UCD method they are experienced in: design games. A design game provides users and designers a setting that helps them to come up with experiences and combine these into ideas. The designers help the users in visualizing their ideas. The group dynamics enable the users to build on each other stories. A variety of stakeholders can contribute to the development of garbage collection. With the time constraint, the team chose to only include visitors and organizers of events. Blauw Research and Flex | *the Innovation Lab* recruited visitors and organizers of events in their own network. The team aimed for a diversity of events and people.



Applied UCD methods: design game developed by Flex I *the innovation Lab*

Project manager from Flex | *the Innovation Lab*: *"It was a rather broad topic with many different target audiences and that was though. It was a pity we could not include municipalities. Usually we work with consumers, and use a selection agency that gets paid. And then you can ask for some more. Here it is different, because the users are stakeholders from the client."*

Researcher from Blauw Research: *"I called some of my contacts at event organisations to find out how it works and how it is set up. Bammens did not know anything about it. So we started from scratch. Based on these contacts we decided on the kind of people to invite for the design games."*

The first design game was played with event organizers, the second with visitors of events. Flex | *the Innovation Lab* invites users to talk about their experiences.

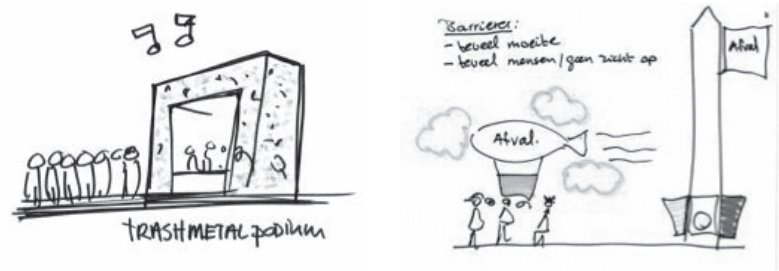
Flex | *the Innovation Lab*: *"The first group is always a little bit more difficult as you are yourself are still a little unfamiliar to the topic. So it's more scanning, a little more analysis. We changed the questions after the first game based on the initial responses and of course because it is a different kind of group."*

One of the event visitors says about playing the design game: *"It was intense, exerting and fun to hear and see other visitors about their experiences. All brakes were loose in spouting ideas, on a given moment we were unstoppable. At the end I was completely exhausted!"*

Playing the design game twice: once with visitors, once with organisers of events.

The design game was not video recorded, a researcher of Blauw Research took notes. Five employees of Bammens were observing in an adjacent room through a see-through mirror. After each game, the entire team evaluated the design game. Through this evaluation Blauw Research and Flex I the Innovation Lab knew what insights could be most valuable to Bammens.

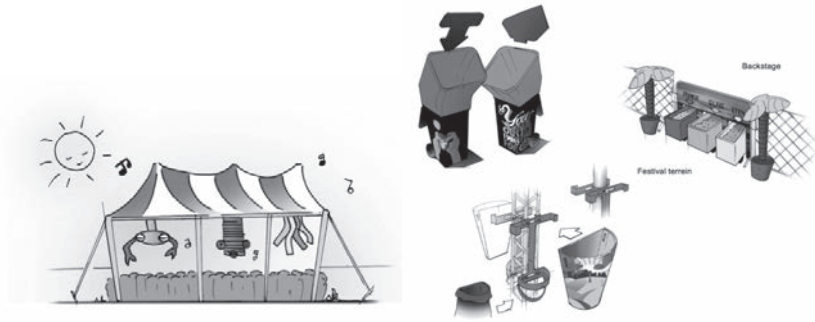
A designer of Bammens says about the design game: *"Being able to actually meet our users, being able to observe them is fantastic! The design game created energy not only amongst the users, but also amongst us. It gave us energy to explore this market further."*



The result from playing the design game: different sketches of ideas.

Developing concepts

The designers of Flex | *the Innovation Lab* continued with the developed ideas. They analysed the different ideas, made a selection, explored them in more detail and turned them into concepts.



Concepts for garbage collection at music festivals or during band practice.

Results

Some of the eight identified trends coming out of the case were converted into concept sketches, ideas for garbage collection. Several trends were left unexplored providing many future opportunities. Flex | *the Innovation Lab* presented the entire process to a large group of employees of Bammens (a total of fifteen was present). The presentation covered background information on Flex | *the Innovation Lab* and Blauw Research, the design game, the eight identified trends and the related concepts and ended with recommendations for Bammens for the future.

Project manager from Flex | *the Innovation Lab*: *"You saw that they had difficulties to translate the concepts to actual Bammens products. They will need some help. Normally that is the follow up we do in a next project. One of the conclusions was for Bammens to consider delivering services, and there were many employees that heard that for the first time. This led to a lot of discussions. There were people that wanted a bin, and we were there with ideas and services and a segment they had not really thought off yet."*

The Product Development Manager of Bammens: *"We really took the opportunity to explore, and we found out that the landscape of our problem definition is really diverse and that is an answer in itself. There were people internally that said that we still do not know what kind of garbage collection we have to make. So that's*

a challenge for us know: how to continue the internal process and how to sell it to others. Or make sure that the low hanging fruits we see are also recognized internally."

Question: *"How would you try to get internal people involved?"*

The Product Development Manager of Bammens: *"What might work for us if we invited some employees and visitors to play the design game at the company. So the enthusiasm that we got from looking at it also gets to them."*

Next steps

First some internal steps and decisions need to be taken as many of the proposed trends have influence on the company's strategy and the conduct of business. This was an outcome they had not anticipated. The results of the Pressure Cooker kicked off an internal discussion on the current product assortment regarding the new insights which have an impact on their vision and strategy. They are exploring whether their current product portfolio or product-service combinations should be their core-business.

A project manager of Bammens: *"We did relatively little with our users, the persons that throw garbage in a bin. We now do more. This project gave us a fresh perspective on our company."*

A designer from Bammens: *"It was a nice process. We got many new ideas and information about a user group we usually do not talk to. Our expectations are met!"*

Flex | *the Innovation Lab* was asked to convert one of the concepts into a more concrete concept that industrial designers of Bammens can further develop internally.

User insights gathered during the case:

"It's all about 'Experience'"

— Garbage collection damages the event experience of the visitors
— "If you walk away to throw away garbage, you cannot hear the music anymore"
— "Garbage collection is located at the least cosy places"
— Garbage collection influences the sensory experience of visitors
— Make garbage collection part of the experience

"Visitors are easy-going, lazy."

— Just dropping garbage is easy and does not harm the visitor. It takes more effort to throw away garbage in a bin.
— Better visibility of garbage collection
— Better accessibility
— Mobile garbage collection to go where the visitor is so they do not need to move

"Seeing clean is keeping clean"

— When the surrounding is clean, visitors tend to make more effort to keep it clean

Make the effort of keeping clean visible *"There is no incentive for visitors to throw garbage in a bin"*
— Increase the reward for visitors to collect garbage

"Garbage collection are extra costs for organizers"

— Motivate the visitors to collect garbage

"Behaviour of visitors depends on the type of event."

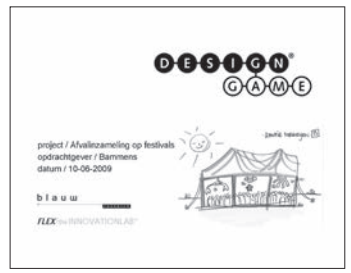
— Change the behaviour of the visitors according to the type of event
— Invite artists to make garbage collection a cultural event
— Make use of garbage collection "themes"

"The location of the garbage collection requires its own solution"

— Different types of events: Indoor, city, moving, outdoor, etc.
— Different places on the event: on access roads to the event, at exits, near toilets, near catering, on the terrain, on camping sites.
— Each municipality has its own rules for garbage collection
— There are different kinds of garbage collection

"Garba*ge is not always negative"*

— The amount of garbage says something about the experience of the festival: "The more garbage at the end, the better the event has been"
— Visitors do not experience garbage as problematic
— Visitors distinguish different kinds of waste: plastic cups and paper are not dirty, food leftovers, glass and cans are considered dirty and dangerous, waste of other people is always filthy.



Flex and Blauw Research used a presentation for a large group of employees of Bammens to communicate the results. Quotes and sketches from the users are grouped along themes like "Experience, Easiness, Seeing clean is keeping clean".

Obstacles during the case:

The case started with a broad briefing leading to a lack of focus. The team had difficulties to explore the entire scope of the briefing.

Time and budget restrictions gave room to only two design games and other stakeholders were left out.

The outcome of the case is beyond the core-business of the company, causing a lot of internal discussion.

Enablers in the case:

There was a high engagement of the SME; at all moments of contact five Bammens' employees were present.

The team evaluated the user input right after every design game. This created a lot of enthusiasm, energy and support for the results.

As designers were present during the design game, the ideas of the users were immediately visualised.

Two points of views/stakeholders were taken/involved in the case giving a lot of information about a broad area of the event market.

Considerations regarding the use of UCD:

Bammens really like the **enthusiasm** and the **energy** created with the users and amongst the employees by the design games.

The **presence of the designers at the design games allowed immediate visualization of the ideas of the users.**

Many employees of Bammens were involved in the case. Still, **the company experienced many difficulties in accepting the results**. They are out of the scope of the core-business of the company. Flex | *the Innovation Lab* does indicate: *"The difference of Bammens as client compared to our large clients, is that they are a lot more involved."*

The number of design games was reduced from four to two to **fall within the time and budget restrictions** of the Pressure Cooker. Usually, Flex | *the Innovation Lab* has a smaller project scope but Bammens asked to explore a new market to gain a broader perspective. In comparison to design games for large companies, about the same amount of time was spent on preparation and analysis.

Flex | *the Innovation Lab* states that they were **not really able to change the format** of the design game as it is a fixed format that has a proven track record and changes might influence the quality.

The team indicated that they did not know the company well enough to frame the findings in the context of the company. They **advised Bammens based on their market knowledge** and not based on their company knowledge. They would do this different next time, to make sure the results fit the context of the company better.

Summarizing the case:

Bammens knows their existing clients well: municipalities and garbage collection companies. They wanted to explore the event market to see what opportunities it presents to the company. Flex | *the Innovation Lab* invited both visitors and organizers of events to participate. Two design games were observed by a group of Bammens employees and evaluated right after the game. The evaluation and the generated ideas provided a basis for the further development of concepts. The main change Flex | *the Innovation Lab* made to their usual process was limiting the number of design games from four to two. The design game does not allow to make any further changes to the game set up itself to fit the context of SMEs, however, the UCD expert indicated this was not necessary.

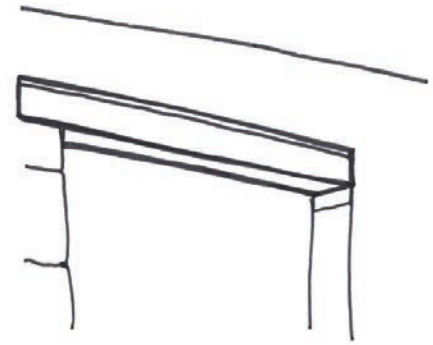
Bammens expected to get a concept for a new type of garbage bin, but received eight trends including product-service concepts on entirely new ways of garbage collection. The company was not prepared for this result and realized the importance of the "experience" and desires of different kinds of stakeholders and their impact. For example: regulation of municipalities concerning cleaning after an event, organizers trying to reduce costs of garbage collection, etc.

Design games proved to be suitable to be applied for SMEs. However, the UCD methods needs to be applied by a UD expert and cannot be applied by the SME alone. The SME specifically appreciated the playful character of the method, the direct contact with the users and the immediate translation with the user of the insights to ideas. The difficulty of the SME in dealing with the result is not related to the use of this specific UCD method but rather to the gathered user insights. The SME did not expect to get insights that would affect the company beyond developing a new type of garbage bin.

Case

BAT continental

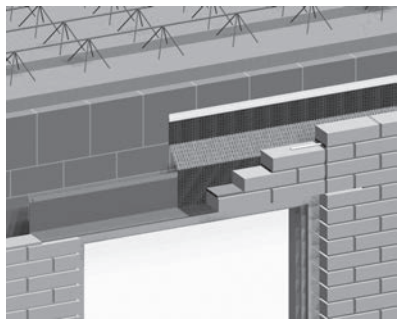
Challenges related to industry & SME prevented team to apply UCD



BAT continental[1] is a company that specializes in steal equipment for masonry activities and custom solutions in the building industry. BAT was mainly active in the market of newly built buildings. With the crisis in the building industry, BAT wanted to explore opportunities in the renovation market. To gain insight of the needs of contractors of renovation sites, the team used contextual design.

Background:

BAT continental is a small SME of about 30 employees that develops, produces and sells standard steal products for masonry such as joists, anchors and armaments. The standard products are delivered to specialized construction wholesalers. Custom made products are directly delivered to constructors.



To spread the risk and with their limited product-range, BAT Continental was looking for new markets. BAT was already actively looking for ways to innovate when they were approached to participate in the Pressure Cooker.

[1] At the moment BAT continental does not exist anymore, they filed for bankruptcy May 2012.

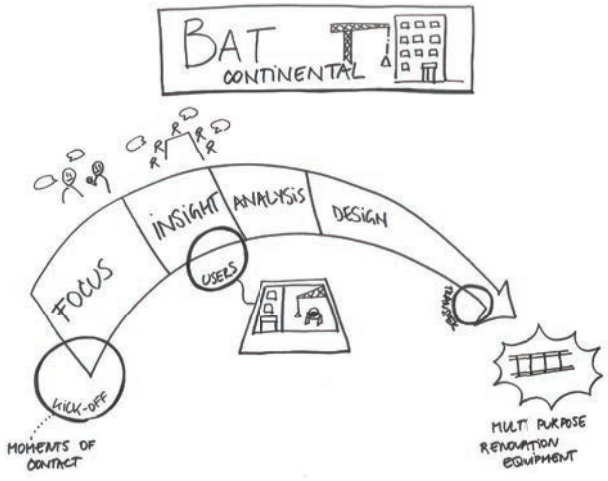
The entrepreneur of BAT: *"We are looking for concrete insights and opportunities in a new market. Where is the inefficiency in the building process? What technical building solutions are needed? What can ease, speed up or improve the building process? We want to focus on the needs of contractors working on renovation or repurposing of buildings and translate these into new product concepts."*

BAT at the time had no experience in User-Centered Design and was very interested to explore new approaches. They teamed up with P5 Consultants (a user-centered research agency) and Aldus Bouwinnovatie. P5 Consultants is a consultancy of two people with specialisation in Contextual Design. Aldus is an engineering agency of 6 people. As the building industry requires expert knowledge to understand its complexity, Aldus was invited to support P5 Consultants. P5 Consultants was in charge of collecting the user insights. Aldus helped to frame the project, discuss the questions and recruit users.

Starting the case

There were face-to-face team meetings at three different moments of the design process:

-at the kick-off of the project to discuss the design brief,
-when the users participated in a workshop to explore opportunities, and
-at the end of the design process to communicate the developed concept.



An overview of design process of the BAT case with the three key moments indicated.

The first moment of contact was all about getting to know each other and framing the question from the design brief. The brief was quite broad and needed focus, P5 Consultants and Aldus attempted to narrow down the design brief. They asked questions like "Why did you choose this target group?" and "What it the actual question you have?". BAT was not very motivated and involved to give input and make the most out of the project. They were struggling to survive in the crisis, dealing with internal difficulties such as layoffs, financial insecurity, personal circumstances etc.

P5 Consultants: *"We went to Aldus, because we were really motivated to make this case work. We tried together to get a clear picture. We did not know how to continue with this case. Right after the kick-off one of the two BAT people stopped working due to personal cirucmstances, and the other one was fired. So they had to find another contact person. That person recently had become a dad so he .... You get the picture. We were just not able to involve the SME as partner in the conversation."*

By email conversations with the entrepreneur, the team was able to get some answers about the context of the company, their market and was able to frame the project somewhat better.

Involving the users

The design brief was aimed at getting to know the market of renovation better. P5 Consultants chose to use the UCD method they are experienced in and would enable them to get to know this specific context: contextual design. Based on these insights gathered in context, they wanted to invite users to jointly develop new product concepts.

Aldus: *"The building industry has five different definitions of users. Our main challenge was to decide which users to involve and to find users to participate."*

The team experiences difficulties in recruiting users. When trying to involve BAT, the response of the entrepreneur of BAT was: *"I have already paid for this project, and now I have to devote my time to it?"*

The team decided to visit buildings sites guerrilla style, just show up and ask if they could get a tour and ask some questions. The team made for example a bike tour around the area to visit different building sites. On two building sites they managed to get access. They also took advantage of the "Day of the building industry" where building sites open their doors to the public.

P5 Consultants wanted to organize two sessions each with a different type of user: one with executing users such as contractors and planners. The other session with designing users such as architects and engineers. Recruiting users for the sessions proved to be even more difficult than organizing site visits.

P5 Consultants: *"We were experiencing so many difficulties in recruiting users that we wanted to postpone our session till after the end of the Pressure Cooker. During the summer holidays the users indicated to have more time. We realised the building industry is an entirely new context from what we are used to. You need a lot more time to prepare. Syntens called us back, wanting some results by the end of the Pressure Cooker. So we started to call around again within our network and managed to plan one session."*

Making on-site visits to see the products used in context and talk with different kinds of users.

P5 Consultants analyzed the insights acquired during the on-site visits. P5 Consultants and Aldus compiled a report for BAT with quotes and pictures from the users classified into themes as observed and defined by the team.

Developing concepts

The information collected from the building sites was used during the session with people from the building industry that all came from the personal network of the team.

> P5 Consultants: *"We used the collected insights to frame certain things, but that went different than expected. For the session that we prepared we had taken the building process as a starting point as we needed to get a better feeling for it. We wanted to know the differences between renovation and newly build, how do you address them differently as a contractor or an architect? We wanted to take the entire process into consideration, and not just a product. In the discussion we realized that the process is entirely non-relevant. We had to turn everything completely around. If we had a more elaborate meeting with BAT at the start we could have prevented this."*

The session became an interesting discussion with different view-points on construction and renovation. The marketing manager and the Engineering Manager of BAT attended the session. They were able to think along with the users as they understood the preparation side and execution side of the renovation market. They immediately translated the insights into opportunities and ideas.

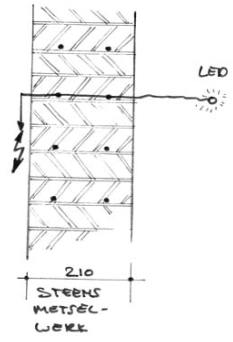
> Aldus: *"We wanted them to illustrate what kind of problems they dealt with on a daily basis and it was interesting to hear how it is different from the perspective of a constructor, an architect and a planner. BAT knows about the preparation and the actual work, so they were thinking along as a designer."*

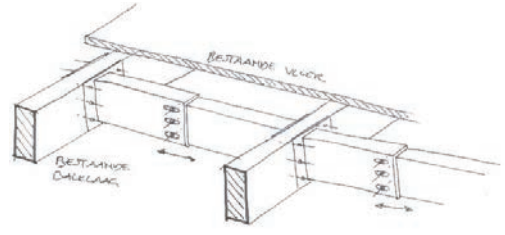
Aldus used their engineering expertise to translate the problems and ideas into directions and concepts.

Results

The case resulted in rather abstract concept sketches and directions for the future related to the renovation market. The main focus was on increasing flexibility on-site for example by combining structural support in combination with increased safety, sound- and fireproofing and insulation.

Discussing the renovation market with different stakeholders and developing solutions together.





Sketches for flexible renovation solutions.

P5 Consultants: *"To get to more concrete ideas, we actually need to do another session with users. We now feel like we know what to ask for, so we can speed things up."*

> Aldus: *"If you combine the building industry and UCD, you get a great match. If you do the same in a pressure cooker, the result is something doubtful"*

Next steps

Evaluating the case, the team indicated that the main problems came down to the current crisis in the building industry, their lack of knowledge of the context and the lack of involvement from BAT. They said: "We have lost a lot of time to frame the question and the kind of users that would be most interesting". The internal, unforeseen events at BAT reduced the SMEs' involvement and had a big impact on the case.

> Engineering Manager of BAT: *"We feel like for us it only just started. We see many new opportunities but we have to take the time to further explore them. Unfortunately these are turbulent times at the moment."*

In the end, the team had the impression that they just got started, but that it was worthwhile the effort to continue. .

> P5 Consultants: *"It appeared to be mainly related to communication errors and stress related to the survival of the company in the crisis., not only for BAT but for all the stakeholders in the building industry. These contextual factors cannot be influenced. Our main contact person kept on going for 100% for our project, but you felt he was on his own. He did not have the support of the company. And now they see what it can bring, he has more support to continue with us."*

Insights gathered during the case:

Visits on two building sites:

Vorstelijk Complex Zuilen, Utrecht
— Renovation and restoration of monumental buildings
— Part new build: theatre
— Public function: music school, meeting house, etc.

Renovation and restoration of the former Jewish Orphanage, Leiden
— Renovation and restoration of monumental buildings from 1920's and addition of 1980's.
— Shelter for mental healthcare.

Observations from visits:

— Surprises during construction, piping, materials etc.
— Unpredictable in necessary adjustments
— Thin floors: floors do not support necessary adjustments, temporary or permanent.
— Anchoring of scaffolds in monumental buildings while the state of the masonry is unknown.
— Tension field:
If renovation = restoration, specific solutions are needed.
If renovation = new build, common solutions are sufficient.
— Dialogue between contractors, constructors, architects and planners needed.

Following aspects came forward during a session with stakeholders:

Architects:
— What concept fits the "feeling" and "character" of the existing building?
— What is the potential?

Constructors:
— What solutions fit the "history" (preserve the original details)?
— What is the current state (real measures, strengths, etc.)?

Specific renovation problems that BAT could respond to:
— Nothing is straight
— Improvise: come up with solutions on the spot
— Dealing with tolerances, measuring and strength
— Improving existing structures (wood and concrete), improve within the existing measures/ volumes.
— Fix and support without damaging existing parts.
— Totally new concepts: visual construction elements (anchors visible, playful), flexible solutions (analogue to Rietveld with flexible use of interior spaces but bearing.

Specific challenges for BAT:

— How to prevent that BAT delivers all specifications and that a blacksmith can deliver cheaper according to those specs?
— How to deliver mass-produced custom work?
— How can you support the architect in achieving their dream (the concept) while the undertaker is looking for certainties (calculations, strengths etc.)?

Recommendations

— Determine a good focus, and develop solutions for specific challenges in co-operation with partners.
— Target relevant problem areas in renovation
  — Support for complex adjustments in renovation
  — Systems that can speed up the renovation building process (for example build dry solutions instead of wet such as with flooring etc.)
— Increase visibility of BAT, literally and metaphorically
— Connect new parties on the market to BAT (through innovation with the introduction of new products and systems)

P5 consultants and Aldus used a report during a session to communicate the findings to BAT. In this report pictures and quotes were used as means to convey the insights..

Obstacles during the case:

The dual role of Aldus and P5 Consultants caused a wait-and-see attitude and no-one took the lead.

Urgent internal/external issues and many changes in responsibilities demotivated the SMEs' representatives.

The lack of involvement of the SME prevented the team to discuss the design brief with the SME, formulate a clear aim and select appropriate stakeholders for the case.

The building industry is a complex world. The team needed an introduction to get started but did not get the required support.

The team encountered difficulties to get access to building sites due to safety regulations and other priorities in the industry (why would they tour with researchers while they are struggling to finish in time and survive). With the limited budget the UCD expert could not use their usual points of access to recruit participating users.

Enablers in the case:

There was a good collaboration between P5 Consultants and Aldus. They shared interest in the case and got along well.

P5 Consultants and Aldus realised that the building industry is an interesting context wherein UCD could contribute significantly. This kept them motivated to continue working on the case.

The advisors of Syntens pushed the team to obtain results before the end of the Pressure Cooker. This forced the team to focus and take action.

Considerations on the use of UCD:

P5 Consultants and Aldus see many opportunities for UCD in the building industry. Construction companies deal with many different stakeholders and products for different uses. UCD could **help creating solutions that improve and speed up the building process.**

The stakeholders from the building industry involved in the session were very **enthusiastic about the approach** and the opportunity to develop solutions for renovation with the manufacturer.

The complex nature of the industry and the large variety of stakeholders made it difficult to determine the focus. Too late, the team realized the **importance of focus** and knowledge of the context.

With the current state of the building industry with all parties struggling to survive, the "leave" in the industry (Bouwvak) and the time span of the Pressure Cooker, the team could not fully explore the potential of UCD.

Aldus was invited specifically for their experience in the building industry. Still, the team lacked knowledge on the specific situation of BAT to gain sufficient information on the context of the case. If BAT had been more motivated and involved, they would have been able to focus more and speed up the process.

P5 Consultants did not change much to their usual way of work. The project did not really take off and little **adaptation to the time and budget restrictions** of the Pressure Cooker were done. Adjustments were: fewer users and no recruitment through their usual channels, only one workshop, basic report, and a shorter analysis. P5 Consultants stated: *"We have devoted a lot of energy to get the project started and to get some results. The results ended up to be quite theoretical and abstract. That's really a pity."*

Summarizing the case:

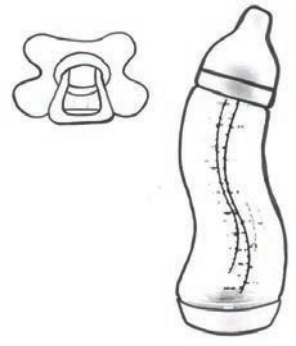
In the current state of the building industry, BAT realized they needed to look for new opportunities and markets to survive. The renovation market is still quite large and they decided to take a closer look at creating solutions for this market. BAT at the time was struggling with internal difficulties (layoffs, financial insecurity, key employees on sick leave) and was not very engaged in the case. P5 Consultants and Aldus had problems to understand the company's context and the design brief and to determine the focus of the project. The complexity, safety regulations and current state of the building industry was a hurdle for the team to recruit users and visit construction sites for interviews and observations. In a forced-fit session with some users, interesting directions for BAT were developed. The main adjustments of P5

Consultants to comply with the Pressure Cooker constraints were: fewer users and no recruitment through their usual channels, only one workshop, basic report, and a shorter analysis. Even though the case never really took of, the team became aware of various opportunities for UCD in the building industry. In this case, one cannot conclude whether the UCD method is suitable to the context of SMEs as this case did not fully succeed in applying UCD. Due to the lack of overview of the context of use, the different kinds of stakeholders and the lack of involvement and engagement of the SME, Contextual Design was not applied successfully. This brings the importance to the front of the SME being involved to grasp the design brief and to gain results within the restrictions of projects in SMEs.

Case

Difrax

Learning to extend existing contacts with users



Difrax designs, produces and sells a large array of baby care products and toys. The company aspires to make the life of the parent/caregivers as pleasant as possible by developing products that "ontzorgen" (worry-free). Examples are soothers, baby bottles, and the product this thesis started with: the B2b breastpump. Hygiene plays an important role in developing these products. Using probes and questionnaires, this case investigates needs and desires related to the perception of hygiene by parents/caregivers.

Background:

Since 1967, Difrax is a well-known brand in the Netherlands for soothers, baby bottles, care items and stuffed animals. Difrax has 24 employees of which two are designers. The entrepreneur, Vivienne Eijkelenborg is highly involved in strategy and product innovation. In 1999, Vivienne took over the lead of the company from her parents. Since her arrival the products stand out even more from their competition. Difrax designs and produces primarily plastic baby products. The products are sold to customers in the baby product section of pharmacies, warehouses and web shops.

Typical Difrax products (left) and context for this case: hygiene with kids when travelling..

Difrax has contact with parents and caregivers in a semi-annual customer panel. People of the network of the company are invited to discuss recently developed products, new opportunities and aspects like marketing and sales. Difrax employs a part time pediatrician, a children's dietician, a children's dentist and a maternity nurse. These experts provide valuable input for the designers and can also be consulted by customers of Difrax. Difrax would like to explore new ways and opportunities to gain user insights and involve users in the design process.

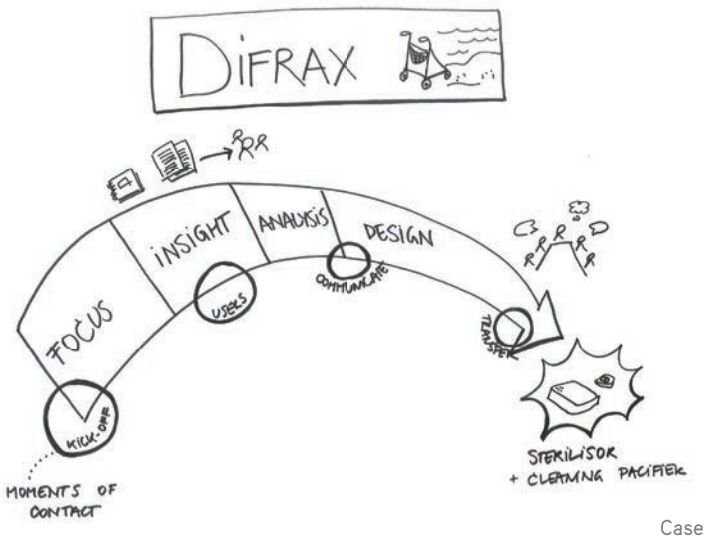
The design brief for this case is: *"Discover the problems and (latent) needs of parents and caregivers of babies up to 1,5 years related to hygiene with plastic baby products and translate these into new product concepts".*

> The director of operations of Difrax: *"We participated in the Pressure Cooker for two reasons: first of all to know more about hygiene and baby products, second to get to know new methods for involving users."*

Difrax had only experience with User-Centered Design (UCD) in the field of focus groups (their consumer panels). They teamed up with WeLL Design for their experience with designing consumer products. WeLL Design is an experienced design agency of 14 people that creates new products based on User-Centered design. They have experience with contextual design, personas and Customer Journey Maps. WeLL Design uses visualizations and storytelling of the current and desired situation.

Starting the case

WeLL Design took the lead in the case and suggested the approach. At the kick-off meeting they discussed the options with Difrax and immediately decided to use the existing customer panels. Together they decided on the subjects of the user questions that were presented to the users in the form of a probe and a questionnaire. Later on there was a short meeting at Difrax with a maternity nurse to check their assumptions and see whether their planned approach fitted the subject. This conversation helped WeLL Design to better understand the subject.



An overview of design process of the Difrax case with the four key moments indicated.

In total, there were four face to face meetings with Difrax and WeLL Design:
- -at the project kick-off meeting to discuss the design brief,
- -at the first customer panel to hand out the probes and the questionnaires,
- -once the insights from the user session were analysed, for a joint brain-storm session and
- -at the end of the design process to present the developed concepts to Difrax and the customer panel.

Involving the users

WeLL Design chose to use questionnaires (a method they are experienced in) and wanted to take this opportunity to explore the use of probes. The probes enabled users to reflect on what hygiene of baby products means to them. Getting insight into their context at home and when traveling was considered relevant and interesting for this case. The probes with questionnaires were handed out at a customer panel of Difrax and to parents from the personal network of WeLL Design totalling 17 parents. They returned the probes after two weeks.

> Designer of WeLL Design: *"Those probes were new to me, and the fact that you give people something to take home was really exciting. I was curious to know whether people would make use of them. They spent a lot of time, and on a subject I did not expected to be interesting for them. Some of them returned probes with complete layouts of the dishwasher!"*

The designer of WeLL Design expected that when involving users in group discussions or generative techniques, they would tell us what they think we want to hear from them. For example they would say they clean everything, to keep up their image towards to others. By an individual approach she aimed for their personal stories. The probes were intended as a first exploration to gain broad insights. The designer of WeLL Design expected them to bring up a clearly defined need that could be focused on in a second stage with a group of users.

The intention was to invite the users for a group discussion where the probes would be used as a starting point. Of the 17 parents only two people were able accept the invitation due to their busy time schedule and school holidays. The team decided to cancel the discussion.

> Designer from WeLL Design: *"We did not want to have seventeen people for the discussion, just five or six would have been ideal. By returning the probes in advance we would have gotten an idea of what to expect, and what was interesting for us to further discuss. That was the idea. Really a pity that did not work out as planned."*

WeLL Design analysed the acquired insights and summarized the findings in a presentation for Difrax.

Using probes and questionnaires to gain insights from users.

Communicating the user insights at the start of the brainstorm session using a presentation with quotes and pictures of the users.

Developing concepts

In a brainstorm session WeLL Design presented the results of their analysis to a senior designer and the director of operations. The main purpose of the brainstorm was to move from general trends and themes to a number of concrete product ideas. Afterwards, WeLL Design continued to transform the ideas into concepts.

Some of the developed concepts for hygiene at home and on the road: a steriliser and a cleanness indicator on a pacifier.

Results

The case led to several concept sketches, ideas for different types of products in relation to hygiene for babies. Several trends were left unexplored, offering future opportunities. Several concepts were evaluated in the next consumer panel of Difrax.

> The director of operations of Difrax: *"The whole area of hygiene in relation to baby products was quite obscure for us. We gained a lot of insight in what people do with plastic baby products and how. Clear needs have been identified that brought us new product ideas. One of the ideas has been further developed."*

> Senior designer of Difrax: *"Every research project provides more information. Every user has a different opinion and sometimes a confirmation. A consumer panel and the use of questionnaires were already known to us. Using probes was new. I liked the returned pictures from the probes.*

Next steps

Difrax is further developing some of the obtained concepts. In the kick-off event they learned about a whole range of possible UCD-methods. Difrax is interested in other UCD methods and wants use them to improve the existing consumer panels. They have contacted Muzus (see other cases) and collaborated with them in another project (2010).

The director of operations of Difrax: "We have the feeling we now have the right ingredients to continue, but we also have the feeling that there are still opportunities left unexplored."

Currently Difrax has the following products on the market that came out of (besides other activities) the Pressure Cooker case:

Hygienic wipes for soothers (left) and Steriliser for microwaves (right). A pink cover indicates it is hot, purple indicates it is cold. The inside can be used as a dripping rack..

Insights gathered during the case:

The ideal way of keeping products sterile:

—I don't want to do it myself
—The dishwasher
—A combination of a bottle-rack and a microwave box. You get the dripping rack out and leave it to dry on the counter
—A device that independently sterilizes bottles. For each part a dedicated compartment.
— *"The dishwasher but I always lose the small parts of the bottles, So I stick those to a pan. Maybe a holder for it in the dishwasher?"*
—Washing-up everything and sterilizing it in one go
—And indicator showing whether the soother is dirty or not

How do you clean when on the road?

—First with a cloth an than with my mouth
—With a cloth
—I bring a bottle of water and rinse it
—I do not use the soother anymore

Most parents feel like cleaning goes well enough at the moment: *"A child gets dirtier things in their mouth."*

Parents consider sterilising only important in the first two months.

Using a sterilizing box is preferred. Identified opportunities:

—Prevent hands from being burned
—Handier rack that can be used for drying
—More compact for easier storage, but everything still needs to fit in it.
—Prettier, it is not so bad if the box is big, as long as it looks nice

74% would like to have a handy way to keep the baby bottle and soother clean while on the road.

WeLL Design used a presentation to communicate the insights to Difrax. Quotes and pictures from the users are grouped into different products to sterilize and keep baby articles clean and kinds of cleaning.

Obstacles during the case:

The limited time of contact with users was used to explain the probes and hand them out with questionnaires.

Designing probes was new to WeLL design and they might not have been used to their full potential. Probes are often combined with a follow-up session to have the opportunity to ask additional questions.

Enablers in the case:

Difrax was interested and engaged. Difrax was open to try out new UCD methods.

WeLL Design could make use of the existing consumer panel of Difrax. This enabled WeLL Design to save time on recruiting users.

The developed concepts were evaluated with users in the next customer panel providing immediate feedback.

Considerations regarding the use of UCD:

Difrax already involves users through consumer panels (a type of focus group) and has experts that are part-time employees (such as dieticians, paediatricians and maternity nurses). They are **interested in learning new ways to involve users.**

WeLL Design **used the existing consumer panel** of Difrax to gain insights and attended the following scheduled consumer panel to share the results.

The probes developed for Difrax were not at the skill level of an experienced UCD expert, but still led to a lot of surprising and interesting insights. Difrax and WeLL Design appreciated specifically the **extensive anecdotes and pictures**.

The full potential of design-led methods could not be explored. The user session had to be cancelled.

The main changes WeLL Design made to their usual process were: trying out a new method, reducing the number of different users and limiting communication of the concepts to a presentation.

Difrax realizes the advantages design-led methods. They get information on the user context and users get time to reflect and formulate their thoughts. Difrax would like to further explore probes as well as other design-led methods.

Summarizing the case:

Difrax was interested to explore new opportunities for products in relation to hygiene and to learn more about other ways to involve users. Difrax is user oriented and knows its clients well. They have semi-annual consumer panels. By probes and questionnaires, WeLL Design gathered information from members of the consumer panel and parents from their own network. The obtained information was used as input for a brainstorm session with Difrax. WeLL Design transformed the ideas into concepts and communicated these to Difrax in a presentation. The main changes WeLL Design made to their usual process were: trying out a new method, reducing the number of different users involved and limiting communication of the concepts to a presentation.

Difrax is one of the few participating SMEs with prior experience in UCD. They wanted to learn about design-led UCD methods and try them out. This is the only case where the results were passed on the users for feedback. Some of the products are currently on the market.

Probes enabled the UCD expert to collect rich stories of the users and were successfully applied in the context of the SME. The active involvement of users was limited during the case and the SME has indicated to explore other methods in the near future. They indicated they would do this with the support of a UCD expert as they acknowledge they lack the required skills for design-led UCD methods.

Case

Jansen Medicars

UCD enables SMEs to develop long term vision in collaboration with other SMEs

Jansen Medicars makes medical carts for operating rooms. They produce different modules that can be combined according to the purpose of the medical cart. Jansen Medicars has good contacts with hospitals and is always looking for new opportunities. The context has an important influence on the use of the carts. Contextual design is selected as UCD method for this case.

Background:

Since 1971 Jansen Medicars designs and manufactures metal furniture. Jansen Medicars is one of Europe's leading manufacturers in the niche market of carts, carrier systems and customized equipment for medical environments. The modular concept of their products enables them to assemble standard parts into the customers' specific configuration requirements. The company delivers these products to furnishers of medical equipment or directly to the end user: the hospital.

Since some time the company involves designers and students (student projects), capable of using UCD methods, when developing product concepts. Jansen Medicars has good relations with the hospitals and has regular meetings, taking the opportunity to see their products being used.

Entrepreneur of Jansen Medicars: *"As a small enterprise you are in close contact with your clients, but often there's no time to have structural talks with the customer about a specific subject. Co-design offers us handles to have that conversation."*

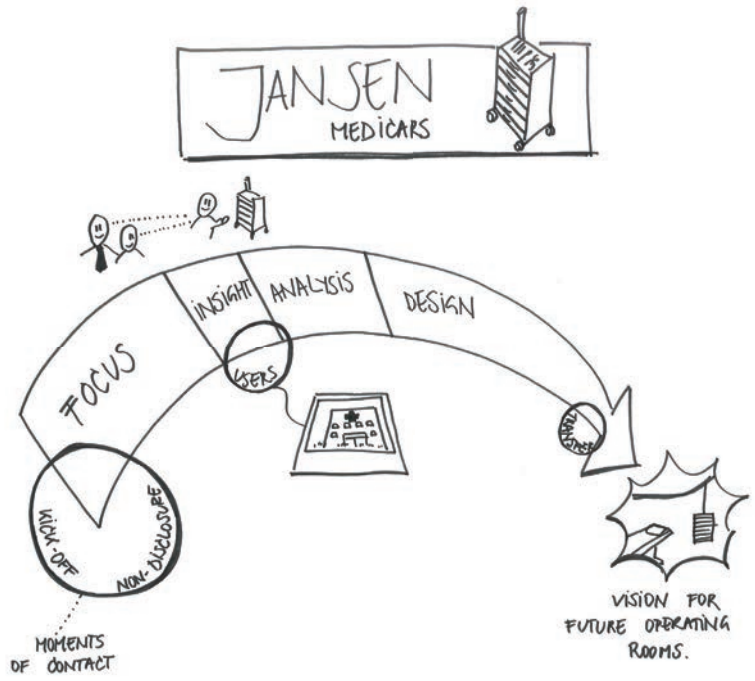
WeLL Design is an experienced design agency of 14 people that creates new products based on User-Centered design. They have experience with generative techniques, personas and Customer Journey Maps. WeLL Design makes use of visualizations and storytelling of the current and desired situation. WeLL Design was matched with Jansen Medicars because of their experience with medical projects and the use of contextual design in hospitals (the design of a Consultation room of the future for UMC Utrecht [2]).

[2] http://welldesign.com/en/health/umc-consultation-room/

Use of endoscopy in surgery is increasing. The endoscopic equipment varies with the severity of the surgery. In an endoscopic operation room the equipment needs to be changed frequently. A product allowing quick deployment of other devices would substantially improve effectiveness.

> *"How can Jansen Medicars develop new products specifically for endoscopic surgery making use of trends and the needs from this specific target group? "*

Stakeholders involved with equipment for endoscopic surgery are: surgeons, nurses, the technical staff, the head of the hospital and the cleaning staff. In this case the technical staff and nurses are targeted.



An overview of design process of the Jansen case with the three key moments indicated.

Starting the case

The entrepreneur wanted to have a non-disclosure agreement signed. The entrepreneur of Jansen Medicars is very protective over his intellectual property. Having to sign a contract made the team start on the wrong foot. Well Design was seen as a competitor, not as supporting the design process, discovering new opportunities for Jansen Medicars.

WeLL Design took the lead in the entire design process and had face to face meetings with Jansen Medicars at three different moments:

- -the kick-off of the project to discuss the design brief,
- -to meet the stakeholders in context by going to the hospitals,
- -at the end of the design process to communicate the developed concept.

Only at the end of the project it became clear that the entrepreneur of Jansen Medicars had already developed a new concept and wanted to test his expectations. The insights were not "new" to the entrepreneur. He stated he was already aware of these issues and wanted to see whether WeLL Design would come to a similar solution.

Involving the users

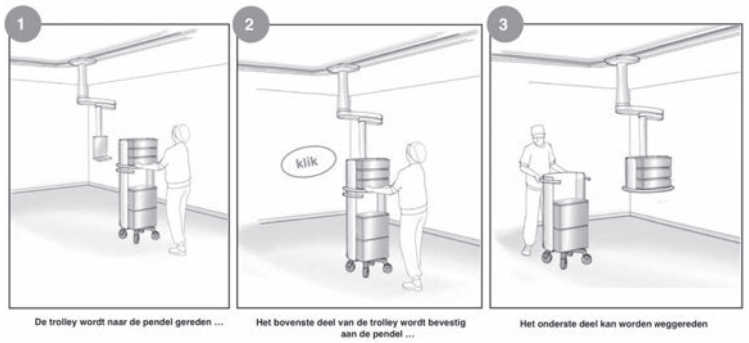
The actual contact with the stakeholders took place in the context of use as it has great influence on the experience of the stakeholders as stated by the designer from WeLL Design *"The context of the operating room played an important role in this case."* It is difficult to get into an operating room as they are often fully booked and have many safety regulations. The entrepreneur of Jansen Medicars has contact with the technical staff of hospitals he wanted to visit and knows very well how different the hospitals are from one another. Two of the three approached hospitals agreed to a visit. Each hospital had a different setting of medical equipment for endoscopic surgery. The first hospital had a somewhat out-of-date setting. The other two hospitals were selected because of their newer equipment. The atmosphere differs at each hospital, having a big influence on how the products are used.

WeLL Design and Jansen Medicars visited three different hospitals, each with a different setting.

Walking around in the operating rooms enabled the team to *"learn a lot from simply being there. You see what they do, and do not have to believe what they tell you they do. You see people having difficulty to get something done, and when you ask them about it they say it is okay"* Designer WeLL Design.

Developing concepts

The co-design activity took place without the actual users being present. Input from the operating room staff provided a basis for a creative session with the designer and entrepreneur of Jansen Medicars and the designer of WeLL Design. They used the gathered insights, structured and analysed by WeLL design, to come to new product concepts. *"It wasn't easy to get contacts in a hospital. Everyone is busy all the time and you also need the institutions' approval. So it's impossible to invite people for a session just like that"* (WeLL Design). *"I had a feeling already for a longer time that he (ref. the entrepreneur from Jansen Medicars) had an idea in his head. He acknowledged this and said he wanted to get a better feeling of what the users need and wanted to check whether his idea was good."* In the creative session the initial idea of the entrepreneur proved to be interesting and the team decided to build further on that idea.



WeLL design made sketches of the final concept. Jansen Medicars used these sketches to get feedback from the users.

The entrepreneur of Jansen Medicars knows the hospitals that make use of their products. He visits them on a regular basis to discuss orders, maintenance and technical aspects of the trolleys they deliver. He never actually follows the staff when they are using the trolleys. Entrepreneur of Jansen Medicars *"I go to the hospitals to check if they have specific needs or new problems. For example they have a trolley for applying plaster bandages that is really heavy. We developed a trolley with a motor for them"*. The entrepreneur looks at the staff from an engineering perspective. The designer from WeLL Design illustrates the difference between how the entrepreneur and a designer from WeLL Desgin makes observations with an example: *"In the example of the trolley with a motor they put the electric outlet at the back of the trolley on the bottom. If the staff need to recharge the trolley they need to bend over to plug in the power line. When I ask him about it he replies: this way is the only option."*

Results

WeLL Design explains the delivered results based on insights like: *"In the operating room there are two concepts: everything on the floor, or everything on pendants on the ceiling. If these pendants need to swing, they need to make large turns, making them heavy and obstructive. We came up with a solution for this: making the turns smaller combined with the idea of the entrepreneur."* The key problems were: heavy to handle and difficult to direct while operating, many cables that are the source of possible technical malfunctions and keeping the work environment sterile. By just making changes to the existing product, the problems could not be tackled entirely. The proposed system, a combination of ceiling rail-systems and lighter carts, could address all of the problems.

The designed product has a large impact on the context: it needs to be mounted on the ceiling, requires other co-developed products and a different way of handling. In a context where products have an important impact on the way of work and the context itself, changing the products is difficult and encounters many obstacles. The concept requires a different client relationship with the hospital and other manufacturers of products for operating rooms as it asks for a different layout of the operating room.

Before the Co-Design Pressure Cooker, Jansen Medicars did not have any pendants in their product line. These pendants are still far from the developed concept. By including pendants in their assortment, Jansen Medicars slowly moves into that direction.

Jansen Medicars now has pendants in their product portfolio.

Next steps

In the Pressure Cooker time frame, the team did not manage to return to the users with the designed concept. The entrepreneur mentioned he wants to go back to the hospitals to present the concept and ask for feedback: *"To really develop the concept together with the hospitals is a big challenge as it needs to be requested by the hospital. Only then the hospital will invest time and dedicate staff to sit down with you."* Another issue for Jansen Medicars to design the product with the users is the limited scope of their products. They design medical carts and carrier systems and not entire operating rooms. The designer from WeLL Design states: *"You can come up with a vision, but you are not able to make it happen. It merely serves as a trigger and gives an impression of what can be."* The case gave Jansen Medicars the aspired confirmation for the product they had in mind: *"The design is already partly completed. It's possible to get going with the results from the case."*

> WeLL Design: *"Jansen Medicars asked us to make sketches of the concept. They are already engineering the concept but it looks too finished to show it to the hospitals. That's what they want to use the sketches for. So the users feel able to give feedback."*

WeLL Design showed Jansen Medicars how they can ask more specific questions and how to give the users feedback on the suggested designs and remarks. The company found out that this way of working resulted in improved customer relations.

User insights gathered during the case:

Carts on the ground:

"+"

Flexible layout: adjustable to the type of surgery, no double equipment

Flexible in maintenance: if something breaks you role it out of the OR (operating room) and the OR does not need to be shut down

"-"

Cables everywhere: you ride over them, trip over them, are often too short, less hygienic

Lots of rolling the carts: takes up time and effort.

Manoeuvring in the OR is difficult

Moving equipment leads to defects and shortens the life span.

Limited space for sticking carts.

Pendants

"+"

Everything away from the floor: more hygienic, more floor space

No cables over the floor

No need to drag equipment that is physically heavy and unhygienic: the door needs to open each time, better for the equipment to stay in the same place

No disconnected cables

"-"

Turning and adjusting pendants is still heavy

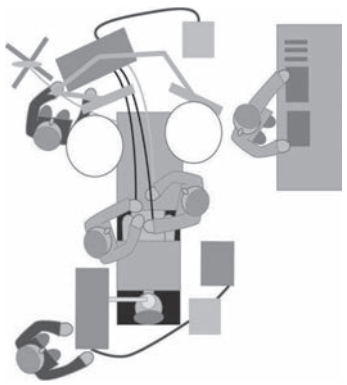
The posture needed to adjust the equipment is not ergonomic. (too high, unnatural)

For a small adjustment of the screen, a big turn needs to be made which is not always possible.

Maintenance: if something needs to be fixed, the OR needs to be shut down.

The ideal operating room:

—Large (at least 49m2 is demanded by legislation) + Large plenum where everything fits
—Dedicated endoscopic OR's (no need to drag equipment)
—Ergonomic:
—All equipment is easy to position on the dedicate place
—All handles and panels are on the right height
—All equipment is easy to position with little effort
—Little needed space to adjust/turn in order not to come in the sterile zone
—Everything from the floor
—No visible cables
—No interrupted cables
—The OR does not need to be shut down for repairs
—Sufficient displays
—Ability to record the surgery and observe from a distance



WeLL Design and Jansen Medicars worked together when talking with the users. Communication of the user insights was easy. WeLL Design made a presentation with the quotes and pictures of the users.

Obstacles during the case:

Collaboration between the SME and the UCD expert started off difficult due to the need to sign a NDA (non-disclosure agreement) to protect the final concept from being used by the UCD expert. Demanding an agreement set a negative mood on the project. The entrepreneur from Jansen Medicars: "If we would have had the opportunity to choose a UCD expert ourselves, we would not have chosen WeLL Design, due to their possible competition as they operate in the same market."

The UCD expert could not make use of the knowledge already present and add to the existing knowledge. The UCD experts started from scratch and the existing knowledge was confirmed rather than extended.

The context played an important role in the project. Contact with stakeholders in context was hard to achieve. The team had limited time available and had to take advantage of every opportunity.

Enablers in the case:

The existing good relation of Jansen Medicars with its clients (the hospitals) enabled the team to visit the hospitals, interview stakeholders and observe them during surgery. Considering the time span of the Pressure Cooker, without the good contacts of Jansen Medicars, the team would not have succeeded in getting into the hospitals to interview and observe the technical staff and nurses.

The staff is keen to contribute, enabling the team to make good use of the limited time available.

Considerations regarding the use of UCD.

Jansen Medicars had already a **good relation with their stakeholders,** making use of this knowledge and contacts made the case more valuable. It was possible to see the users at work and ask questions. **More active involvement of the users was not possible** due to the context and type of users and the skills of the UCD expert (lack of knowledge on for example generative techniques which could have enabled the users to be more actively involved).

Planning is difficult; you depend on the alacrity and timetable of the hospital. WeLL Design needed to **be flexible** and ready to respond quickly to opportunities for contact moments.

The **team hardly needed to ask questions**: the staff loved talking about what did or did not work and what could be improved. It proved **valuable to talk to different stakeholders**. The technical staff had other priorities and viewpoints than the nurses.

Jansen Medicars could use help in taking another **look at their products**; asking unbiased questions. The entrepreneur of Jansen Medicars: *"The Co-*

Design Pressure Cooker was a good occasion to get a new perspective of our current way of work. I found it important that someone else joined us in the context, using a different background and ways of work. This can be very informative."

Engineers at Jansen Medicars are used to present new products to stakeholders that are rather "finished". Because of this, stakeholders got the impression that giving feedback is useless. WeLL Design documented the insights and developed ways to communicate the results to the stakeholders by providing sketches; inviting stakeholders to give feedback.

Summarizing the case:

Jansen Medicars wanted to see whether their product innovation approach could be improved and whether the UCD expert would come to similar results. The latter was not communicated to the UCD expert beforehand. WeLL Design used contextual design by interviewing and observing the operating room staff, both medical and technical. The time frame of the project limited the interaction with the hospital staff and WeLL Design was unable to actively involve the users. The developed concepts were not as detailed as WeLL Design usually does for a project. The entrepreneur of Jansen Medicars valued the viewpoint and used the supporting materials of WeLL Design to discuss concepts with clients.

The developed concept, of which products of Jansen Medicars are only a small part, gives an entire new view on the operating room. Jansen Medicars is not able to develop this vision on its own and needs to work with other companies. Co-operation with non-competing companies, will give Jansen Medicars a strategic advantage.

Once the difficulties at the start of the case were overcome (related to the NDA agreement and lack of trust), the case could take of. Contextual Design proved to be suitable to be applied by SMEs. The SME specifically appreciated the different perspective beyond their usual way of thinking and approaching the users as well as the developed sketches providing means to further explore the opportunities of the concept. The SME was very open to this new approach and recognized how they could get another perspective with only minor effort.

Case

Premaxx

Investigating preconceptions of SME with users.

Premaxx[3] specializes in smart design solutions to help young parents in taking care of their children. This case investigates how parents can be supported in bringing their children to bed. They expect parents to experience many difficulties in the sleeping ritual of their children and look for a product that can make a difference. To find out the needs and desires of parents, design probes and generative techniques were used.

Background:

Premaxx is a small company of 4 people: the entrepreneur, a financial manager, a designer and a warehouse employee handling the shipping of the products. Premaxx produces products like baby carriers and play rugs, that can be changed into a bag. Premaxx designs all products in-house. The products are sold to customers through wholesalers.

[3] At the moment Premaxx does not exist anymore, they closed in June 2012.

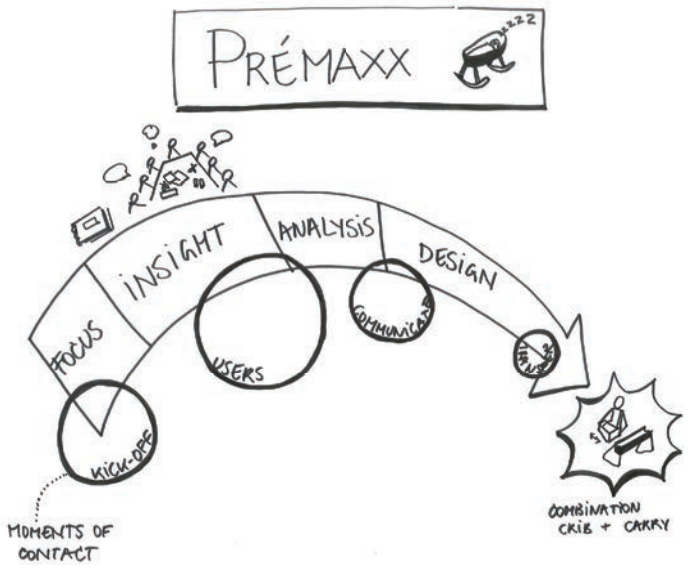
Overview of Premaxx products.

The financial manager and the designer of Premaxx are young mothers. They use their own experiences and involve parents from their personal network (in an intuitive way) as a starting point for new product developments. Premaxx is interested to learn how they can get user insights in a more structured way.

> The entrepreneur of Premaxx: *"We want to produce really novel problem solutions. Co-design seems to bring to surface the hidden problems in our target group."*

Premaxx thought that the sleeping ritual would be an interesting opportunity to develop a new product. They believed they could design a product that helps young parents with young children, more in particular babies. For different reasons these children wake up regularly and start crying. At the beginning of the case the main issue was to define the actual question to answer and the type of solution they were looking for.

Premaxx had no experience in User-Centered Design (UCD). They teamed up with Muzus (a user-centered design agency) and Pilots (an industrial design agency). Muzus has four employees with a design background, employing interns on a regular basis. They are experts in the use of probes and generative techniques. Users are actively involved in the design process. Pilots is specialized in exploring and refining upcoming market opportunities and translating ideas into persuasive, functional and meaningful user experiences. They employ six people. Pilots focuses on product design and engineering and has no experience with user involvement. They are part of the project team to translate the user insights into new products.



An overview of design process of the Premaxx case with the four key moments indicated.

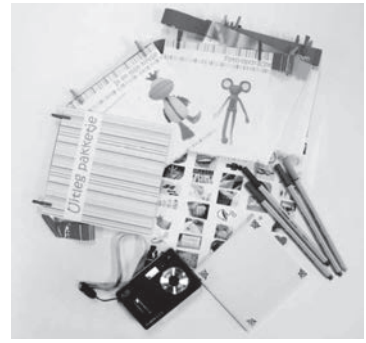
Starting the case

Muzus lead the first half of the design process and suggested the approach. Halfway the design process they held a creative session to pass on the insights to Pilots. From then onward, the design agency took the lead. Muzus was involved in the design process to safeguard the user perspective during concept development. There were meetings with Premaxx and Pilots at four different moments of the process:

- -at the kick-off of the project to discuss the design brief,
- -when the parents came to Muzus to discuss the sleeping rituals of their children,
- -once the insights of the user session were analysed to brief the design agency and
- -at the end of the design process to communicate the developed concept.

Involving the users

Muzus chose to use the UCD methods they are experienced in: probes and generative techniques. The probes enabled the parents to reflect on the sleeping rituals of their children over a longer period of time. The probes provided extensive information on the context of use with pictures taken by the users and their responses. Based on this information the users co-designed a solution for the sleeping ritual making use of material provided by Muzus. The group dynamics enabled the users to build on each other stories. Muzus was asked to find parents willing to participate.



Using probes as preparation for and generative techniques during the workshop with users.

Communicating the user insights at the start of the creative session using a report and persona's.

As it is hard to ask parents to take time off from work during the week, the workshop was organised on a Sunday. Premaxx did not mind investing personal time to be present at the workshop. They were personally engaged to devote their personal time.

Muzus: *"This is what I really like about working with a company like Premaxx, with SMEs. They are very grateful clients and are very enthusiastic. It is more than a one to one application."*

The designer and financial manager of Premaxx attended the workshop. They observed the workshop from another room using a live stream video. Muzus provided Premaxx with a framework to take notes during the workshop. The notes and observations of Premaxx were discussed with Muzus after the workshop.

The designer of Premaxx: *"I think we were lucky. The UCD method Muzus used enabled us to map what is important for parents. We now know exactly what young parents deal with."*

One of the key insights was that what Premaxx expected to be a problem for parents (putting children in bed), was simply accepted by parents as being part of educating children. This insight was an interesting outcome. A product does not always needs to tackle a problem.

Muzus: *"The users who participated in the session were so enthusiastic that they would love to do this more often. Taking care of your children is something many people love talking about. This is a great advantage for Premaxx. "*

Muzus analysed the acquired insights by reviewing the recorded workshop. They compiled a report for Premaxx with quotes, pictures and sketches grouped into themes as observed and defined by Muzus. Muzus also created three personas, each representing one type of parent and how they think about the sleeping ritual. This sizable user information inspired the designer and the SME.

Developing concepts

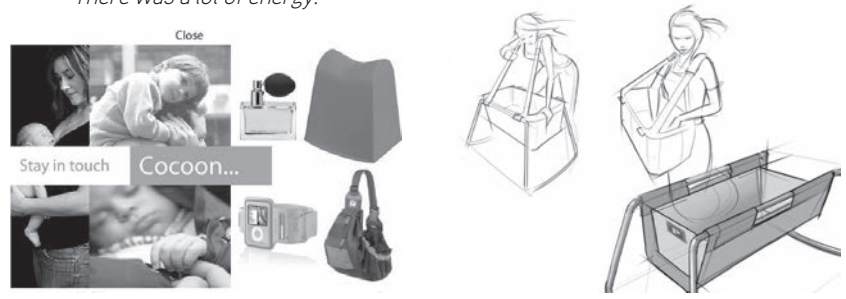
In a creative session Muzus communicated the results of their analysis to the designer and Premaxx. The main goal of the creative session is to move from general directions and themes to a number of concrete product ideas.

Muzus: *"We spent a lot of time transferring the insights. We not only wanted to hand over the user insights; we wanted to make a big step towards concepts together. Communicating the insights in person is essential to pass on all relevant information. With the quotes and the pictures, the designer gets empathy for the users."*

They all went through the report and highlighted quotes that inspired and were considered important. The personas were used as a reminder of the user workshop. As all the team members attended the workshop there was a lot of recognition. Several directions came forward during the discussions. Pilots was able to start right away with the concept development and considered it an "easy ride" because of the personas.

The two designers of Pilots were present on all moments of contacts. As they recently became parents, they had a personal interest in the subject. They were also interested in learning how to use UCD methods for their own projects.

Muzus: *"Pilots was really enthusiastic and engaged during the case. They had a large contribution and participation. This made the group work well and fast. There was a lot of energy."*



A mood-board for the concept and a sketch of the concept: Cocooning. Combining swinging and a crib

Results

Premaxx invested a lot of time in the case. They recognized the value it could bring, and to get most out of the project they gave feedback to Muzus and Pilots. An important benefit of the Pressure Cooker set-up for Premaxx was getting user insights AND having them translated into physical products at the same time.

Premaxx: *"Well, you get the opportunity to learn something new. It is like a present. So we felt obliged to use it to the fullest." Premaxx: "You get so many impressions in a short time. It is almost 1+1=3. A side effect for Premaxx was the confirmation of their current way of work. They felt they were already doing well."*

The designer of Premaxx: *"We got a fresh perspective. We would never get to this ourselves. We either do not have the time, or do not think of it."*

Next Steps

Premaxx ended up with several product ideas. They were very enthusiastic about them and indicated they would further develop the concepts. As important are the user insights and the new contacts with users. They learned how to involve users in a structured way in the design process.

Premaxx: *"We now have so much information that we can make use of it for a long period of time. Pilots developed concepts and visuals that really match our company. They took into consideration what Premaxx wants to represent. The concepts are nice and usable. We feel fulfilled, content."*

Muzus: *"At the moment Premaxx feels saturated. That's also the thing with SMEs, as I notice after the Pressure Cooker, they do user research and feel like they have enough input for four more years. Of course, this case had a wide variety of insights, but it was rather specific. It is finding a balance between realizing the opportunities and being able to use it."*

User insights gathered during the case:

The sleeping rhythm of a young child changes frequently (feeding times). This can be confusing for parents when the baby first sleeps well and then wakes up. Also the other way around happens: parents wake up alarmed not hearing their child as it sleeps longer.

When a child gets older, there always seem to be period that a child wakes up. Every time there are other reasons why sleeping is difficult. It seems related to security and longing for their parents.

Example of the parents' rituals:

—Taking a shower together, rub and massage with cream, a last bottle of milk before going to bed.
—Taking a bath, reading a story, go downstairs, even only for a minute, kiss and sleep.
—Read a story, breastfeed and sleep.

The use of products:

Parents need to make a conscious choice to use products like pacifiers, blankets and teddy bears. Sometimes the baby will indicate what it needs. A pacifier can help when they have a need to suck, a teddy bear can offer them security. These products calm them down and ready to sleep. At the same time, children become dependent on these products making them awake when they are lost or refuse to sleep when they are not around.

Sleeping Ritual:

Rituals, being consistent and persistent, appear to be most important related to sleep, despite all available products. Children need to learn that they go to bed when they are tired and when it is time to sleep. Sleep and everything connected to sleep needs to feel safe and secure. Every family deals with it in a personal way.

Examples of user quotes:

"We take turns to go out of bed for the children. One night you can sleep with earplugs, the other you're responsible. He has some sort of a chronic cold, he coughs a lot and then he does not get to sleep without help."

"When he has been to day-care, has been doing all kinds of new things and it was a busy day, he tends to wake up soaked in sweat. He is digesting what happened. Then he starts crying. I think he needs to process it."

"I put him in his sleeping bag. In the beginning I did not have one, but he was always crawling up in his sleep and woke up. He has to be able to get his arms up otherwise he gets wild. And he always has his pacifier and a little blanket close to his face."

Muzus used a report to communicate the insights to the designer and Premaxx. Quotes and pictures from the users are grouped according to themes like sleeping, family and dealing with insecurity".

Obstacles during the case:

No obstacles observed.

Enablers in the case:

With their design background, Muzus was able to analyse and communicate the gathered insights in a rich and inspiring way to the SME and the designer.

Premaxx devoted a lot of their own time to the case as the concept was a good match with their capabilities and considerations.

Premaxx was very eager to learn and had an open mind for new things. They appreciated the support of Muzus and Pilots.

The two designers of Pilots recently became parents and could easily relate to the insights of the users. They felt well supported by the creative session, the report and the persona's of Muzus.

Considerations regarding the use of UCD:

Parents are an **easy target audience** for participation in the design process. They care about the subject of the case and they had no trouble talking about their experiences.

Premaxx got a real good sense of the family life of the users, what is important for the parents putting their children in bed. The information was collected from the context of the users, who got time to reflect and formulate their thoughts. Making use of probes requires a great deal of skills and Premaxx does not see themselves using them on their own.

Muzus changed their standard way of work to **adapt to the time and budget restrictions** of the Pressure Cooker. The main changes were: fewer users, only one group of users in one workshop, basic report, and a shorter analysis.

With their design background, Muzus was able to a**nalyse the gathered insights with the purpose and use of the insights in mind**. Insights were formulated on a less abstract level and gave direction. The SME appreciated this as it helped them to understand the value of involving users.

Even though Pilots had no prior experience with UCD, they **did not encounter any problems translating the insights to concepts**. They felt well supported by the creative session, the report and the personas.

Premaxx did not mind investing personal time to be present at the workshop. They were personally engaged to devote their private time. This engagement of the SME was an enabler in the case for successful application of UCD.

Summarizing the case:

Premaxx wanted to investigate a new domain for their products. By the use of design probes and generative techniques Muzus brought insight into the sleeping rituals of young parents with their children. To limit the budget spent, Muzus decided to invite users for just one workshop and standardized their format and materials as much as possible. By doing parts of the process with the team, they could save time on analysing and communicating the results to the SME. The employees of Premaxx were engaged and were present at every moment of contact. The designers of Pilots recently became fathers. It enabled them to gain empathy with the users and understand the gathered insights. They were really motivated in creating the best possible solution.

This case stands out from the other cases because the SME considers the gathered user insights not only relevant for this project.

> The SME said: *"We now have so much valuable information that we can make use of it for a long period of time. Pilots developed concepts and visuals that really suit our company. We feel saturated."*
>
> Muzus added a precaution: *"That's also the thing with SMEs, as I notice after the Pressure Cooker, they do user research and feel like they have enough input for four more years. This case had a wide variety of insights, but it was rather specific. It is finding a balance between realizing the opportunities and being able to use them."*

Another important contribution of this case for Premaxx was that it made them realize that what they envisioned to be a problem for young parents (putting their children in bed) was not considered a problem by the parents, rather a situation they needed to deal with. Involving users for product innovation can shift the prejudices of the SME.

Probes and generative techniques proved to be suitable for the context of SMEs with the support of a UCD expert. The SME specifically appreciated the different perspective beyond their usual way of thinking and the wealth of information that was gathered. The active involvement and dedication of the SMEs was an important enabler in this case.

Case

Scala

Co-designing the 'product' through a close relation with users

Scala is a publisher of special interest magazines for different target audiences. The subjects address a wide range of hobbies like model trains, photography and scrap books. This case investigates who the new target audience of their recently acquired magazine "Dollhouse and Miniatures" is. To bring the needs and desires of these hobbyists to the surface probes and generative techniques were used.

Background:

Scala is a family-owned publisher founded in 1992. Currently the second generation leads the company. Scala has nine "titles" of magazines and sells them in three different countries by licensing to other publishers. In 2009 Scala was voted as one of the 100 most innovative SMEs of the Netherlands. In 2005 they were one of the first publishers to invest in cross-medial magazines. Scala produces and designs the magazines in-house with the aid of 25 employees and almost 100 contracted freelancers. The products are sold to customers in hobby-related stores (wool shops, hobby articles and others) and online in print and electronic subscriptions.

Scala recently acquired a "dollshouses" magazine and is interested to know who the readers are..

Each title targets a passionate group of readers with some of them giving input in the form of articles or leads for new articles.Scala involves a large number of freelancers for the content of their magazines. Hobbyists and readers write for their magazine of interest. With this input and involvement Scala has a good idea of what lives amongst their readers.

Recently Scala acquired a new title: "Dollhouses and Miniatures". Scala was interested to know why sales had dropped and what kind of cross media products could be developed for the magazine.

> The entrepreneur of Scala: *"We see opportunities for offering the target group something more comprehensive than a magazine. Think of online services, events or a community. Co-design offers the possibility to let readers think along on what they want and how they want to be treated."*

The magazine "Dollhouses and Miniatures" has 9000 subscriptions. Some of them contribute to the content but many remain unknown. Scala has many own ideas but needs to have them confirmed. They were interested to see whether their expectations and assumptions were valid. Scala lacks general input on the magazine in a supported and structured way. Not only the current readers of the magazine are important stakeholders for the company. The magazine has a very active forum on the website where current and former readers of the magazine contribute and post. There are only two magazines on this subject in the Netherlands offering online interaction. Next to the present and former readers of the magazine, Scala is also interested in information from advertisers and retailers.

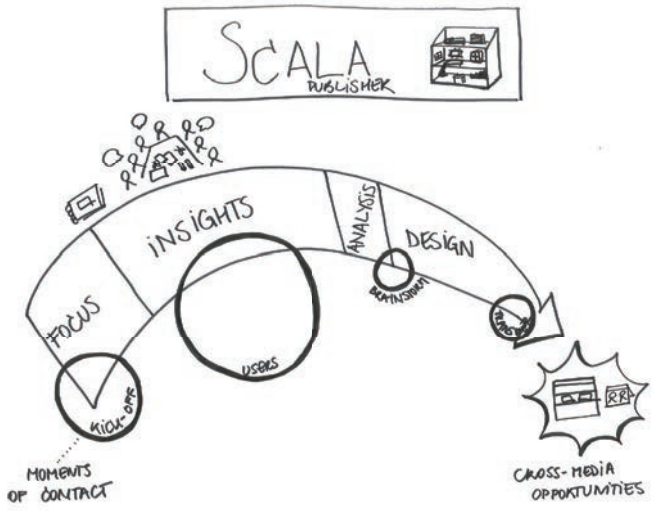
Scala had no experience in User-Centered Design (UCD). They teamed up with 31 Volts (a service design and design research agency). 31 Volts has 3 employees with a background in design and ICT. They are experts in the use of probes and generative techniques. Initially there was no other company involved but later on Crown Communication, having experience in cross media solutions, was invited to participate.

Starting the case

31 Volts took the lead in the first half of the design process and suggested the approach. Even though Scala lacked UCD skills, they were so involved that they were considered as a partner, sharing responsibilities and tasks. Once the user insights were collected and analysed, Crown Communication was involved for the development of cross media solutions. 31 Volts had face to face meetings with Scala at four different moments in the process:

- -at the kick-off of the project to discuss the design brief,
- -for the session with the users at the Scala office,
- -to inform Scala once the insights from the user session were analysed and
- -at the end of the design process when Crown communicated the developed concepts.

As a preparation for the moment of contact with the users, 31 Volts visited Scala. In the discussions the vision of Scala came forward. Scala has a clear idea what they want to achieve. This was influential for the case.



An overview of design process of the Scala case with the four key moments indicated.

31 Volts used the UCD methods they are experienced in: probes and generative techniques. With the acquired insights, users co-design their desired magazine making use of material provided by 31 Volts. The group dynamics enable users to build on each other stories.

The readers of the magazine are very enthusiastic and passionate people. They are active on online forums, go to fairs, offer and visit workshops. Scala made use of their "fan-base" by posting a call for participation on the magazine's forum. Within short notice, there was an overwhelming response of users willing to participate in the project. A selection needed to be made. A total of 20 users were invited. 15 were able to come to Scala on a Monday (!).

Involving the users

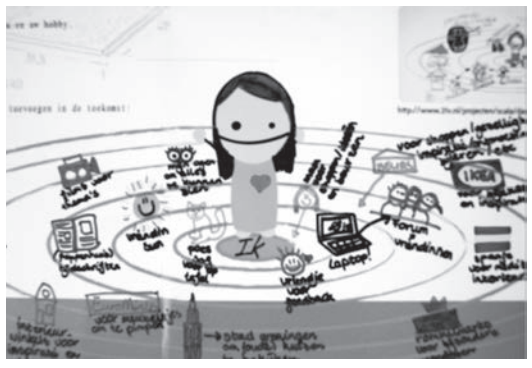
31 Volts send all of the participants a probe with elaborated questions, created in such a way users could employ their hobby skills. The probes were built around themes. Every day a different theme was covered, indicated by another colour. The themes for the probes were selected based on the general subjects usually covered in probes (e.g. who are you, what is important to you) complemented with magazine specific themes. The probes were returned just before the workshop. 31 Volts could browse them to get a feeling of the input they could expect.

> 31 Volts: *"The retuned probes were real pieces of art. They were incredibly rich. The people really made use of their skills, they had been making complete,... I mean, everything was glued in the probe for illustration. They ran out of space!"*

The user workshop took place at Scala. 15 users were present as well as 4 employees of Scala (the entrepreneur, someone dealing with the companies cross media products and two more employees). Most of the users knew each other from other occasions (like the workshops and fairs) or from the forum. The workshop started by discussing the probes the users made. Then the group discussed future opportunities for the magazine. At that moment, the users were struggling to get away from thinking about rather straightforward

solutions and to move to another abstraction level. Many ideas were not surprising or unexpected.

> 31 Volts: *"The users really encountered difficulties to help us out. We started by asking if they saw opportunities for the magazine, or if they had ideas themselves. We got responses like: 'It is already in the probe isn't it, so what more do you want to know?' We replied that we now wanted to think on a more abstract level taking all the probes as input. But it remained a big effort to get them to that level, it was hard to detach them from their dollhouses."*



Using probes as preparation for the workshop, they became real pieces of art as the readers used their dollhouse creation skills for the probes.

Scala took the opportunity during the second half of the workshop to ask the users questions on topics they were struggling with. These more general questions were not always related to the magazine. A lot of discussion started. Having this opportunity was very valuable for Scala. They could validate solutions they already had in mind and added a few new ones. But mainly they created a basis, support from their users.

> The entrepreneur of Scala: *"At least half of the ideas the users came up with were already on our agenda. These were open doors for us. From time to time 31 Volts reminded us to slow down our pace and acknowledge the users that they gave use valuable ideas. I recognized a lot, but it was good to have confirmation that we were thinking in the right direction."*

31 Volts analysed the acquired insights. They compiled a presentation for Scala with pictures from the workshop and the users with a summary of the main conclusions. 31 Volts did not further develop the ideas generated during the workshop. They focused on the insights and the communication of the process.

Developing concepts

Scala and 31 Volts decided (with the help of a Syntens advisor) to involve Crown communication to further develop the ideas into cross media concepts. In a meeting Crown Communication was briefed by Scala, and the presentation of 31 Volts was used as input. The main goal for Crown was to explore opportunities to attract more subscriptions by the use of cross media.

> 31Volts: *"Not all insights are new. The findings confirm existing ideas or add something to them. Yet they are such a low hanging fruits that it wouldn't take long for Scala to make use of them."*

Results

Crown Communication provided ideas for Scala on the following subjects: an online game combined with a contest, online advertising, PR in local media, organizing events, co-operation with shops, events and museums.

Concepts for cross media opportunities for the magazine. For example: let users experience their hobby differently by a game.

Next steps

Scala will further develop the ideas of Crown Communication. Some were already planned. In a magazine article, Scala was going to inform its readers of their efforts and the planned actions. They wanted to invite readers to provide feedback on these ideas to take them one step further.

> Entrepreneur of Scala: *"What I learn by doing for one of our magazines, I can also use for the other magazines. It is an important learning lesson for us using these methods for different target groups."*

Scala recognizes the opportunities UCD brings to them. They learned how they could make use of the already available tools (their active online forum). The probes were a great method, especially for this kind of users, but Scala admits that they lack the skills to continue using them. They saw how much time 31 Volts invested in setting up the probes and giving feedback to the users.

The main benefit for Scala in using UCD lies in developing a relation with its readers, creating support for future changes to the magazine. Involving users creates a lot of goodwill as the users feel part of this change process. 31 Volts: *"The entrepreneur of Scala is a smart business woman, I am sure she had thought about this, and this was her intention with the project in the first place."*

User insights gathered during the case:

During the workshops, the participants arranged the generated opportunities in a matrix using the following quadrants: Active/Passive Physical/Digital

Active – Physical:

—Subscriptions get their magazine delivered earlier
—A dollhouse marketplace in the magazine
—Swapping days (exchanging items)
—Opportunities to craft together in small groups and with friends.
—A dollhouse as a group effort
—Workshops (learning crafts)

Passive – Physical:

—Reward loyal subscriptions
—Organize a "Meet and Greet" day
—Organizing workshops and offering subscriptions on these workshops
—Having physical stores for the magazine with related products

Active – Digital:

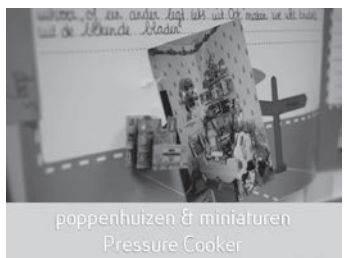
—Online polls
—Online workshops for subscriptions (with the option to ask questions using a webcam)
—Exclusive content for subscriptions
—Tips for re-using materials

Passive – Digital:

—Have nice prints available for download
—A dollhouse Wikipedia
—Index of the magazine
—Calculation overview for measurements

Recommendations for future steps:

—Take another closer look at the probes
—Do another workshop with probes
—Stay in physical contact with the involved group of users
—Validate the findings with a larger group of readers
—Involve the current group of users in the development of new concepts.



31 Volts used a presentation to communicate the insights to the Crown Communication and Scala.

Obstacles during the case:

No barriers.

Enablers in the case:

The magazine has a motivated group of readers willing to invest time. The topic is important to them; they feel the necessity to think about the future of the magazine. Using probes was a great fit with the interests and capabilities of the users.

The entrepreneur of Scala is very engaged, always thinking about future opportunities. Assigns the necessary means to take fast steps forward. What they learned for his magazine can be used for their other magazines.

Considerations regarding the use of UCD:

The readers of the "Dolls and Miniatures" magazine are an **easy target group.** They are enthusiastic about their hobby and are concerned about the future of the magazine. They are creative people using this creativity when completing the probes. Users had no trouble to talk about their experience but experienced difficulties in thinking on a more abstract level about the magazine taking a step beyond the actual content.

31 Volts **did not make many alterations** to their standard way of work in order to adapt to the context of the project. As Scala was present during the workshop they reduced the communication of the insights to Scala into a presentation.

31 Volts indicates that the main difficulties lie in taking the users to a more abstract thinking level. Another difficulty is related to the entrepreneur, she considered many of the ideas self-evident, or already thought off. 31 Volts played an important role in overcoming these difficulties; **they facilitated the workshop to get the users and the entrepreneur on a higher abstraction level**.

Scala understands the **advantages of probes**. They get information from the context of the users, and the users get time to reflect and formulate their thoughts.

The **help of a UCD expert remains necessary** as they lack the necessary skills. Making use of probes is still a large hurdle to take.

Summarizing the case:

Scala had recently acquired a new magazine but was unfamiliar with the readers and wanted to know more about them. 31 Volts made use of the existing channels by posting a call for participation on the online forum. The response was prompt and sizable. The magazine has a committed group of readers willing to invest time in collaborating to improve the magazine that revolves around their passion: creating dolls houses. 31 Volts decided to use design probes developed in a way it fits the interests of the readers. In small knick-nack exercises, the readers were encouraged to share their experiences with their hobby and the magazine. In the workshop, 31 Volts facilitated co-design of the magazine with the employees of Scala and the readers.

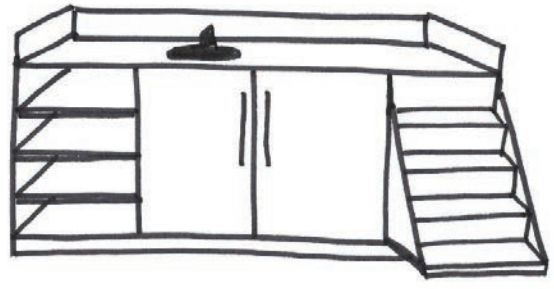
Probes and generative techniques proved to be suitable for the context of SMEs. The SME specifically appreciated the active participation of the users, the richness of the collected probes and the support of the UCD expert. The SME was very open to this new approach and because of their active involvement the case could take place in limited time and effort.

This was one of the cases where the 'product' was co-designed through active involvement of the users. Scala is now translating their experiences of the approach of this case towards their other magazines.

Case

Schilte

Exploring opportunities in a new context that emerged from a change in society



Schilte started 150 years ago with carpentry and woodturning. They have specialized in wood processing for a broad range of markets with a focus on furniture for schools and day-care centres. Since fifteen years the government is supporting a new concept in schools: "Brede Scholen" (Community Schools) where different kinds of organizations dealing with growing kids are situated in one building. In 2004 there were 500 Community schools in the Netherlands and this number is still growing. This case investigates what kind of furniture Schilte could develop for community schools. To discover the needs and desires of these schools contextual design was used.

Background:

Schilte, since 1858, operates both as a supplier of wood products as well as a manufacturer of finished products such as furniture, stairs, interiors, office furnishers, toys etc. All of the products and half fabricates are designed and produced on site where there is also a large showroom. Schilte has 71 employees. Schilte sells directly to schools and other organizations or supplies other companies on demand. Schilte closely follows new developments in the field of machinery. Their motto is "Specialised in Versatility".

Schilte products made of wood for schools and day cares.

With more and more community schools, Schilte wanted to explore if these new types of schools require furniture to support their specific mode of operation. In a community school there is one large building housing several different types of schools; for example after school care, day-care, a music school, etc. Each of them has its own rooms and a common part like a gym or a handcraft room. These common rooms might need their own type of furniture.

> The commercial manager of Schilte: *"The learning environment of schools is changing and schools are given more functions. We want to know how to discover (hidden) needs of users. It can be the source for new products."*
>
> The owner-manager of Schilte: *"When we were invited to join this project we were doing market research ourselves. We were looking for new opportunities to de develop new products. In this regard, there was a great match."*
>
> The owner-manager of Schilte: *"The products we designed in the past were never outstanding in their design. We have always looked at their relevance and listened to our clients. To see what requirements they needed to meet. Our products have always been based on that."*

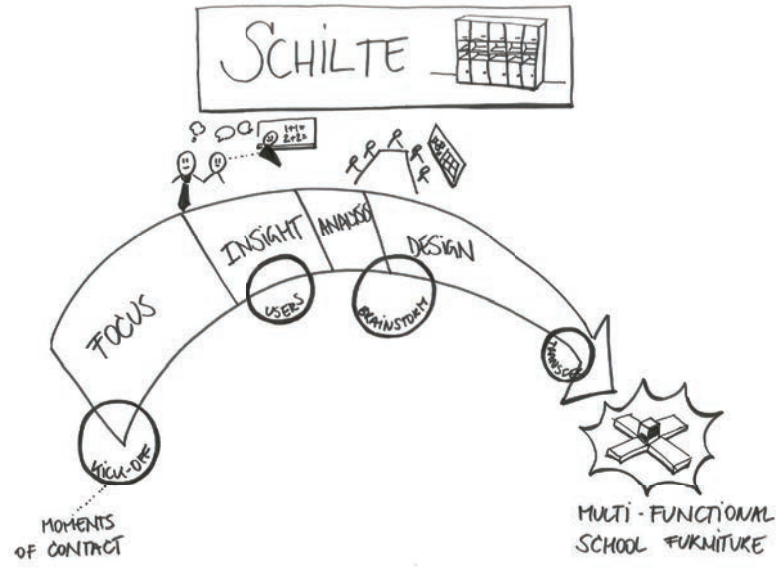
Schilte had no experience in User-Centered Design (UCD). With the aid of Syntens, they had recently finished a project with Barry Koperberg, an independent consultant. For the Pressure Cooker, Schilte asked to team up again with Barry Koperberg. Barry Koperberg has versatile experience in different contexts and his primary expertise is providing a different perspective to companies and getting information to the surface. Barry Koperberg says: "To recognize what moves people and groups and take them along. To look at the speckle at the horizon from different angles. To get under the skin of people who are not aligned. To experience what the terrain has to say in the here and now." Scope Design, having industrial design expertise, was invited to help translate the user insights in new products. Scope is an all-round design agency with a strong emphasis on close collaboration with their clients. They have 6 employees.

Starting the case

Barry Koperberg took the lead in the first half of the design process and suggested the approach. Gradually his lead would be taken over by Scope Design once the users were involved. There were face-to-face team meetings at four different moments of the design process:

- during the kick-off of the project to discuss the design brief,
- while visiting a community school,
- during a brainstorm session and
- at the end of the design process to communicate the developed concept.

After the kick-off meeting Barry Koperberg had a phone meeting with Schilte to further discuss the design brief. Schilte used their existing contact with a community school to make sure they could visit the school. They called the school in advance to discuss their visit.



An overview of design process of the Schilte case with the four key moments indicated.

Involving the users

Barry Koperberg used a method that resembles contextual design. He has no background in UCD, but is used to question and dive deep into the motives of people in their context. This approach enabled the team to surface the dynamics between people and their current use of products and furniture. It is a UCD method that provides rich information on the context of use by visiting the context and observing the user at work. Step by step he asked about the users' actions to understand the motivations and strategy.

> The commerical manager of Schilte: *"I was surprised by the engagement and enthusiasm of the people at the school. They were very willing to participate. And because of that, it became theirs. Really nice they wanted to think along."*

The entire team visited the community school. In the morning the visit started with a meeting with the managing director of the school that shared his vision of the school. Later on they walked around the school and had meetings with various employees such as the janitor, teachers, an employee of the after school care. While walking around the building Barry Koperberg asked the employees about their experiences, their work, their needs. Schilte could see how their furniture was used, and saw examples of un-anticipated use.

> Designer of Scope Design: *"On a given moment we were looking for the janitor and we could not find him, so we started to have small talks with teachers that we ran in to. They started telling how they were 'surviving' in the building. It became clear that there is no notion of which room belongs to whom and they were not aware that they were co-owner of certain rooms. There were not only opportunities for furniture but also for policy or just a good meeting with all employees across schools."*
>
> The owner-manager of Schilte: *"Unexpected talks during our visit to the school yielded a lot of information."*

Schilte had a strong pre-defined vision of what they wanted to design. They have close relations with different schools and day cares. They know the people. For Schilte it was difficult to step away from what they know. That's where Barry Koperberg had his value: he enabled them to look beyond the current use of their products and take advantage of side events that took place.

Using contextual design to dive deep into the context of use.

The contacted with the users in context was limited to one visit of a community school. There was no further deepening of the topic and user contact. When asked, Barry Koperberg indicated that the budget did not allow him to spend more time on the case.

Developing concepts

Two days after the visit the team came together for a brainstorm session. Scope Design had asked all the team members to prepare the session by thinking of *"How can you..."* questions. This is a commonly known method for starting a design process, but was unfamiliar for the SME and Barry Koperberg. The insights from the school visit were not further captured or analysed by Barry Koperberg. By having the brainstorm quickly after the visit and by asking each team member to note down their insights in the form of questions for the designer, Scope Design attempted to consolidate the gathered input. The commercial manager from Schilte did not understand why they were asked to come up with the questions for the designer: *"Why do we need to prepare a session with a designer? And think of these questions? Why do we need to be there anyway? You are the designer, that's your job!"*

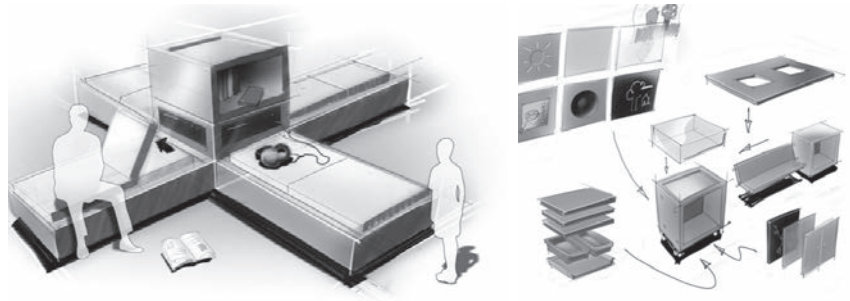
> Product manager of Schilte: *"I was not involved in the entire project, but I participated in the brainstorm session, and that was incredibly inspiring!"*

As one of the participating employees of Schilte had not been present during the visit of the school, there was a lot of discussion on the vision of the user. The insights had not been consolidated in any kind of material. The major part of the brainstorm was spent on discussions on what "the user" wanted rather than on developing concepts.

The format of the brainstorm was new to Schilte; they had never been so actively involved with a design agency. The added value in the brainstorm was that they could share their knowledge on working for schools with the design agency. For example: *"You cannot do this, this is not allowed, these loose parts are not possible because they can get lost."* The main goal of the brainstorm was to move from general directions and themes towards a number of concrete product ideas. Scope Design took the ideas a step further.

Results

The case resulted in concept sketches, ideas for different kinds of products for furniture in community schools. The visit to the school not only yielded concepts, it also facilitated a dialogue in the school. It surfaced internal conflicts at the school and had an unconscious facilitating effect.



Concepts for multi-purpose furniture in community schools.

Next steps

Schilte recognized how the collaboration with a design agency can provide different ideas and shift expectations. They decided to continue with two of the developed concepts and see if they are financially viable. The collaboration with Barry Koperberg showed Schilte how they can make use of their existing contacts. They recognize that they need support to put their prejudices aside.

> The owner-manager of Schilte: *"We got ideas on paper. Very concrete final results. We still do have some questions about the commercial feasibility of the concepts; this was a little under exposed during the project. We primarily focused on the products. We selected two concepts from the brainstorm session for further development but we now have to explore how they can be sold."*
>
> Product manager of Schilte: *"My quarter dropped during this case!"*
>
> Commercial manager of Schilte: *"This case was very inspiring and challenging to us!"*

Insights and observations gathered during the case:

"How is the furniture used differently in community schools?"

"Community schools need to corporate... while maintaining their own identity."

"Teaching takes place differently and this has an influence on the furniture."

"There is no one responsible for the rooms in common and the equipment."

"It is of everyone, and therefore of no one."

Principal of one of the schools:
"The "Community school" is a concept, not a building."

Some of the teachers state they have to "survive" while teaching. One of them indicates that she has to get her clay downstairs, leaving her class unattended. There is a lot of unfamiliarity with the other organizations and people. No one knows how to deal with it.

The owner manager of Schilte sees a child sitting behind a computer on his knees. He walks into the classroom to grab a chair. He complains about the bad use of the computer tables. They are wide enough to fit four computers, but there are only two. Not even five meters further there are two loose tables with two more computers.

There is no notion amongst users of ownership. For example, all members of the 'Brede School' paid for a handcraft room, yet nobody makes use of it. To which extent does this ask for a new policy instead of a new product? Could a product change this?

Most important "How Can you..." design questions (HCY)s:
— HCY be flexible?
— HCY create added value together?
— HCY maintain the overview?

All members of the team were present during the visit at the "Community school". The designer from Scope Design asked the other team members to note down their remarks and start thinking about "HKJ's" for their brainstorm meeting the week after.

Obstacles during the case:

Some of the participants of the brainstorm were not present at the school visit, this caused a shift in perspective of the discussion towards: who is the user, rather than what does the user want and develop solutions for these needs.

The contact with users was limited to one school visit. There was hardly any preparation and the team was "thrown in the deep" by the UCD expert. The expert indicated that with the available budget, he was not able to spend more time.

The SME was very focused on their existing products and vision of the user. They experienced difficulties in letting this go and be open to the user.

Enablers in the case:

From each organization someone was present at all moments of contact. Different employees of the SME were involved in the case.

The SME made use of their own contacts to find a school they could visit. A visit could be scheduled in short notice and different employees of the school took time to sit down with the team.

The UCD expert was able to dig deep for information and bring underlying needs and conflicts of the users to the surface,

Considerations regarding the use of UCD:

Contextual Design was a suitable method and fitted the context of this case. Due to time and budget limitations, **the method has not been applied to its full extent**.

Downsizing of the UCD method, contextual design, mainly took place by: restricting time for preparation, only one visit to context where several interviews were held, no contact over prolonged time, and no analysis and developing means to communicate findings by the UCD expert.

As **all team members were present during the school visit**, the need for communication means was reduced. **Future use of the gathered user insights is difficult as they have not been consolidated.**

By the help of the UCD expert, the SME now realizes how their current contacts with users can be **a basis for acquiring more information** and to see how their current products are used. The UCD expert enabled them to step away from their current perspective and expectations.

During the entire process Scope Design Strategy has been an involved party. This pragmatic approach gave the designers an immediate insight in user situations. By working together the individual roles appeared to overlap from time to time. Sometimes this lead to confusion about responsibilities but still it encouraged the creativity.

The **SME appreciated the active collaboration with a design agency**, this was new to them, having the ability to share their expertise and see how a designer brought a new perspective for developing products.

Summarizing the case:

Schilte was interested in exploring a new emerging type of market: Community Schools. These combinations of schools reside in one building sharing facilities. Schilte expected these schools to have different needs and uses of furniture. Through contextual design Barry Koperberg immersed the team in the context of Community schools and was able to bring underlying information, needs and struggles to the surface. Time and budget limitations limited the contact to one school visit, reduced time for preparation, no analysis or means developed for communication and consolidation of the user insights. The team was able to spend dedicated time with different kinds of users at the school and move quickly towards concepts.

Contextual Design proved to be suitable for application in SMEs. The SME appreciated the different perspective beyond their usual thinking. This perspective was obtained through the support of the UCD expert, by applying contextual design, by the involvement of a design agency and being supported in moving from users insights towards concepts.

Case

Verheul

Providing the SME a different perspective on the context of use

Verheul designs, manufactures and installs, custom made luxury stairs for private clients, shops and office buildings. For the design of their stairs Verheul collaborates with architects. Verheul has little contact with the actual users of their stairs and wanted to explore how they can support their users with regards to safety. Contextual design was used to bring the needs and desires of private customers to the surface.

Background:

Verheul Trappen, since 1984, is a family owned company that delivers stairs for every situation, from simple to exclusive, from classic to modern. All stairs are unique. Verheul combines a wide range of materials like glass, stainless steel and wood. They have knowledge on the ergonomics of stairs and requirements of height, depth and width of stairs. Verheul has on-site production and takes care of the entire scope of stair installation: design, taking measurements, production, installation and finishing. Verheul Trappen employs 20 people. The products are sold to customers, via architects and building contractors.

Verheul Trappen has an in-house production faciltity to make custom-made stairs.

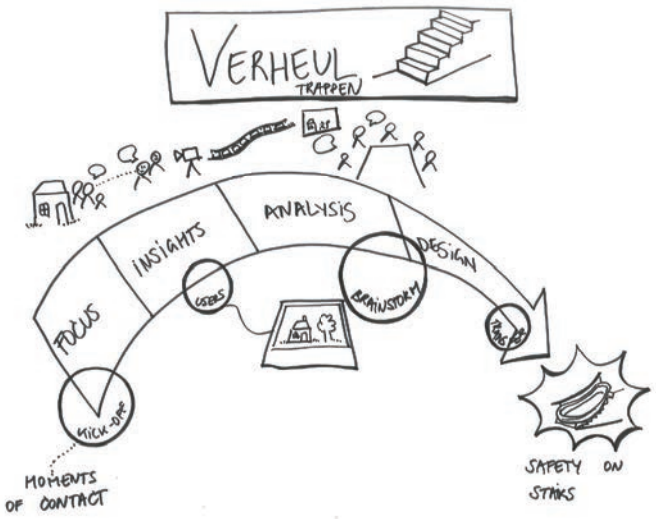
Verheul Trappen admits they know very little about the people using their stairs. They see a possible problem and would like to better support their users in the field of safety. Currently there are only a few solutions: banisters, stair lifts, non-skid zones and stair gates. Verheul was thinking about developing a solution for safety on stairs, but it remained informal and unstructured. With this case they want to address the topic in a structured manner.

> The entrepreneur of Verheul Trappen: *"We are looking for a new business opportunity and want to do something around safety on stairs. How does the target group take this? We already have some ideas, but would like to know how our users look at safety on stairs."*

The company has no experience in User-Centered Design (UCD). They teamed up with 31 Volts (a service design and design research agency) and Koen&Co (an industrial design agency). 31 Volts has 3 employees with a background in design and ICT. They are experts in the use of contextual design probes and generative techniques. Koen&Co is specialized in consumer products and electronic casing made from plastic. They employ 4 people. Koen&Co focuses on engineering and production of products and has no experience in involving users. They are part of the project team to translate the user insights to new products. 31 Volts and Koen&Co know each other from previous projects. This accelerated the start of the case.

Starting the case

31 Volts took the lead in the first half of the design process and suggested the approach. In a brainstorm session they communicated the user insights to the Koen&Co. From then onward the design agency took the lead. There were five key moments in the design process:
- During the kick-off of the project to discuss the design brief,
- A visit of the company
- 31 Volts visiting various users at home
- Communicating the user insights during an analysis session
- At the end of the design process to communicate the developed concepts.



An overview of design process of the Verheul case with the key moments indicated.

After the kick-off meeting the entire team met a second time to get to know the company better. Afterwards 31 Volts took off making plans to involve users.

Involving the users

31 Volts chose to use contextual design to dive deeper into the context of use of the targeted users: their homes and how they use their stairs. To contact users, 31 Volts used its personal network (to find architects and young families) and contacted former customers of Verheul Trappen (so they could ask about their experience with the company). The clientele of Verheul were mainly older people having difficulties to walk. Due to the time limitation of the project, 31 Volts limited the number of users. 31 Volts chose to also involve an architect designing his own stairs because of his different perspective on safety in general and responsibility for kids at home. Compared to going to the homes of users and interviewing them all one by one, probes and a follow-up session requires less time.

31 Volts prepared the interviews by defining a range of themes to discuss with the users: responsibility, independence, active versus passive, view on aids, safety in general etc. They defined these themes based on the conversations with Verheul and their interpretation of the design brief. These themes were sent to the users in advance so they could start thinking about them. The interviews were recorded on video. 31 Volts compiled a video of the recorded interviews with the themes as a red thread. The 45 minutes video contained the most important quotes.

> The owner-manager of Verheul Trappen: *"We specifically did not want to attend the interviews. We had already a clear picture of the results, and we did not want to influence the interviews and the outcome."*

Developing concepts

In an analysis/brainstorm session all members of the team were present: the owner-manager and the commercial manager of Verheul Trappen, Koen&Co and 31 Volts. 31 Volts invited "unusual suspects" to participate in the session: the guide of the Dom tower (the largest church tower in the Netherlands, with 465 stairs) and a physiotherapist. These experts brought a new, different and extreme perspective to safety of stairs.

> 31 Volts: *"We wanted to surprise Verheul by inviting the experts to provide a completely unexpected perspective to safety of stairs. For example the guide of the Dom Tower walks up and down a lot of stairs on a daily basis with many and different kinds of people. We try to go beyond the usual boundaries because it makes you think."*

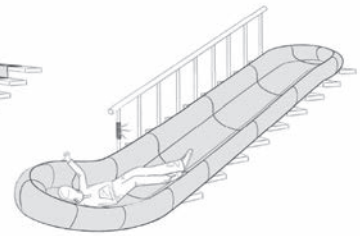
The session started by watching the video compiled by 31 Volts. The video enabled everyone to get a grip on the users. Everyone received a sheet to take notes during the video and had a basic structure: what is interesting and why? These notes were used as a basis for a discussion after the video. The discussion ended up in a set of design guidelines.

31 Volts: *"Those design guidelines should be seen as leads or conditions for the to-be-designed concepts. They are some sort of principles such as 'motivating but not pedantic' or "winter-tyre feeling. These design guidelines encompass a feeling that is difficult to put into a program of requirements. They are quite obvious."*

Question from researcher: *"You say these guidelines are quite obvious, but maybe not for Verheul?"*

31 Volts: *"That's true, but that's of course our role in the project. They had not even considered asking people questions. Our contribution is trying to grasp in words what is otherwise left out. Verheul is used to think in materials and production methods. We support them in making experiences understandable and usable."*

Based on the design guidelines, the team started to develop concepts by sketching and acting out, leading to three concepts. One of them was close to an idea Verheul Trappen was already considering.



Developing concepts based on the user insights gathered from the user videos and the discussions with experts (left).

One of the concepts for safety on stairs enabling users to stay home longer (right).

Results

Koen&Co took the lead in further detailing the developed concepts. In a meeting, where all members of the team were present, Koen&Co presented the ideas. Two selected concepts were finalized and had quite some details in terms of shape, modularity, technical feasibility etc. Koen&Co explored to what extent Verheul could develop parts themselves and for which parts they needed to look for partners or suppliers.

The commercial manager of Verheul Trappen: *"This project gave us inspiration and ways to realise this: a whole new perspective on innovation."*

The owner-manager of Verheul Trappen: *"We manage the company with the two of us (referring to the commercial manager, ed.) and I had an idea and with this project I wanted to explore the opportunities. What turned out is a little different and more abstract but close to what I thought off. He was rather sceptic. This was a good way to test my idea in practice. He now is enthusiastic too. He participated in the entire project, and by being involved he felt part of it and responsible."*

Next steps

Verheul Trappen is enthusiastic about the developed concepts and is applying for patents, supported by Koen&Co.

Insights and observations gathered during the case:

In most cases, adjustments only take place in case of immediate urgency.

Lifts on stairs limit the possibility to climb the stairs (narrows the staircase).
Climbing stairs quickly is unsafe.

Climbing stairs is better for revalidation.

Aids for children that gradually support children to climb stairs.

Stair gates in combination with stair lifts are dangerous.
Ability to climb stairs at home with socks.

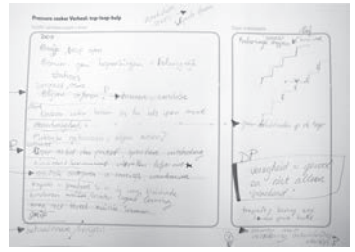
Being able to pause while climbing stairs

"How to adjust your stairs without needing to replace them completely?"

"A stair lift is for really old people, I am not that old yet."

Design guidelines:

— Chameleon
(adaptable to each situation)
— Affordable
(yourself, lease, health insurance,..)
— Independence
— Tray-function
(used for something else, you can use as an "excuse")
— Motivating but not pedantic
— High tech or Low tech
— Winter-tyres feeling (show off you can afford them while they look functional in doing so)
— Active/Passive
— Safety and sense of safety.



31 Volts communicated the user insights by a video compilation of the user interviews. They used a format to support the team in taking notes during the video.

Obstacles during the case:

Organizing a user group discussion and having the SME contact with the users was not possible due to school holidays, user type and unforeseen circumstances.

Enablers in the case:

The UCD expert used videos of the users to communicate the insights.
Formulating design guidelines with the entire team based on the user insights to help the designer translating them to concepts.
The UCD expert invited unusual users or experts such as a guide of the Dom tower, and a physiotherapist. These experts provided another perspective to the context.
The UCD experts consider it as their responsibility to go beyond the usual of the SME and to provide a different perspective on the SME's current approach.
The UCD expert designed ways to support the SME in taking notes when looking at the videos of users.
The UCD expert acted flexible to unforeseen circumstances and adjusted their approach accordingly.

Considerations regarding the use of UCD:

Contextual design was suitable to be used in the context of this case. The UCD expert made following changes to adjust the method to the context of SMEs:

- Limitation of the number of users to six,
- Using only video to communicate user insights,
- No final report in the end, less rigour (iterations and time spent) in going from insights towards concepts and
- No development of any common view in the form of a work model.

As the main target users were people that are experiencing difficulties in climbing stairs (immobile elderly, busy parents with young children, etc.) **the UCD expert experienced difficulties in applying UCD methods as they had planned** and needed to change their approach.

One of the key aspects in this case was that t**he UCD expert wanted to show the SME a perspective that was different from their assumptions and expectations**. They wanted to show the SME different ways of looking at stairs with little effort (by inviting the Dom tower guide and a physiotherapist).

The UCD expert provided the SME a **format that enabled them to actively participate** in the analysis of the user insights and conversion into concepts.

The UCD expert found a format, **supporting the SME and the designer of Koen&Co, to deal with more abstract subjects** than usual. By jointly developing the design guidelines based on user insights, a mutual starting point was created with common understanding.

The time and budget limitations of the Pressure Cooker constrained the actual **active involvement of users**. No users were invited during the brainstorm session and the developed concepts were not created with or evaluated by the users.

Summarizing the case:

Verheul Trappen was interested to explore how they can expand their current way of work: from manufacturing custom made stairs to supporting their users in safety of their stairs. They recognize safety as an important issue for their clients, with age, the stairs have become a danger in their house, and is often the reason why people have to move houses. Using contextual design, 31 Volts interviewed different users of stairs. The interviews were recorded and compiled into a video that was used to communicate the user perspective to Verheul Trappen. Experts or unusual users were invited to the session to provide another perspective on safety regarding stairs. By jointly developing design guidelines based on the user insights, 31 Volts enabled the rest of the team to understand the abstract information they were dealing with.

Contextual Design proved to be suitable to be applied by SMEs. The SME specifically appreciated the different perspective beyond their usual way of thinking and the design guidelines supporting them in moving from user insights to concepts as a result from collaborating with a UCD expert. The SME was very open to this new approach and recognized how they could get another perspective with only minor effort

SME	UCD method	Downsizing UCD method	Customizing UCD method	Suitability UCD method	Main barriers	Opportunities
Alpine	Probes, Genarative techniques	Preparation time, standard set of generative techniques, analysis and communication results.	Prepare material to context of design brief.	Good fit but requires help of UCD expert due to necessary skills. Other methods will be used to add perspectives.	Due to time limitations only one type of user involved. Designer experienced difficulty in using insights.	Presence of marketing supports uptake of results. SME recognizes benefits of contact with users in context.
Alrec	Probes, Contextual design	Preparation, analysis and communication of results. Invite personnel as user.	Prepare material to context of design brief.	Good fit but requires help of UCD expert due to necessary skills. SME will use UCD expert as coach in future.	Limited time for analysis, therefore many 1 to 1 conclusions.	Use insights as argument for pitches to clients.
Bammens	Design game	Preparation, analysis and communication of results. Two games instead of four.	Prepare questions to context of design brief, invite two types of users.	Good fit but needs to take place with UCD expert due to necessary skills.	No barriers.	Quick results from translation of insights into ideas. Standard set up requiring little customization.
BAT continental	Contextual design	Due to limited activities not able to determine.	No customization of method.	Due to limited activities not able to determine.	Complex industry. Lack of focus, choice of stakeholder and engagement of SME.	UCD methods as means to support collaboration with stakeholders.
Difrax	Probes, questionnaires	Preparation time, analysis. Evaluation of concept outside project span.	Prepare material to context of design brief.	Good fit but limited use, not to its full potential.	Almost no direct contact with users. Limited use of design-led UCD method.	Build on existing contact of SME with users.
Jansen Medicars	Contextual design	Limited visits possible due to context of use.	No customization of method.	SME is shown how to make use of their existing contacts and how to approach users in context. Good fit of method.	Difficult collaboration. Lack of trust. Difficult to reach users.	Good existing relations of SME with various users, keen to share experiences.
Premaxx	Probes, Genarative techniques	Preparation time, standard set of generative techniques, analysis and communication results.	Prepare material to context of design brief.	Good fit but requires help of UCD expert due to necessary skills.	No barriers.	Involved and active SME contributed to concept with good match to context SME.
Scala Publishing	Probes, Genarative techniques	Except for reduced communication of results no downsizing.	Use of existing network of SME. Fit probe to context user.	Good fit but requires help of UCD expert due to necessary skills.	No barriers.	Use learning lessons to develop user relationships for other products.
Schilte	Contextual design	Preparation, analysis and communication results. Only one school visit.	Only customization of method, all decisions were taken within short notice.	SME is shown how to make use of their existing contacts and how to approach users in context. Good fit of method.	Due to focus on time and budget: no preparation of user contact, only one visit and no consolidation of insights.	Basis created to extend good existing relation of SME with stakeholders.
Verheul Trappen	Contextual design	Small number of users involved. Enable SME to contribute to analysis. Communication results.	Make use of videos to bring user perspective in workshop. Invited user experts for brainstorm.	SME will visit users in context themselves in the future. For the use of video, analysis and translation into concepts UCD expert is needed.	No barriers, encountered difficulties were well tackled.	Invite experts . Make use of video to bring user to SME. Joint analysis.

Table 5.3: Overview of downsizing, customizing and suitability of UCD methods for each of the cases.

5.5 — Results across cases:

Cases like the ones presented in this chapter have great value as they demonstrate the effect, the results and the possibilities of UCD applied to SMEs. This section discusses the insights presented after each of the case descriptions and related them to the earlier conclusions presented in Chapters 3 and 4.

The following questions came to the surface in the previous chapters. They will be discussed in relation to the cases:

Chapter 3:
- How can the strengths of SMEs be used?
- How to make use of UCD in a flexible way to deal with unforeseen events and the context of SMEs?

Chapter 4:
- Recruiting users is experienced as difficult, how did this take place in the cases?
- What degree of user involvement can be achieved in SMEs?
- How to deal with gathered user insights in the design process?
- How can design-led UCD methods be downsized and customized to the context of SMEs?

5.5.1 — UCD tools and methods

This study provided insight into different aspects of using UCD methods in product innovation projects of SMEs. These aspects are for example: degree of user involvement, recruiting users, dealing with user insights in the design process and customizing and downsizing UCD methods.

Status of UCD before the Pressure Cooker:

Before the start of the Pressure Cooker project, the common methods for UCD at SMEs were random conversations with users and/or quick observations. This occurred in the BAT continental and Schilte cases. If the SME was already interested in involving users, they had a more developed relation with their users. For instance the regular user panels organized by Difrax. Every half a year users were invited to give feedback on concepts or new directions Difrax was developing.

Recruiting users

In Chapter 4, one of the main challenges designer encountered was recruiting users. Also in the previously described cases recruiting users was an issue. The easiest target user audience are concerned or involved people such as:
- In the Alpine case, the musicians enjoyed talking about their passion and experiences.
- In the Jansen Medicars the team barely needed to ask questions as the staff of the hospital loved talking about what did not work and what could be improved. There it proved valuable to talk to other stakeholders. The technical staff had different priorities and interests than nurses.
- In the case of Premaxx and Difrax, parents cared about the subject so they had no problem talking about their experiences.

There were also cases where recruiting users posed more difficulties. In the case of BAT, the main difficulty took place at the beginning, as the team was not able to define which stakeholder group would be focussed on. Especially in the building industry there are a lot of different stakeholders that deal with "products to support renovation". This difficulty remained throughout the project; the building industry is dealing with a hard time as many projects are stopped. Key decision makers are devoting all their time to the survival as a business. Investing time in a "funny creative and strange talk with these people I do not know" was one of their lowest priorities.

Users were recruited In two ways: using the strong and good existing relations of the SME with their users, or in the case the SME did not have any relation with their users and therefore the UCD expert used their own network. It was in the second type that the most difficulties were present.

In some of the cases, the UCD-experts and the SMEs experienced difficulties in recruiting stakeholders within the time frame of the case, involving users in the context of use and/or recruiting an interesting and diverse group.
- In the Bammens, BAT continental and Alpine cases the aim was to include different groups of stakeholders. Due to time limitation this was reduced to one kind of users.
- In the case of Premaxx, finding parents willing to participate was not that hard. Main issue was planning a moment where all of the participating users could be present. Due to the hectic and busy life of young parents they could only come to the workshop on a Sunday afternoon. Because of the subject they did not mind doing so.
- In the case of Verheul, the type of users (people with difficulties using stairs) had an impact on their capability to travel to a workshop. The UCD expert had to come up with an alternative and solved this by interviewing all of the users at home. By using video the users were 'present' during the creative session.
- In the case of Jansen Medicars, having contact with the stakeholders in their context was hard to achieve. As the operating rooms were fully booked, planning was not difficult. The team of the Jansen Medicars case had to take every opportunity and had limited time available.

Ways of user involvement:

Across all cases the degree of user involvement was different:
- In most of the cases (Alpine, Alrec, Bammens, BAT Continental, Premaxx, Scala and Verheul) the team attempted to co-design the products with users.
- In some of the cases the team aimed at gaining insights and using these as a basis for designing the products themselves (Difrax, Jansen Medicars and Schilte).
- Except for the case of Difrax, none of the developed concepts were evaluated with the users.

Even though the study aimed at applying design-led participatory UCD methods, in some occasion, co-design proved difficult (for example Jansen Medicars) as the context and the type of users restricted the team in this respect.

Dealing with user insights in the design process

The UCD experts all spent much time in communicating the user insights to the designers and the SMEs. The UCD experts needed to show the SME how to use the insights, making them aware that these insights cannot be translated one on one to new products. Having creative session(s) proved to be a good means to communicate the user insights and start up the concept development as all team members were present during these sessions. The UCD expert was leading the session in which they communicated their findings to the other members trying to find ways to engage and immerse the others in the world of the users To pass on the user insights, for example Personas (Muzus) were used, user material like probes or the artefacts made with the generative techniques, or a video with a compilation of the user interviews (Verheul case). 31 Volts used design guidelines like for example "security" and "winter-tyres feeling" as well as a video compilation of the interviews with the users.

The SMEs indicated that having UCD experts with a design background has great value. Some of the entrepreneurs had earlier experience with for example marketing agencies. They put forward that these agencies do not have the same considerations for the users as the UCD experts did. With their background, the experts are able to analyse the gathered insights with the purpose and use in mind. Insights are formulated on a less abstract level and give direction. The SME appreciates this characteristic as it helps them to understand the value of involving users.

The SMEs are not used to deal with user insights and have difficulties analysing them.

- Jansen Medicars wanted help to have a fresh look at their products; to ask questions without their own bias. The entrepreneur from Jansen Medicars: "This project was a good opportunity to get a fresh look at our current way of work. I found it important that someone else joined us in the context, using a different background and ways of work. This can be very informative." The designer of WeLL Design explains the difference of observations of the entrepreneur and Well Design with an example: "In the example of the trolley with a motor they put the electric outlet at the back of the trolley on the bottom. So if the staff needs to recharge the trolley they need to bend over on their knees to plug the power line in. When I ask him about it he says: this way is the only option." The entrepreneur looks at the products from a very practical perspective and likes the critical user perspective from the designer.
- Muzus added another example: "Alpine tended to take the insights too literal. Through listening to what they are saying, 'read between the lines', the users tell what they really want and one can uncover the underlying motivations."

When involving users, not only insights are gathered for product innovation purposes. By asking questions about users' needs within the context many unrelated issues and conflicts the users are dealing with come to the surface.

- In the case of Schilte, the insights helped the schools in reorganizing, change aspects, agreements or processes.
- Jansen Medicars, by asking the nurses and the technical staff about their way of work and using products, a discussion got started and they became aware of other considerations. This enabled them to share experiences and improve their work.

Regarding the use of each of the design-led UCD methods:

Contextual design (BAT, Jansen Medicars, Schilte and Verheul)
In the past, Jansen Medicars and Schilte used to interview their users in the usage context in an informal manner, not having any structure or formalised process. The UCD experts supported the SMEs to structure their moments of contact with users. They prepared the visit with questions and briefed the SMEs on how to approach the users to gain more information. At the moment of contact the UCD experts were focused on confronting users with their own actions and responses. In the case of BAT, the UCD expert visited the context without the SME. In the case of Verheul video was used to bring the user to the workshop with the SME.

As Contextual Design is a UCD method with low threshold, all companies that used contextual designs in the project expect to use it the future, initially with the aid of a UCD expert.

Design game (Bammens)
The subject of new ideas for garbage bins in the context of temporary events was a good fit with the playful nature of the design game. The limited time and budget of the project reduced the time for preparation and communication of the findings, the standard amount of games from four to two and the amount of users involved. Visitors of the festivals played one of the games whereas for the other game organizers of the festival were invited. This might have decreased the level of validity of the findings, but the design games is primarily aimed at inspiring the designers. Even with the limited amount of users involved, Flex considered the insights gathered valuable input for the design process.

Bammens liked the use of the design game as it created a great atmosphere amongst all participants and a lot of energy. As Flex' designers helped users to visualize their ideas, the insights were translated into sketches during the game itself, resulting in immediate results, appealing to SMEs' way of work.

Design probes (Alpine, Alrec, Scala and to some extent Difrax)
Design probes enable users to take time to reflect and formulate their thoughts. The information collected gives information on the user environment. Using probes was a good fit with the information needed for the design brief as well as the interests and capabilities of many of the users.

The SMEs valued the input received through the probes. They state that they get a good sense of the lives of the users and the context of use. This kind of insight was new to them and very much appreciated. They did however see the amount of skill and preparation required to make the probes and there-

fore not see themselves making probes in the future. They would rather hire an expert to do so.

Even though WeLL Design and P5 Consultants were approached for cases because of their contextual Design capabilities, they both wanted to use the opportunity to try out design probes in their cases. Their design probes were not as developed with an understanding of the underlying mechanisms, but still provided a lot of details on the context of the user and enabled the user to prepare for the session.

All probes were developed and customized for the context of the case. The probes for Verheul and Alrec consisted of basic sets of assignments to enable users to reflect upon their experiences in their own context. The probes for Scala, Alpine and Premaxx were more extended. This was due to the more elaborate experience of the UCD experts. They have a large array of means to invite users to provide more in-depth information.

SMEs appreciate how the probes work and how these enable users to bring insights to the surface. They do recognize the amount of work design probes require to make, and the skills that is necessary in making the probes.

Generative techniques (Alpine and Premaxx)
Downsizing took mainly place by using already existing sets of images and words as means for users. Normally Muzus would develop a customized set of techniques for each project. Furthermore they used "standard" previously proven set-ups for the sessions with the users and reduced time in analyzing the gathered information. Where they usually transcribe the entire session, they now noted down the most important insights and quotes to compose a report for the SMEs. Because of the presence of the SME during the session with the users, supporting them to take notes themselves and taking time to evaluate the session afterwards, the time necessary to communicate could be shortened.

Using generative techniques, as intended by Sanders (1999), requires experience and skill. This explains the hesitation of SMEs to use this method. Quite often generative techniques are considered as doing 'fun stuff': cutting and pasting images. In order to appreciate the added value and recognize its value, SMEs need to experience the techniques during a project. Once they did, they recognized the value of providing users the tools to express themselves, reflect upon their own experiences and make these explicit. The acknowledged the rich information that can be obtained using generative techniques which often remains unknown using other UCD methods.

In some cases the design-led methods have not been used to their full potential:
- BAT continental: due to a lack of focus and choice of type of user, the case did not get to gathering user insights.
- Schilte: the UCD expert was very time and budget aware and because of this many opportunities were missed. Only one school was visited for a short time.
- Difrax: the probes and questionnaires were handed out to users, no other contact or use of design-led methods due to time constraints and unforeseen circumstances (users could not participate because of holidays etc.)

Customizing and downsizing design-led methods
At the start of the project I had expected the UCD experts to be obliged to take many measures to adapt to the context of SMEs within the time and budget frame of this project. However, the measures they had taken were limited. Primarily due to the strengths of the SMEs the design-led methods could be applied within the contexts of SMEs and within the time and budget restraints of the study.

With some changes, the existing methods and tools can be adapted to the SME context. The primary changes were made in the process of involving users and the use of the methods. The tools used were standardized as much as possible for different purposes. There was less room for preparation and framing the design brief. Choices had to be made with limited information and involving the SME during the analysis shortened the analysis. User insights were communicated directly to the designers and to the SME and not through the analysis of transcripts of the videos and reports.

5.6 — Discussion

Looking back to each of the cases, different barriers and enablers were observed as well as considerations for the use of the design-led UCD methods. This provides the basis to address the two key research questions for this study:

1. What are the barriers and opportunities for design-led UCD tools and methods in SMEs?
2. Which UCD tools and methods suit the context and capabilities of SMEs?

5.6.1 — Barriers for design-led UCD tools and methods in SMEs

For each case descriptions containing properties, situations or conditions that were obstructing for the use of UCD in SMEs were coded as barriers according the three pre-defined subjects: (1) related to the SME, (2) with regard to working in a team consisting of different organizations and (3 executing a UCD project. This section describes the three subjects and the activities related to the theme.

Related to the SME:

One of the main struggles SMEs deal with is lack of resources. Each time an investment needs to be made, this is done with a great deal of thought and consideration. Muzus: *"The difficulty with SMEs is that they all see the value of involving users, but at the moment an investment needs to be made it becomes a breakpoint. This was very much the case with Alpine. So now they focus more on making use of the insights they have and will not easily start a complete new project."*

A prerequisite to start a UCD project is the **attitude of the SME**. In the case of Jansen Medicars, the entrepreneur was very protective about their own insights and concepts. The UCD expert could not make use of the knowledge already available, preventing him to build on existing knowledge. As the UCD experts started from scratch, the existing knowledge was confirmed rather than extended.

Another aspect related to the attitude of the entrepreneur of the SME is his/her engagement and commitment to the project. To lower the threshold to participate, the investment of the SME was limited to 250 Euro. Many SMEs did not feel the urge to invest a large amount of time into the project and get the most of it. The entrepreneurs of Alpine, Difrax, Alrec and Schilte acknowledged this during the discussion rounds after the project.

Due to the **lack of engagement of the entrepreneur** of the SME some cases had a tough time to make progress. Especially the case of Bat continental suffered many delays and a lot of uncertainty on the aim of the project.

Some designers indicated during the discussion rounds that they need tools or arguments to "sell" these kinds of projects internally and to clients. They were looking for ways to explain the value of applying the design-led methods.

When presenting the results of the case internally to other employees, which were not involved in the case, many of the cases ran into **misunderstanding or objections**. The collected user insights suggested in many cases a change of strategy for the company. The resistance internally to make use of the results limits the uptake of the results.

With regard to working in a team consisting of different organizations :

The main barriers related to the team come down to difficult collaboration through a lack of a clear division of tasks, a lack of trust and different backgrounds.
In the case of BAT continental the entire process was lingering, mostly caused by no having one and the same dedicated contact person of the company. The person from BAT present at the kick-off went on sick leave. So the case moved to someone else. That person did not see the value of the project so it was handed over to another person. Meanwhile that person was on holiday. At the closing event the initial person was present but he had not been involved during the entire case. All this had a large impact on the collaboration of the team and the results of the case.

Executing a UCD project:

Another consequence of the time limitation was that the teams were only able to either dive deep into one type of user, or investigate the context wide but limited in depth. Most teams chose to focus on one type of user with as a result a lack of diversity the SMEs would have liked to have. While in many cases it was the combination of different kinds of stakeholders that was valuable (Schilte, BAT continental and Bammens).

Another aspect of dealing with users, and recognizing the value of users was pointed out by Muzus: *"The difficulty with SMEs is that they all see the value of involving users, but do not feel the need to do something similar in the near future. They see the wealth of information and think they have sufficient information for a long period of time. The collected information though, is quite specific to one subject. It is not as easily translated to other products as they may think."* **Due to the large amount of insights gathered and the novelty they bring, SMEs tend to feel overwhelmed.** This might cause SMEs to refrain from applying UCD methods in the near future, as they feel satisfied.

5.6.2 — Opportunities for design-led UCD tools and methods in SMEs

The cases brought many different opportunities to the surface for the use of UCD in general in SMEs and more specifically for design-led UCD methods. These opportunities can be divided into two groups: those related to the application of UCD, and opportunities related to the nature of SMEs:

Regarding applying UCD in SMEs:

The acquired insights during the case were not only valuable for the product-to-be-designed but had a **larger impact on the organization**. It made the SME aware of the opportunities of UCD, gave them a better idea about who their users are, and that there are different kinds of stakeholders involved.

Due to the SMEs' flat organizational structure and size not only designers got involved. For example in the case of Alpine, the marketing manager was present at the creative session and could use many user insights directly for marketing purposes.

Normally getting the approval from hospitals takes a long time. The **existing good relation** between Jansen Medicars and its clients (the hospitals) enabled the team to actually visit the hospitals, interview different stakeholders and observe the stakeholders during surgery. In the time span of the Pressure Cooker the team probably would not have succeeded getting in the hospitals and interview and observe the technical staff and the nurses without this relation. The staff were also interested to see the improved products in order to do their work better motivating them to cooperate. If new products can lead to a safer and sterile environment, their work would be easier. The team was happy they were able to ask questions to the users, however the more active involvement of the users they had hoped to get was not possible due to limited time available in the operating rooms and the busy schedule of the users. The cases of Schilte, Verheul and Difrax also made use of the network and contacts of the SME but were able to use the available time more extensive.

In the case of Scala, the magazine had a motivated group of readers willing to invest time to think about the future of the magazine. This made involving users easy; Scala posted an invitation to participate on the magazine forum. The response was fast and in large numbers.

SMEs consider UCD as a way to change the relations with their clients. Towards thinking along about product innovation instead of "you ask we deliver".

- At Jansen Medicars, engineers presented produced results to the stakeholders as rather "finished". Stakeholders felt like they could not give feedback anymore. To enhance the relationship, WeLL Design supported Jansen Medicars by documenting the insights through sketches. This way the results are passed on to the stakeholders who can give feedback.
- For Scala involving users has become relatively easy. They can structurally make use of users input to develop new products, and co-design the content as well as the media around the magazine with its users. The insights gathered with UCD can be used to create support within the organization for an idea as it is validated with users. The entrepreneur of Verheul explained: "We had an idea within the organization, but not everyone supported the idea. I really liked the idea but my business partner was a little sceptical about it. I was confident it would prove to be useful so we tested my idea during our case. My partner joined the creative session and by seeing how users think about it he got convinced about it as well."
- For some of the SMEs being able to ask users direct questions is new. Alrec has good relations with its clients and the retailers, direct contact with users was new and provided an advantage during future pitches for clients.

Regarding the characteristics of SMEs:

The **commitment of the SMEs** speeds up the process. In some of the cases SMEs took over part of the responsibilities. Alrec for example took care of the interviews with the retailers. Distributing tasks and sharing responsibilities could decrease the invested time for all members of the team. The team meetings were used to formulate questions, do analysis of user insights and translating the user insights into the start of concepts.

As the case progressed, **the intermediate results** and the direct contact with users make the SME more interested, engaged and enthusiastic. This has a positive effect on the future progress of the case. To get the most out of the case and many of the SMEs started to devote more time to the case.

In all cases the SMEs were present during the moment of contact and joined during part of the analysis of the results. Because of their involvement and their informal way of conduct time necessary for analysis and communication could be shortened.

Based on their previous experiences, **SMEs have a lot of knowledge about the context of use, their products and their users**. External designers and UCD experts can make use of this knowledge and build further on it.

The UCD experts summarized their collaboration as follows: *"SMEs are real thankful clients and are super enthusiastic. It is a more one to one application. One of the SMEs came back after meeting the users and had already been developing something based on the insights. He was completely inspired. You see that insights are used and products are altered quicker. The projects are not so inert or long. It all goes a lot faster and easier. There are not as many barriers or obstacles to execution as in larger companies."*
When evaluating the project with the entrepreneurs we asked feedback on UCD now they had some experience with it.

- One of the entrepreneurs (from Alpine) responds: *"We got a lot of enthusiasm and became proud about what we do. We found a lot of opportunities, more than we expected. It is a larger market than we anticipated."*
- Another entrepreneur (from Verheul Trappen) adds: *"We make stairs. And we are good at making stairs. Or we are good at making school furniture (ref. pointing at Schilte). The funny thing is that this process tells you to get out of your comfort zone and sit on the other side to take a look at it. You have a vague idea on how to do that but UCD helped us in doing so effectively. We got a really nice idea out of this, and we now believe there is a market for it. We are going to look at the financial feasibility. It is the reverse way of working for us. This is different from starting with the financial feasibility where you immediately exclude a lot, supposing it will be too expensive for the market."*

To make sure they can afford UCD in the future, entrepreneurs would be interested in cooperating with other SMEs using each other's expertise and doing research together. In the case of Jansen Medicars, this already came

forward. The insights gathered are valuable for all products in an operating room. The users automatically started talking about their entire context of use/work. Jansen Medicars could cooperate with other producers of operation room equipment to develop a joint vision of the future of operating rooms where the products complement one another instead of compete or clash. One of the entrepreneurs mentioned: *"I really believe in UCD, just as many larger companies. It is not something you can ignore. I do not think there is anyone who doubts that. But if you really want to use UCD well, you quickly deal with large investments. This is not a real bad thing, but it does not end there. You have to put it on the market etc. For some of the target groups, we could team up with several producers that cooperate with a UCD expert so we can share the costs as a cluster."* When involving users, not only insights are gathered for product innovation purposes. Through asking questions to users needs within the context also come forward often unrelated to the SME. For example, in the case of Schilte, the insights could also help the schools in reorganizing, change aspects, agreements or processes. Branch associations can have a contribution in this cooperation.

5.6.3 — Which UCD tools and methods suit the context and capabilities of SMEs?

There is not necessarily one suitable method for a given design brief. Quite often multiple UCD methods can be used and yet, not all UCD methods were possible in all of the cases.

In determining which method to be suitable, the following factors or combination of factors played a role in the cases:

- Design brief
- Type of information needed
- Familiarity and comfort with a certain method
- Type of user
- Context of SME

The **design brief** was formulated in a more general way than those SMEs usually use. In the past, the design brief was an idea that needed to be worked out in terms of working mechanisms or in production details. Formulating a design brief with a wider scope that includes user insights was new for most companies. When we approached SMEs to participate in the Pressure Cooker project, we did not encounter many problems reformulating the design brief. We simply discussed the challenges the company was facing and the opportunities they observed. In many of the cases we ended up with a shortlist of possible design briefs out of which we picked one.

The **information type needed** has an impact on the suitability of a UCD method for a project. What kind of product innovation does the design brief imply? Is it about a redesign of an existing product, for another market or a complete new product for a new market?

- When redesigning an existing product, users can reflect upon their earlier experiences with the product or the use can be observed.
  In the case of Jansen Medicars, observations of the use of the existing medical carts were used as a starting point to redesign the product for the existing market.
- When targeting new user groups it is important to obtain the context of use as well as the needs.
  In the case of Bammens, they were at the time unaware of the implications for their products in a different context (that of temporary events) and wanted to know more about this new context with different types of users.
- For more radical product innovation it is the tacit and latent knowledge of users that it is valuable. Probes and generative techniques help users in getting their tacit and latent knowledge to the surface.
  In the case of Premaxx, the parents were given time in their own context to reflect on their needs when putting their children in bed. Over several evenings they analysed what was important to them.

Familiarity and comfort with a certain method: especially when using probes, generative techniques and design games, the SMEs needed the support of a UCD expert. The set-up, the analysis and the translation of the insights into ideas were the moments where the help of a UCD expert was needed most. All SMEs indicated that in the future they would need support as they lacked to knowledge and skills.

The UCD methods could be adapted to the **context** of the different cases of the SMEs and meet the time and budget constraints of the study. The SMEs indicated that using the UCD methods themselves in the future however is a different challenge. The UCD methods applied in the cases of this study require basic experience and skills. All SMEs required support in applying the methods.

- Contextual Design is the only method the SMEs expect to use it in relative short timeframe, requiring only little support primarily aimed at using it structured to its full potential. This method is also closest related to the UCD methods SMEs are already using.
- Design probes and generative techniques are UCD methods that bring rich insights to the surface and support the users well in providing insights. The SMEs are happy having experienced these methods but are hesitant to use them in the future. Support from an expert is required. Difrax, with prior experience with UCD methods turned to Muzus at the end of the project for support in using probes and generative techniques in the future.
- Many SMEs showed interest in using the design game at the kick off of the Pressure Cooker. They valued the quick results by the immediate translation of insights into ideas. The design game from Flex is however a more expensive method (partly due to the collaboration with a research agency). Only in the case of Bammens the design game was used. In the matching of the UCD method with the design briefs many of these briefs required in depth tacit knowledge from users preferably gathered in-context, which was expected to be difficult to attain using the design game.

5.7 — Conclusions

The cases of the Pressure Cooker show that design-led UCD methods can be used in design projects of SMEs. Minor changes are made to downsize and customize the methods. These changes mainly come down to:

- limit amount and kinds of users involved
- make use of experts and present knowledge within the SME to have a head start
- use standardized formats instead of customized formats based on the experience of the UCD expert
- shorten time for preparation and analysis
- actively involve the SME and divide responsibilities and tasks
- reduce time needed to prepare communication of results

SMEs do need support to make use of design-led UCD methods. SME cannot afford a dedicated person for user involvement, either in research or design (as it is the case in an academic setting or with some large organizations). Thus applying UCD in SMEs cannot be built around an in-house UCD expert and learning how to apply UCD in their practice is an important challenge they struggle with. The external UCD experts attempted to support the SMEs by choosing a UCD method matching the context and design brief, applying the UCD method, showing how it is used and in some case supporting the SME in taking part in these activities as well as the analysis of the obtained information.

Effective use of UCD requires making the SMEs aware of opportunities users/clients present, adding UCD to the current way of work and taking advantage of the SMEs' strengths (e.g. flexibility, iterative approach, project based development, involvement of different internal stakeholders, existing relations. A key component of all cases was the collaborative character of the process. With the limited time available, all teams had the feeling "we are doing it together". Workshops were the main carrier of the collaboration between team members.

SMEs have close contacts with their clients. At the moment, however, these contacts are either on a personal level (small conversations on personal activities, for networking) or very sales-oriented (how many products are they buying). In the cases I have shown there are clear opportunities offered by involving users and clients in product innovation for SMEs. Extending their user contacts by discussing new product opportunities or markets strengthens their relation. It offers a basis for collaboration between SME and client.

The main difference between SMEs and large firms is that it is easier for SMEs to involve different internal stakeholders at actual moments of contact and immersion in user data. Unlike in large firms, this is not limited to designers and user researchers (Sleeswijk Visser, 2009). Throughout this research project, marketing managers, sales representatives and the entrepreneur were often present. Due to the flat hierarchical nature in SMEs and the informal distribution of functions and responsibilities, low-hanging fruit for the SME can easily be identified.

UCD not only investigates the use of a product but also its context and the user itself from a broad perspective. An additional outcome is that although each case started with a clear design brief to develop a new product, the end results included much more, such as new insights on aspects like marketing, new services, directions for the future, and strategic considerations for the company. It is this nature of SMEs, where different kinds of stakeholders of the company are involved in design projects that allow them to recognize additional opportunities and act upon them.

Almost all encountered barriers come down to the attitude, engagement and involvement of the SME. If overlooked, misunderstanding and objections take over and in some cases the project even fails (such as in some of the cases of this project).

The Co-Design Pressure Cooker made us aware that the main challenge is how SMEs can apply UCD. Difrax and Jansen Medicars were the only companies that structurally involved users for product innovation. Most of the SMEs indicated that they would continue using UCD in their daily practice. The key issue is that SMEs need to be supported in implementing these UCD methods and learn how they can involve users:

- Difrax will continue and extend the use of UCD. They had already asked the help of one of the UCD experts who was involved on a regular basis in projects of Difrax. Difrax also had contacted Muzus to make use of probes and generative techniques in future projects.
- BAT continental and Alrec both approached an UCD expert to continue collaborating. BAT continental has the feeling the project had only just begun. Even though the case did not go so well during the project, they were exploring with both P5 consultants and Aldus future opportunities. Alrec was already looking with P5 consultants how they could get support in interviewing users.
- Verheul Trappen was exploring opportunities to further develop the results with 31 Volts and Koen&Co.

The SMEs value applying UCD as it provides a different and fresh perspective on their current practice and provides them confirmation of their way of work.

This study could be considered as a first step of a learning process for the involved companies. SMEs indicate they need support in tackling the following three challenges:

- Opening up towards users
- Learning the skills to apply UCD methods and
- Supporting the organization to integrate UCD into in their way of work.

The next chapter will have a special focus especially on these three challenges. As more knowledge is required, the challenges will be further explored to reframe them using existing literature.

Academics:
Design-led UCD methods are also suitable for SMEs, but they need to be supported in applying these methods for example with the help of UCD experts. In this regard it is important for SMEs to get a user-centered mindset, learn to apply the UCD methods, and integrate it in their current way of product innovation.

SMEs:
Examples of how other SMEs deal with involving users. Design-led methods can also be applied by SMEs but they require more skill. UCD experts and design agencies can support in applying these methods.

Students:
Examples of how SMEs deal with involving users. Be aware that SMEs often do not know design-led methods and need to be informed about their use.

Government:
Examples of how SMEs can be supported in applying UCD methods. These methods can also bring user insights that can be use wider across the company and are not limited to product innovation. SMEs need to be supported in making use of design-led methods and how to make use of the gathered insights within the company.

Chapter 6

An approach for supporting SMEs to apply UCD

Chapter 5 summarized the use of four design-led UCD methods in ten cases with manufacturing SMEs. Although the UCD methods were suitable for the context of SMEs, they found the methods difficult to implement. The actual challenges they face are: becoming aware of their users, learning the necessary skills to make use of UCD tools and methods and applying UCD in their design practice. These challenges were more easily addressed when the entrepreneur and the employees of the SMEs were interested in and open towards their users. In this chapter I will analyse the conclusions of the previous chapters and discuss how the gathered insights provide recommendations for designers working in or for SMEs. The challenges are further explored in more depth using literature dealing with for example adoption process, absorptive capacity and learning to provide structure and to frame the challenges. This chapter concludes with a proposed approach to help SMEs to learn to apply UCD in their practice.

6.1 — Introduction

This PhD project started with the assumption that a selection needed to be made of existing methods and tools and, if necessary, think of and develop new methods and tools suitable for the SME context. What started as a quest to downsize existing User-Centered Design (UCD) methods used in large companies so they become usable for SMEs has ended in a different journey. During the study discussed in Chapter 5 it became clear that there is no need for a specific set of methods and tools for SMEs. The main difficulty was that SMEs lacked knowledge and skills to use these new methods. The SMEs did not feel ready to apply UCD during the project. They needed the support of

a UCD expert to make use of the methods. Where the initial research questions investigated what UCD tools and methods are suitable for SMEs, the Co-Design Pressure Cooker project made me aware that *SMEs can utilize their strengths to apply UCD in their innovation practice* (which is the fifth research question brought forward in Chapter 2).

This asks for more insight and understanding of the challenges SMEs are dealing with, more specifically how they can learn to apply UCD: make use of the UCD tools and methods themselves with the support of a UCD expert. This also includes making them aware how they can make use of their existing client relations differently. It entails new ways to get their users and clients involved in product innovation and the need for external support. In order to propose an approach for SMEs to learn to apply UCD for product innovation, I reflect on the insights gathered in the previous chapters on each of the corresponding meta-levels (SME, UCD expert and toolkit designer). This enables me to draw conclusions and develop the boundary conditions and guidelines to support SMEs in applying UCD.

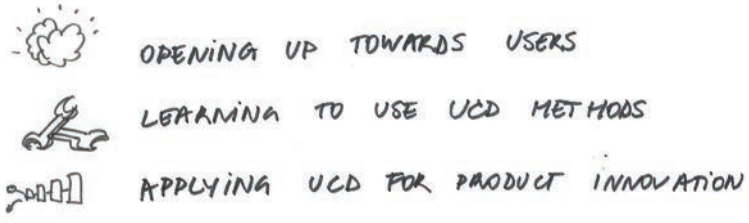


Figure 6.1: Three challenges of dealing with UCD in an SME

6.2 — Three challenges for SMEs to apply UCD

The initial challenge of this research project was to explore what UCD tools and methods are suitable for SMEs. Tidball et al. (2010) bring one of the difficulties forward of toolboxes of UCD methods and tools: for a designer to make use of a toolkit, s/he needs to understand the value of the UCD method and its place along the design process. The issue with many UCD toolboxes for selecting User-Centered Design methods is that they start with the method, rather than the purpose for which the method is used (Bevan 2010). This is especially a difficulty for SMEs as they lack understanding of UCD in general. Goodman (2006) argues that this has to do with the fact that *"designers often think of user methods separately, rather than as parts of other elements of design, such as idea generation or understanding the market".* She argues that it would be helpful if designers could see methods as a natural part of design. UCD is not an added element to the design process, but rather a certain mindset towards users in the design process: gaining empathy for them and feeling engaged to make a product that fits their needs.

This comes back in the first challenge I observed: "*Opening up towards users in the design process*" (see Figure 6.1).

Designers and entrepreneurs need a certain mindset to involve users and need to see it as a natural part of product innovation in order for them to make successful use of UCD methods (as demonstrated in the previous chapter). In the process of opening up towards users, they gain empathy for their users and become engaged towards that user. Everyone is capable of approaching users and asking users for input. It is a matter of being willing to do so, knowing what and how to ask and actually doing it.

In different circumstances using a metaphor, it is not difficult to hammer a nail into wood. You simply have to collect the means, be willing and practice it. This is the main purpose of dealing with the first challenge: people become willing to approach and involve users, prepare and act upon it.

The second challenge deals with becoming able to use UCD methods: *"Learning to use UCD methods."*

For designers and owner-managers to start involving users, an open mindset is required. They need to be motivated and gaining empathy for users and being engaged with users helps them in getting started. But merely a User-Centered mindset does not enable designers and entrepreneurs to use advanced UCD methods. It often boils down to involving skilled user researchers and designers to use these methods. Difrax had already been involving users by inviting them over for focus groups. They are now interested in learning other methods to involve their users. After the Co-Design Pressure Cooker, Alrec asked P5 Consultants for support in doing interviews with stakeholders in the near future.

Going back to the previous example of carpentry: the skills for making a wooden table can be attained by experience, without knowledge or instructions. For making more complex furniture and knowing the ways of different kinds of joining wood, the necessary skills need to be learned. This more complex process requires a mindset whereby the carpenter takes structured steps or a predefined path in making a table (Challenge 1).

For designers and SMEs to make use of UCD methods and structuring and organizing user involvement for product innovation, the development of skills is needed. This can be achieved through education and experience with the help of a UCD expert. The extent to which someone becomes able and knowledgeable on UCD depends on the personal and organizational goals.

How can SMEs start with UCD? What does the process of applying UCD look like? Pozzey (2012) studied family-owned SMEs from within, looking how they can embrace the user-centeredness of design in their daily practice. She argues that the ability for an SME to sustain and implement user-centered design ultimately depends on the embedded core culture being able to internalize and adapt to the shift in becoming more user-centered. Tools and methods do not provoke an internal cultural change. The challenge lies in securing a lasting change within the organization. This is illustrated by the different uptake of the results of the Co-Design Pressure Cooker by the par-

ticipating SMEs. Bammens experienced the user insights as too far-fetched, and hesitated using them. Alrec recognized the value of involving users and a different relationship with their clients.

This challenge is reflected by **the third observed** challenge: *"Applying UCD tools and methods for product innovation in the daily practice of SMEs."*

The cases discussed in Chapter 5 indicate that attaining UCD skills, and involving users for product innovation, has an impact on the way of work of a company and on its culture. UCD implies the company to look at its business from a different perspective by including other marketing perspectives and different distribution channels. As an example how one single SME goes through the different levels, the process of Alrec: Through the Pressure Cooker project employees and the entrepreneur of Alrec gained a more user-centred mindset. Before the Pressure Cooker they were primarily oriented at their clients and the retailers. In formulating a design brief in collaboration with Syntens and I, they realised there could be great opportunities if they learned more about the end users of their product. Alrec approached P5 consultants after the Pressure Cooker as they wanted to be supported in learning how to make use of interviews to gain more insight in their users and involving them for product innovation. Alrec aims at adopting UCD in a structured way as they recognize it as a strategic advantage.

The following page presents an overview of the insights from the previous chapters with corresponding recommendations (Table 6.1) grouped along the three underlying challenges. These recommendations are intended for designers working in or for SMEs and UCD experts that support SMEs in applying UCD.

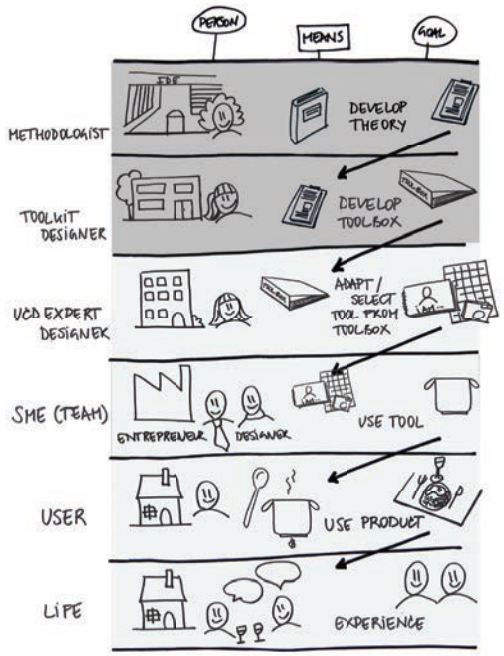


Figure 6.2: Meta-levels in this research project.

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Table 6.1 (on the next page): Overview of how insights are translated into recommendations with the according chapters of origin. The last column refers to the meta-level the recommendation deals with.

	Challenge	Insight
A	**Opening up towards users**	A prerequisite to start a UCD project is the attitude of involved people. Without interest in UCD, applying UCD has no value.
1		SMEs are more oriented towards and accustomed to quantitative research methods and usability testing than to qualitative methods for the early design stages.
2		Designers indicate they are experiencing threshold in getting UCD "sold" internally.
B	**Learning to use UCD methods**	Designers lack knowledge on how to apply UCD, and are uncertain if they apply it well.
3		No functionaries, lack of specialized knowledge. No dedicated staff for UCD.
4		No functionaries, lack of specialized knowledge. No dedicated staff for UCD.
5		SMEs are interested in actively participating in user involvement and taking over from a UCD expert.
6		SMEs are experiencing a threshold in using methods they do not know or see the immediate value of.
7		Need for hands on information and experience on how to make use of the UCD tools and methods in the future.
8		Designers want to know what they can expect from UCD and how to communicate it to others.
9		Designers indicate they are interested in gaining more tacit and latent knowledge from users.
C	**Applying UCD methods for product innovation in daily practice**	SMEs act hands on, want to see immediate results of how it can be valuable to their practice.
10		SMEs have project based product innovation
11		Often, projects in SMEs lack of focus and structure
12		SMEs are result driven.
13		SMEs have a flexible structure but limited resources.
14		The entrepreneur has a large impact on the company.
15		The flat structure and lack of functionaries enable SMEs to involve employees across the organization
16		SMEs have close relations with users and clients and can act in a short time span upon their needs and desires.
17		Innovation in SMEs is rarely strategic, they mainly react or respond to internal and external impulses.
18		Results of UCD can have implications for the company strategy and need time to get implemented.
19		Help of expert is needed to set-up research, select method, formulate questions and do analysis.
20		To increase uptake of results in an SME, the project needs to add to current state, often captured in tacit knowledge of employees.
21		Low degree of formalization, short communication lines.

Chapter	Recommendation	Meta-level
3 & 4 & 5	**Enable SMEs to become curious, willing and gain empathy for users.**	
4	Show the richness and opportunities of qualitative user research methods in relation to quantitative methods e.g. through examples of insights or of cases..	UCD expert
3 & 5	Provide designers means to explain the value of applying UCD methods.	Toolkit designer
4	**Inform employees of SMEs about UCD, when to use UCD, how to use UCD and for which purposes.**	
5	Facilitate for different levels of UCD skills.	Toolkit designer
5	Support employees of SME in applying UCD methods.	UCD expert
4 & 5	Show how the UCD techniques work so SMEs can apply these methods themselves in the future to a certain degree.	UCD expert
4	Provide UCD methods with a low threshold for use.	UCD expert
5	Supply employees and the entrepreneur with an active role in the project.	UCD expert
4	Be transparent about the approach (no black box).	UCD expert
4	Inform employees about UCD methods that enable gaining tacit and latent knowledge such as design-led methods.	UCD expert
5	**Let SMEs experience UCD by making use of UCD in ongoing projects.**	
3	Support SMEs in applying UCD within their ongoing projects.	UCD expert
3	Set and question the focus of the project.	UCD expert
3 & 5	Allow SMEs to monitor and direct the project, for example by building in checkpoints and providing intermediate results.	UCD expert
3	Enable to use UCD methods ad hoc within a short time span and with little budget.	UCD expert
3 & 4 & 5	Involve the entrepreneur of the SME, making sure he enables employees to make use of UCD.	UCD expert
5	Involve employees across the organization in applying UCD such as marketing people, service staff, etc.	UCD expert
3 & 5	Build on the good existing contacts of SMEs, easy basis to recruit users.	UCD expert
3	UCD can be applied in some cases to deal with internal or external impulses and provide a starting point to apply UCD.	SME (team)
3 & 5	Make sure that the project is embedded in a larger trajectory.	SME (team)
4 & 5	Make use of a UCD expert to guide the SME throughout the adoption process.	SME (team)
5	Pay attention to initial ideas and prior knowledge.	UCD expert
3 & 5	No need for formal reports, communicating user insights is based on the SME having actual contact with users and face-to-face meetings.	UCD expert

6.3 — Reframing challenges

In order to explore the three challenges to more detail, I reflect on each of the observed challenges using different concepts from literature to understand how SMEs can apply UCD in their product innovation practice. In this regard, literature is used as an instrument to find support in framing the concepts underlying the challenges and bringing them together. This exploration provides additional insight into the challenges and creates a basis to propose an approach for SMEs to apply UCD based on the previously described recommendations (described in Table 6.1).

6.3.1 — Challenge 1: Opening up towards users

As previously mentioned, in the first challenge, opening up towards users enables designers and entrepreneurs of SMEs to involve users in product innovation. Gaining empathy for users and feeling engaged to make products that fit their needs can help designers and entrepreneurs of SMEs in opening up towards users.

Empathy

Sleeswijk Visser (2009) defines empathy in design as: *"a person's ability to identify with and understand another person's feelings, ideas and circumstances. Although designers are taught to design products for people, their ability, willingness and education to empathise with the user can vary widely. Through a process of stepping in and out of the user's world a designer can identify, connect, and feel with the user. Using this understanding of the user in designing involves reflecting on this imagination, making sense of it and using this knowledge in creative design activities. (p 57)"* Kouprie and Sleeswijk Visser (2009) propose a process of how empathy can be gained in design by providing an understanding of the mental process of empathy people go through when designing for others (see Figure 6.3). This process enables people to become willing to approach and involve users, collect the means and act on it and is based on an in-depth analysis of literature in psychology and philosophy (see Table 6.2 for an overview by Sleeswijk Visser, 2009).

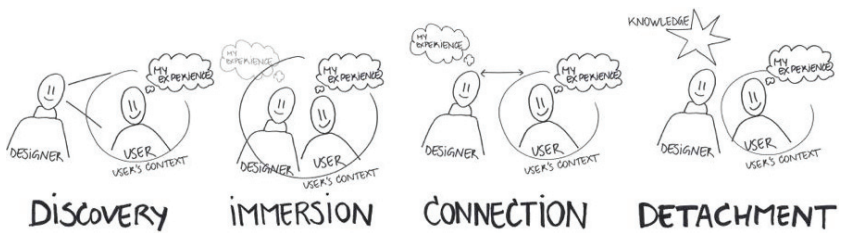


Figure 6.3: The four phases of how empathy can be gained in design (after Kouprie and Sleeswijk Visser, 2009).

The different phases of empathy in design show the process a designer goes through to gain empathy for his/her users. The first phase of the process of empathy in design is **the discovery phase**, where it is necessary to stimulate the designers' curiosity, willingness, andmotivation to step into the world of users. These elements determine to a large degree the achieved level of empathy.

	Discovery	Immersion	Connection	Detachment
Stein (1917)	**emergence of the experience:** perceiving a past experience of someone else	**fullfilling expectation:** getting pulled into the experience, standing next to the person facing the object of his emotion		**comprehensive objectification:** withdrawing from the other's experience, with increased understanding
Reik (1949)	**identification:** Paying attention to another and allowing oneself to become absorbed in contemplation of that person	**incorporation:** making the other's experience own's own via internalizing the other	**reverbaration:** experiencing the other's experience while simultaniously attending to one's own cognitive and affective associations to that experience	**detachment:** moving back from the merged inner relationship to a position of separate identity
Rogers (1975)	**entering:** entering the world of someone else, becoming at home and sensitive to what someone is experiencing	**living:** temporarily someone's life; sensing the other's world with fresh eyes, not making any judgements		**communicating:** communicating your senses to the other, checking if your senses are correct, being guided by the other's responses

Table 6.2: Phases of empathy distinguished by different authors (Sleeswijk Visser, 2009)

The immersion phase aims at enabling designers to become open-minded, observe and experience the users' world for a while without being solution-focused. This phase takes time, and is necessary to increase knowledge about user experiences.

In **the connection phase**, designers feel emotional resonance with the users' experiences, by drawing upon their own experiences. This phase emphasizes bringing out the designers' own experiences, in order to understand what users feel and what this could mean to them. Designers connect to users on an emotional level by reflecting upon their own feelings and extrapolating those to the users' experience.

In **the detachment phase**, designers detach from their emotional connection and take a step back to make sense of the users' experiences. By reflecting on moments of resonance, designers can interpret and utilize new insights for ideation. By leaving the user's world, a designer can use his or her increased understanding in new concept development.

These four phases could aid designers in tackling the first identified challenge: opening up towards users. But the designer's willingness and the situation can affect the designer's ability to empathize with users. Being empathic varies with the situation (Duan & Hill, 1996). When the designer does not see the value of investing in the users' stories or when spending his time in creating empathy with the user is not valued by his manager, it will slow down the process. If the designer is aware of the user and curious to get to know him better, through the ability of empathy he will be able to gain an open-minded attitude. Empathy is a part of the process of opening up towards users (which links with A. in Table 6.1).

Engagement

The previous studies bring another aspect to the surface wth regard to opening up towards users. In the case of Premaxx, the two designers from the design agency had recently become fathers. Because of this they felt personally engaged in getting the best possible results in developing a product that aids in the sleeping ritual of small children. When the designer, the entrepreneur and other, internal, stakeholders of SMEs feel engaged to make products that fit the needs of users, they are more motivated to involve users for product innovation and appreciate the value of the users. This can be their commitment to create products that enhance people's everyday lives, their curiosity towards rich experience information, and their willingness to learn new things from users and involve them throughout the design process. The personal motivation of designers determines the level of engagement with the results.

6.3.2 — Challenge 2: Learning to apply UCD methods

This level focuses on an individual becoming able to make use of UCD methods by gaining knowledge on and skills of different UCD tools and methods. To explore how designers and entrepreneurs of SMEs can learn these skills with the help of a UCD expert, I look at literature regarding learning.

In social sciences, the process of making sense from direct experiences is defined as experiential learning (Lewin, 1946 and Itin, 1999). Learning based on experiences suits the practical approach common in SMEs (see recommendations 5 and 7 in Table 6.1).

In design education, a commonly used learning model developed in experiential learning to support the learning process of design students (e.g. Thieme and van Boeijen, 2011) is that of Kolb (1984), an established model for learning which forms the basis of many new learning models. This model proposes an experiential learning cycle that includes both the learning of theory as well as the acquirement of practical skills. Kolb (1984) argues that: "experiential learning is a process of constructing knowledge that involves a creative tension among four learning modes that is responsive to contextual demands. This process is portrayed as an idealized learning cycle or spiral where the learner "touches all the bases" – experiencing, reflecting, thinking, and acting – in a recursive process that is responsive to the learning situation and what is being learned." Immediate or concrete experiences are the basis for observations and reflections. These reflections are assimilated and distilled into abstract concepts from which new implications for action can be drawn. These implications can be actively tested and serve as guides in creating new experiences (see for a graphical overview of this process Figure 6.4).

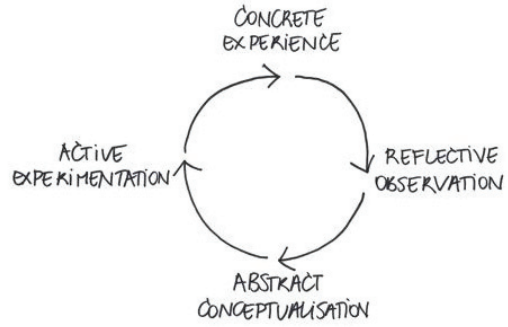


Figure 6.4: The experiential learning cycle (Kolb, 1984)

In order for employees of SMEs to start with experiential learning they first need to be conscious of lacking skills to apply UCD methods. In the Co-Design Pressure cooker, several SMEs became aware that they were incompetent about UCD and wanted to become competent. Difrax and Jansen Medicars participated specifically with the Pressure Cooker project in order to become more knowledgeable about UCD. Others were consciously incompetent and indicated they did not want to become competent but instead hire a competent UCD expert. The UCD expert within the Pressure Cooker was in charge of guiding the SMEs along the process of learning to apply UCD methods through active experimentation and concrete experience.

- As with empathy, one needs to become willing to step in the world of their user: "Discover". They become aware of their users and realize there is a world to explore full of insight about their users (Recommendation 3 discussed in Table 6.1). An aspect in this phase is the entrepreneur enabling and supporting employees to take time and spend energy in discovering the world of their users.

- The second stage "Inform" takes place as soon as employees become conscious of their lack of competence in UCD and are willing to step into the world of their users. This is all about informing about, when to use and how to apply UCD and for which purposes by presenting practical examples. Here the UCD expert has a central role (Recommendations 4 and 5 in Table 6.1). He has to come with accessible and usable information with good and real examples that inspire.

- The last stage "Experience" takes place as soon as the employees are well informed and feel confident enough to take the information into action in their own practice. By repeating the use of UCD in multiple small projects, experience builds up and employees become more competent (Recommendations 6 and 7 in Table 6.1). The results and small victories achieved by each small project create more support and confidence within the SME for trying out new and different UCD tools and methods. By experiencing UCD in small projects in their daily practice (Recommendation 10 in Table 6.1), UCD becomes part of their routines by trial and adoption: small companies' primary source of knowledge needed in innovation (O'Shea and McBain, 1999). Larsson (2001) concludes that much of the innovation work involves gaining an understanding of the enterprise's competence, matching it to needs and problems of the mar-

ket, and using external relations for NPD (new product development). Hiring, training, improved coordination, and learning by doing facilitate the emergence of capabilities (Levinthal and Myatt, 1994). Acquiring new capabilities is often a consequence of an SME's desire to transfer to new markets (Winter and Szulanski, 2001) and/or new product lines (Helfat and Raubitschek, 2000).

6.3.3 — Challenge 3: Applying UCD for product innovation in the daily practice of SMEs

In this section I further explore how SMEs can apply UCD in their daily practice and what factors are relevant in enabling designers to involve users for product innovation.

Innovation literature in general places great importance on company learning, benchmarking, training and networking (Barnett and Storey, 2000). In order to be able to adopt and reorganize, the company needs to be open towards learning. In particular, small enterprises have the potential to start new organizational arrangements that support their innovation processes (Hanna and Walsh, 2008). Changing an organization can take place under very different names: total quality management, reengineering, right sizing, restructuring, cultural change, etc. Kotter (1995) argues that in almost every case, the basic goal is the same: to make fundamental changes in how business is conducted to cope with a new, more challenging market environment.

Cohen and Levinthal (1990) use the concept of 'Absorptive Capacity' as a new perspective on learning and innovation. They argue: *"The ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities. This capability is labelled as a firm's absorptive capacity."* Cohen and Levinthal (1990) argue that the ease of learning is affected by the degree to which an innovation is related to the pre-existing knowledge base of prospective users. They observe that absorptive capacity is part of the company's decision to allocate resources for an innovative activity. This is consistent with the view presented of SMEs in Chapter 3. Only when SMEs recognize value of a potential project, they will allocate resources to it. Translated to the context of this thesis, it means that the absorptive capacity for UCD of SMEs depends on the extent that UCD is related to their prior knowledge and experiences, and their ability to recognize the value of potential projects.

In addressing a change in the daily practice of SMEs through applying UCd, two approaches are generally discussed with regard to adoption processes: top down and bottom up. Venturi et al. (2006) explored which organizational factors play a role in adopting UCD from the top down perspective. They recommend that to enhance the company position, UCD should be part of the business strategy and be endorsed by higher management; by setting user-centred goals, and granting incentives for reaching or exceeding these goals. Venturi et al. recommends to clearly communicate the outcomes and benefits of the UCD approach in- and outside the company. These conclusions of

Venturi et al. (2006) are also reflected by the recommendations formulated in Table 6.1. In SMEs, the owner-manager plays a crucial role in enabling employees to change their current way of work. Due to the flat hierarchical nature of SMEs, we can only speak of the owner-manager as the "top". Owner-managers often react upon impulses which come not only from outside the company but for a large part also from within the company: the employees. Jokela (2004) evaluated the user-centeredness of development organizations. To apply UCD in SMEs, Jokela (2004) indicates that staff could be provided with an explanation about the nature and purpose of UCD. This is consistent with my conclusion that SMEs to begin with need to be informed about UCD in general and UCD tools and methods specifically. Jokela (2004) furthermore recommends: *"In companies where one can anticipate that there is no or very little UCD, a better way of starting improvement action might be to simply start doing UCD in some specific development project."* By the application of UCD, *"the benefit is that it makes people understand the essence and application of UCD"*.

By actively involving stakeholders in the organization, the process of change can be supported. By empowering people in an organization, and putting them in charge, the initiated changes become theirs and will be adopted more easily by the rest of organization. One of the interviewed design consultants mentioned: *"You cannot start from scratch. You need to make use of 'hooks' inside the existing organization. By using what is already there, change will be more easily accepted by the internal stakeholders."* One can make use of the organization's strengths and knowledge that is already present, either by the people working in the organization or in existing data and projects. Applying UCD in SMEs is not either a top down or bottom-up approach, it borrows from both approaches due to its flat hierarchical nature and informal setting.

In order to deal with resistance to change, Kotter and Schelsinger (1979) propose, amongst others, the following actions:

- **Education and communication:** One of the most common ways to overcome resistance to change is to educate people about it beforehand. Communication of ideas helps people see the need for and the logic of a change (Recommendations 12, 19 and 20).
- **Participation and involvement:** When change initiators believe they do not have all the information they need to design and implement a change, or when they need the wholehearted commitment of others to do so, involving others makes very good sense (Recommendations 10 and 15). Considerable research has demonstrated that, in general, participation leads to commitment, not merely compliance (Marrow and Bowers, 1967).
- **Facilitation and support:** Another way that one can deal with potential resistance to change is by being supportive. This process might include providing training in new skills, or giving employees time off after a demanding period, or simply listening and providing emotional support (Recommendations 4, 14 and 19).

The previous exploration further investigating the three observed challenges confirms the existence and importance of the three identified challenges and

many of the recommendations derived from the previous chapters. It does not provide details on how to tackle the three challenges. Therefore, I propose an approach to support SMEs in addressing these challenges in the next section.

6.4 — An approach to support SMEs in applying UCD

The previously described challenges are not standalone constructs that can be addressed separately in order to support SMEs to adopt UCD. There is a need to further explore how the levels are intertwined, and how the building blocks can be used in the context of this research. Without an open-minded attitude, the skill of doing UCD will be useless. Without having the knowledge and skill of UCD, UCD will not be applied or an expert won't be hired by the SME. Without the opportunity and the awareness of the process one goes through, empathy will not be sufficient to embrace the opportunities offered by UCD.

Organizations are often aware that they have to change and start to realize that in order to change they need to adopt new ways/methods to innovate and adapt to change. One of the interviewed design agencies (De Lille et al., 2012) mentions: "Some time ago we got a lot of WHAT questions from companies. They heard a buzzword and wanted to know what it was. Recently they started to come with HOW questions. You notice companies becoming more and more informed on new ways to innovate and getting aware of what it can mean for them. They just do not know how. They recognize the value of UCD for their product innovation practice but do not know how to make use of it". This uncertainty of how they can change and what innovation route to take makes it difficult to start a project.

Supporting SMEs in applying a different approach for innovation in general has already been investigated in a large-scale study: the Pii project. This study will be used as a basis to formulate an approach to support SMEs in applying UCD in their daily practice:

The Pii-project: supporting SMEs in innovation.

Already in 1974, Beckers reported a large Dutch study focused on supporting innovation in SMEs. This study was conducted by TNO (a large Dutch organization for applied scientific research). Another large-scale research project was initiated taking place from 1980 to 1985 funded by the Dutch Ministry of Economic Affairs using the work of Beckers (1974) as a basis. In the Project Industrial Innovation (Pii) 155 SMEs were approached to improve their current bad or mediocre innovation practice. As the project name implies, industrial manufacturing SMEs were targeted. It was unique in its targets, its size, its procedures and its results (Buijs, 1987 and 1993; Van Dijk, 1986). In the previous study of Beckers (1974) the characteristics of successful innovative SMEs were determined. The Pii project attempted to find out whether strategic behaviour of non-innovative companies could be altered into innovative behaviour. They quickly realised that start-ups need to be supported differently than the larger mature companies (Beckers, 1978). Micro and really small enterprises need to be helped by offering specialised knowledge in close collaboration with experts (During, 1984). Mature and larger SMEs in principal have all relevant innovation know-how in-house, but did not manage making good use of it. These companies needed to be supported forming multi-disciplinary teams, under the guidance of some kind of coach enabling them to find their own way in innovation practice (Van Dijk, 1986). Following the experimental phase in 1980 they started with two different projects were started, each targeting one of the above-mentioned groups. Pii-a was targeting the smaller start-up companies while Pii-b targeted the larger existing companies. As this thesis focuses on the second target group, Pii-b will be discussed in more detail.

The Pii-b project: supporting existing SMEs in innovation
155 existing industrial companies participated in the Pii-b project. To support the SMEs in innovation 60 experienced organisational advisors were hired. The methodology used by Pii-b consisted of 5 basic elements (this methodology has grown into the current Delft Innovation Model, Buijs 2012):

1. A simple model describing the different steps of a total innovation process with the emphasis on the first phases. This model describes the innovation from the analysis of the current situation up to the implementation of innovation onto the market.
2. The experts functioned as coaches and facilitators. The experts were not primarily responsible for achieving innovation itself, but were dedicated to transfer knowledge, and to stimulate and motivate the innovation team.
3. A multidisciplinary team-approach. The team consisted of all relevant disciplines from the different departments of the company. A member of the upper management participated in this team.
4. The use of creativity in all phases of the innovation process.
5. Stimulating a strong outward orientation in the context of the company.

As a result of the Pii-project, providing support by means of coaching had a great positive effect on the innovation success. This way of supporting SMEs continues to prove its success as it is still used today by Syntens, a Dutch organization funded by the Ministry of Economic Affairs to support SMEs in innovation. Other elements influencing the success of innovation at SMEs were the focus on the learning experience of the team, the amount of diverging during the projects, the use of creativity and external information. The use of the model with the structured steps did not have an influence on the success of innovation as such, it served more as a support for the actual innovation processes. The Delft Innovation Model itself, the focus on the first stages of innovation (the Fuzzy Front End) and the use of external information are all important elements that provide the foundations I start from in developing a specific approach for SMEs to be supported in applying UCD.

Figure 6.5 proposes an approach for SMEs to apply UCD in their product innovation, which is a combination of all three challenges and their according recommendations and builds on the work conducted during the Pii project aiming at supporting SMEs in innovation. The process is a combination of describing the current product innovation process of SMEs with added prescriptive elements (the support of a UCD expert, building intermediate result, an entrepreneur that enables, gaining experience on UCD through projects, etc.).

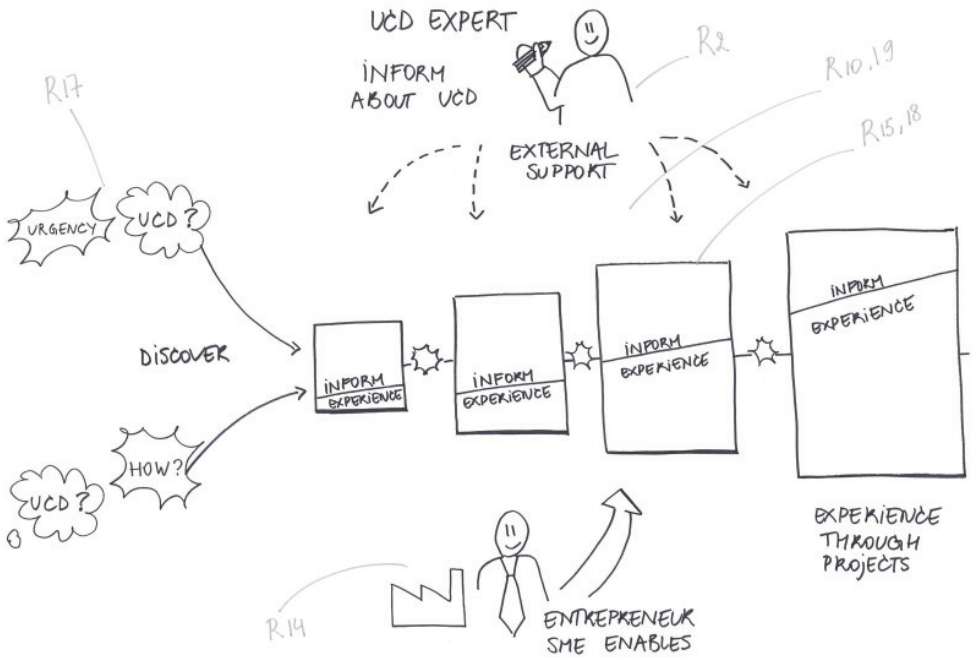


Figure 6.5. An approach to support SMEs to apply UCD in their product innovation practice. The "R + number" refers to the according recommendation on p 203.x

Starting (Recommendation 17)

Change in the organization can be either problem driven ('we have this problem, how the solve this' or 'how can we address this problem') or opportunity/knowledge driven ('we see this as an opportunity, but do not know how to tackle it' or 'how can we make use of UCD'). Acklin (2012) explains that different events make SMEs aware of a change that affects their daily business. Once they realize action needs to take place they start looking for ways to tackle their problem. Acklin (2012) explains that this process for product innovation within SMEs is based on either external or internal impulses.

Start problem-driven:
This can be the realization that sales have dropped, a patent is about to expire, a change in legislation, start exporting to new countries or other potential urgencies. Once they realize action needs to be taken they start looking for ways to tackle the problem. Some entrepreneurs are aware UCD can help solving some of these problems.

Start opportunity/knowledge-driven:
An opportunity presents itself, through for example cooperation with a university (such as through student projects), through an invitation to participate in a project such as the Pressure Cooker, etc. Through this opportunity, the SME can come into contact with UCD or gains some experience in involving users. As a consequence this SME can want to learn how to make use of UCD, learn new methods to involve users for innovation strategies or try to apply UCD in their daily practice. Their questions are directly oriented towards making use of UCD.

The approach facilitates both a top down and a bottom-up initiative. In many cases in SMEs it is the entrepreneur that takes the initiative for change. However, when the initiative comes from the employees, the entrepreneur needs to enable and support employees to undertake change.

External support (Recommendations 2, 3 and 19)

Once there is an impulse (either external or internal) the SME is triggered to do something. Some of the impulses the SMEs deal with can be tackled using UCD (but certainly not all of them). Thus far, SMEs felt unable to act upon these impulses using UCD. They need support in doing so with the help of an external expert, who also feeds them with knowledge (Rogers, 2003). Throughout the process, this expert has a supporting role. Unlike the traditional role of design agencies being responsible for an entire part of the design process, the SME is in charge and continuously gets support from an expert.

Enabling through the entrepreneur (Recommendation 14)

Employees who are willing to participate and contribute to the change process often encounter problems in doing so. They are swamped by their 'daily' work and are not supported by the organization to devote time to change projects (De Lille et al. 2012). In most cases the owner-manager is at the basis of all innovation within the SME and is the decision taker. In the learning process of Figure 6.5 the entrepreneur is at the start of the learning process, investing in UCD and enabling employees. Leadership and vision are valuable in being able to engage employees in innovation (Vermeulen and de Jong, 2006). Whatever the resources are of the SME, even if dedicated funds are scarce, there are ways to progress as long as the commitment of the owner-manager is gained (Cawood, 1997).

Experience-based learning through small projects (Recommendations 10, 15, 18 and 21)

To adopt UCD, it can be integrated in existing projects to learn by doing. This is part of the "Implementation phase" as suggested by Rogers (2003). Kotter (1995) recommends "planning for and creating short term wins" (Recommendation 12). By taking small iterative steps using UCD that each end in a period of reflection, the SME obtains quick results. Different employees and stakeholders can be engaged in each project increasing the support within the organization. One of the design consultants states (De Lille et al., 2012): 'You have to limit the risk by taking small steps at a time. There is no need to work on one big project.'" Using this approach, the natural way of working of SMEs is followed: in iterative and rapid cycles. At the start of the process, SMEs lack knowledge on how to apply UCD; therefore the focus lies on informing the SMEs while the UCD expert will perform most of the activities. As the skills and knowledge of the employees of the SME grow, the focus will shift to supporting the SME while using UCD. Each project enables to acquire new skills, improve existing ones, try out new UCD methods and involve other employees to create more support in the organization (Recommendations 10 and 15).

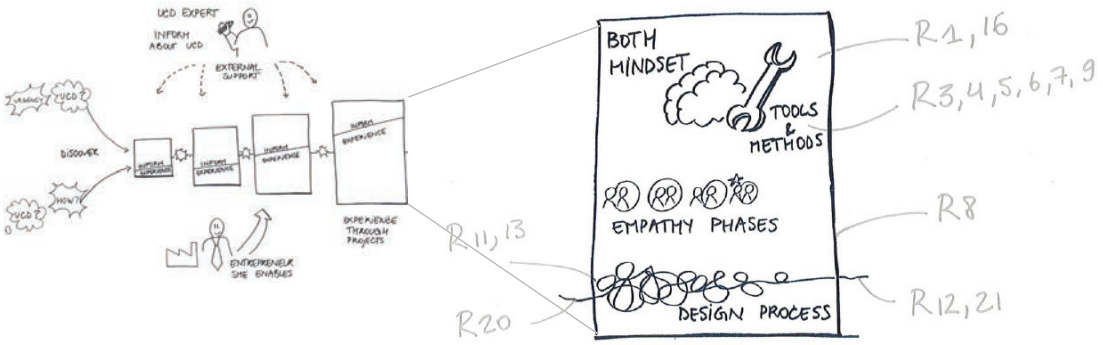


Figure 6.6: Detailed view of one of the projects within the approach. Different activities take place aiming primarily on the first two challenges: mindset and learning within the context of product innovation projects. The "R + number" refers to the according recommendation on p 203. R 2, 10, 14, 15, 17, 18 and 19 can be found on p 212.

As previously noted, existing UCD methods can be applied with minor changes to fit the context of SMEs, but SMEs need to be supported in applying these methods within their practice. At the moment, many efforts for enabling SMEs to learn to apply UCD strand in presentations and workshops (Design council, 2011). Real involvement by doing is necessary. The difference between the cases of Alrec and BAT show that SMEs seem to learn best by active involvement in the process of using UCD.

Based on previous insights and literature this chapter suggested an approach to apply UCD. Chapter 7 explores the proposed approach in more detail to make it usable for SMEs while making use of the presented recommendations.

For Academics:
This chapter proposes an approach to support SMEs in applying UCD in their practice. This approach is based on a set of recommendations that are derived from insights gathered in the previous studies.

Chapter 7

Supporting the journey towards User-Centred Design

Chapter 6 presented a set of recommendations based on the previous studies and concludes with a proposed approach for SMEs to apply UCD. This chapter presents an evaluation of the recommendations through the design and use of two toolkits. One to support a UCD expert, who works for SMEs another designed to support SMEs to apply UCD themselves. While designing the toolkits, one toolkit designer and one project team designing the toolkit took multiple decisions based on my research and feedback from SMEs. Through an evaluation of their design decisions, more insight was gathered how SMEs can be supported to utilize their strengths to apply UCD for product innovation.

7.1 — Introduction

In this chapter the answers to the previously posed questions are brought together in order to answer the main research question of this thesis: How can SMEs utilize their strengths to apply UCD for product innovation in their practice? This research question focuses on how SMEs can learn to use UCD tools and methods and apply UCD in their practice. Chapter 5 already argued that SMEs need support in doing so. The resulting approach presented in Chapter 6 not only considers the role of an expert, which supports SMEs, but also takes into account the strengths/weaknesses of SMEs and the barriers/opportunities for applying UCD in SMEs.

The previous chapter provided an intermediate overview of the insights gathered across different meta-levels: that of the SME, the UCD expert and the toolkit designer. It ended with proposing an approach for toolkit designers

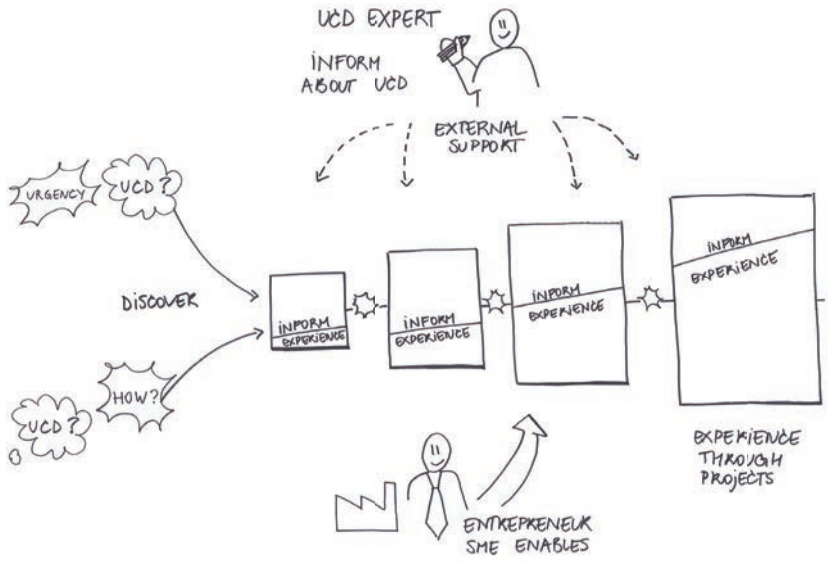


Figure 7.1: Approach to apply UCD for product innovation in SMEs forming the basis for this chapter.

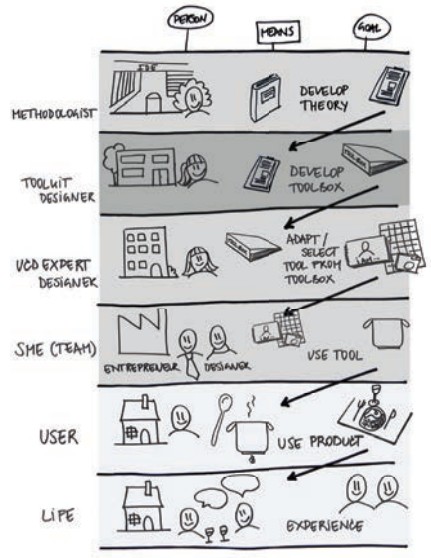


Figure 7.2: Meta levels investigated in this chapter.

to support SMEs in applying UCD in their product innovation practice (Figure 7.1). While the previous chapter was primarily deepening the challenges using literature, this chapter further examines the proposed approach being used in practice. For this chapter I guided two toolkit designers to design toolkits for the practice of SMEs and UCD experts. I order to maintain distance of the decisions taking in the design of the toolkit, I chose to guide two toolkit designers rather than developing the toolkits myself. The toolkit designers used the proposed approach of Chapter 6 and were guided with the findings of the previous chapters consolidated in the list of recommendations. By following the toolkit designers in their design process, by reflecting upon their design decisions and how the toolkits are used in practice I gathered knowledge on what can loosely be called a the 'methodologist' level to improve the proposed approach and how it can be applied in practice (Stappers, 2009). Figure 7.2 shows an overview of the meta levels of this chapter

7.2 — Method

For this study the main aim was to explore in practice how SMEs could be supported to apply UCD in their practice by utilizing their strengths. I was interested in exploring in depth how SMEs can be supported in applying UCD. More specifically, gaining insight how the three identified challenges could be addressed:

1. Opening up towards users
2. Learning to apply UCD methods
3. Applying UCD for product innovation in the daily practice

By making use of the approach and the recommendations in designing toolkits specifically for the context of SMEs I could gain confidence in my findings and explore them further. The use of the toolkits enables to evaluate whether the recommendations and the approach result in suitable ways for SMEs to apply UCD methods.

7.2.2 discusses in more detail how this study is set up. In the following sections (7.3 and 7.4) the two toolkits are discussed. Each section addresses the following items:

- The background of the project with its goals and project team
- A description of the toolkit itself covering the following topics:
  - How can SMEs utilize their strengths to apply UCD in product innovation?
  - How is learning of UCD supported for SMEs?
- Evaluation of the toolkit used in practice

7.2.1 — Two perspectives on supporting SMEs

In the previous studies SMEs were supported in using UCD in different ways:

- Supporting SMEs to address the impulses they were dealing with themselves through providing the in-house designer with the means to do it themselves, or
- by SMEs working together with an UCD expert or a design agency who provides the user insights.

I took a pragmatic approach in setting up this study making use of opportunities that were present and usable to address the research question. At the moment of formulating and setting up this study I was approached by a design agency that wanted to explore how they can support SMEs better in applying UCD, and by a governmental agency that wanted to explore how they could support SMEs in applying UCD themselves. The initiative to develop the toolkits was in both cases out of my hands. Through the design of toolkits, the toolkit designers needed to make decisions based on available information on UCD in SMEs and product innovation in SMEs in general and materialize the recommendations. It also provided the opportunity to compare the design decisions taken and explore the use of the recommendations and the approach materialized into the toolkits in practice.

The general design process for the two toolkits is depicted in Figure 7.3. The process followed the set of recommendations and investigated how the toolkit adds to the proposed approach to support SMEs.

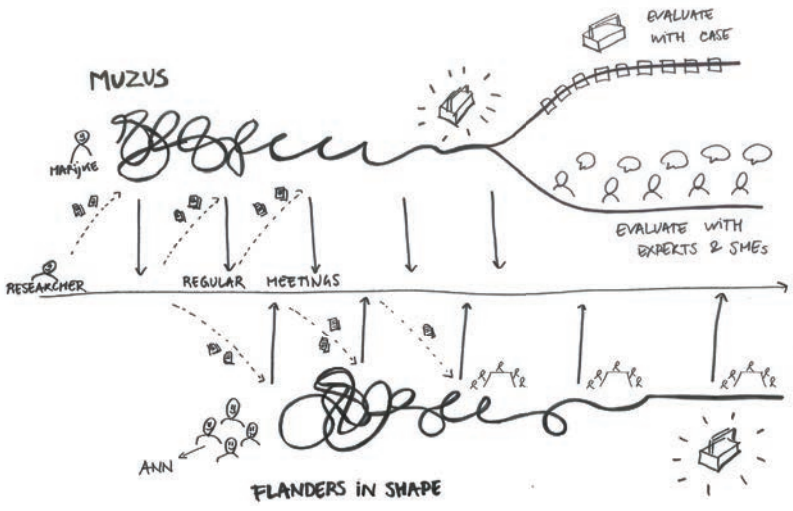


Figure 7.3: An overview of the development of the two toolkits, each with a different approach in designing the toolkit but both providing updates on their progress and design decisions through regular meetings.

The first toolkit was developed for Muzus, a user-centred design agency. Muzus was interested in doing more projects with SMEs after their involvement in the Pressure Cooker and felt the need for a toolkit to support SMEs to apply UCD.

The second toolkit was developed for Flanders InShape, a Belgian non-profit organization established by and for the Flemish industry aiming to support SMEs in product innovation. They were interested in a way that supported them in informing SMEs about UCD and supporting SMEs to apply UCD. This toolkit was developed by a group of organizations (researchers from a university, a design agency and a UCD expert) in cooperation with SMEs.

For each of the toolkits a design researcher was my point of contact. For Muzus this was Marijke Verhoef, a MSc graduation student from Design for Interaction programme of the Faculty of Industrial Design Engineering at Delft University of Technology. For Flanders InShape this was Ann De Keersmaecker from Artesis University College, Antwerp (as part of her job).

Marijke started developing the toolkit first, Ann followed shortly after. During the exploration I provided knowledge on UCD in SMEs based on my set of recommendations. Later on I helped in the selection of the UCD tools and methods. They each worked separately on the design of the toolkit.

7.2.2 — Setting up the study

I took various measures to ensure the decisions regarding the design of the toolkits became explicit during this study such as having regular meetings with both Marijke and Ann where I asked about their decisions and the intermediate changes were discussed, regular reports and an evaluation at the end of design process. As Ann developed the toolkit with a project team, the main design decisions were taken during team meetings. By being present during these moments I was able to record their decisions. Marijke worked individually on the design of the toolkit. For her graduation project she needed to build arguments for the design of her toolkit. During regular meetings she explained her decisions to me.

Both toolkits were designed with the same input information and the same set of recommendations. I asked both the toolkit designers to make design decisions on aiming at the three challenges explicit: supporting a change of mind-set of the SMEs towards UCD, supporting SMEs in learning how to use UCD methods and applying UCD for product innovation. Although the two toolkits support SMEs from a different perspective, I expected them to be quite similar with regard to the selected UCD tools and methods and how these are applied for product innovation. I expected the toolkits to be different with regard to the kind of information provided, the difference in learning experience and a different role of the support (in the case of Muzus changing from an expert executing the project towards a coach and in the case of Flanders InShape as a facilitator and a service-hatch to UCD experts).

I gathered data during the design of the toolkits in regular meetings, intermediate reports of Marijke and Ann, a general report, their own evaluation of the design process and the toolkit as well as in interviews with Marijke and Ann at the end of the process. Besides the information on the design process, I received the documents they were using during the project: presentations, preparations for interviews and sessions with SMEs, pictures and emails. Ann also evaluated the designed toolkit on different occasions during the design process with SMEs. These meetings with SMEs provided Ann with feedback to make new decisions regarding the design of the toolkit. During the project team meetings notes were taken to keep track of the changes in the design of the toolkit based on the feedback from the SMEs. I both cases I was involved not only as observer of the design process and the according design decisions but also as a mentor and/or an expert in UCD for SMEs. This made it difficult to ensure internal validity of the findings.

All information gathered from the meetings and the documents used during the design of the two toolkits provided me the means to make a preliminary overview of the design decisions taken. This overview was evaluated with both toolkit designers to ensure the overview was consistent. The design decisions and the according considerations were clustered based on the three mechanisms that provided the basis for the recommendations. Due to the circumstances the clustering and the analysis was a sole effort.

Based on the clustered overview of design decisions, I evaluated the recommendations that were the starting point of the design of the toolkits and the proposed approach for applying UCD in SMEs.

7.3 — Designing a toolkit for a UCD expert

The toolkit discussed in this section aims at enabling a UCD expert to support SMEs in applying UCD and addressing the three challenges under investigation: an individual gets a user-centred mind-set, an individual learns to apply UCD methods and an SME applies UCD for product innovation.

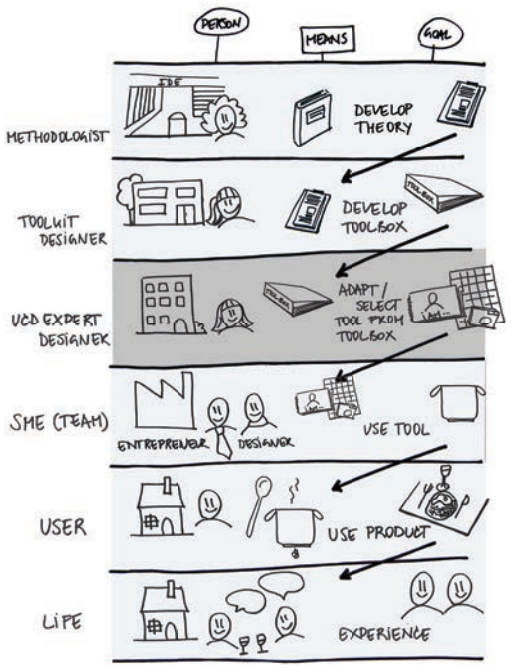


Figure 7.4: The toolkit aims at enabling a UCD expert to supporting SMEs in applying UCD.

7.3.1 — Context of Muzus:

Muzus creates products and services by providing insight in the world and motivations of people. By creating empathy for users in an inspiring way, they claim that facts come to life and solutions become valuable. Their strength is in translating latent user needs into concrete and applicable solutions. Muzus is a User-centred design agency with four employees strengthened by several interns. Since its start in 2007, Muzus has conducted mainly projects with large companies and governmental agencies. Although working for large clients suits Muzus well, Muzus showed interest in working for small and medium sized enterprises (SMEs). Muzus is interested in projects with SMEs for two reasons:

- They see possibilities in some of the characteristics of SMEs. Since smaller companies are more flexible than large ones, changes can be introduced and adopted quickly. Entrepreneurs are involved in many processes in the enterprise, speeding up decision-making.
- They want to increase their client network. As Muzus is a small company, it is risky to work with only a few large clients.

They really enjoyed the projects they did for small companies. The results are good examples of what their approach can do for a company. Unfortunately, these projects were not financially rewarding, inasmuch Muzus spent much more hours in these projects than proffered. Muzus needed a new way of working that suits the context of SMEs. They were willing to adapt their current approach to the needs and expectations of SMEs. For this reason the development of the toolkit was initiated. Marijke Verhoef was hired to develop a toolkit for Muzus during her Master Design for Interaction graduation project at Delft University of Technology. I was mentor to Marijke throughout her project and supported Marijke in the approach as well as with information from my research.

7.3.2 — Design process of the toolkit:

Marijke started with an analysis of the context (See Figure 7.5 for an over view of the entire design process):

- an exploration of how product innovation takes place in SMEs,
- an evaluation of the past SME cases of Muzus for reference,
- an analysis of the current way of working at Muzus in order to explore how it could be altered to fit the context of SMEs,
- taking a look at existing toolkits for UCD for reference.

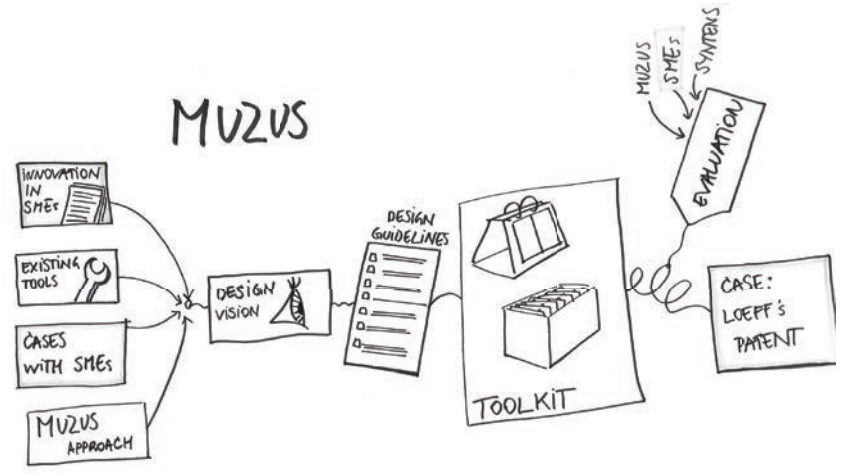


Figure 7.5: The design process of the toolkit of Muzus. In yellow the moments where SMEs were actively involved in the development of the toolkit.

The opportunities for Muzus to anticipate on the needs and expectations of SMEs were expected to be found in the overlap between their current product innovation approaches and those of the SMEs.
SMEs were involved from the beginning of the design process through interviews with owner-managers and investigating previous cases with SMEs of Muzus. The developed toolkit was evaluated at the end of the process during interviews with SMEs as well as during a case with an SME.

General:

Marijke developed a process consisting of three phases with eleven defined steps to take. At each step several tools and methods can be used. The aim of the toolkit is to guide the SME through a project, informing them in each step about possible actions to take, helping in selecting and using a technique. At first Muzus is in the lead with the SME being responsible of parts of the process. As the experience of the SME increases, more and more responsibilities are turned over to the SME until Muzus is only coaching the SME.

In this section I briefly explain the approach of the toolkit. In the next section I will get into more detail on applying UCD in a product innovation process, the selected UCD tools and methods, and how the toolkit enables the SME to learn and apply UCD.

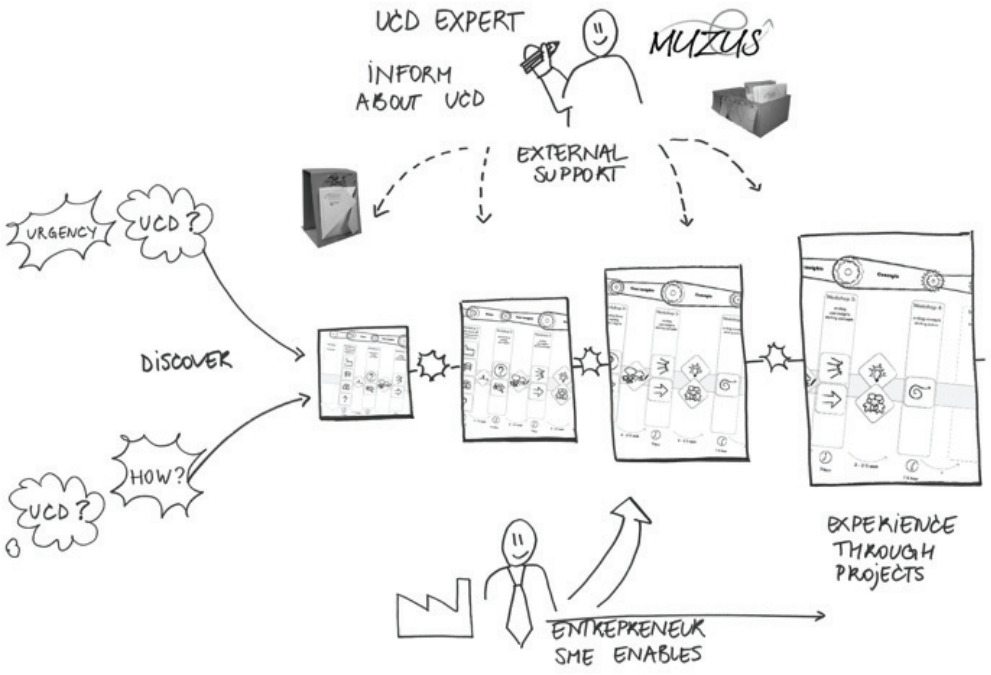


Figure 7.6: Positioning of the toolkit within the proposed approach.

Applying UCD in a product innovation process

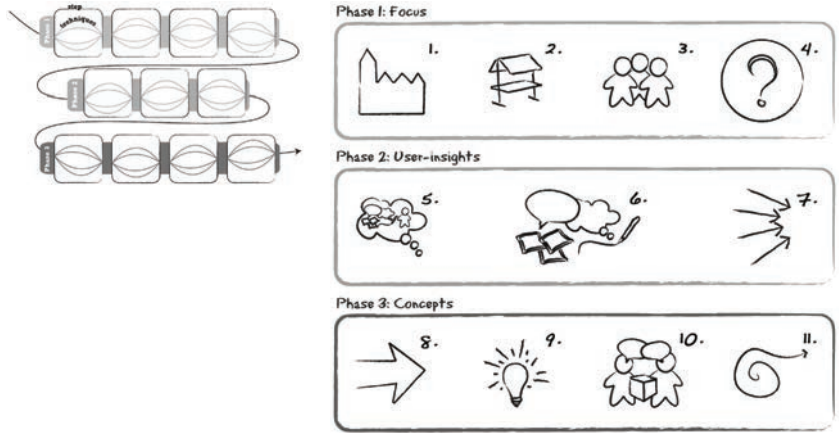
The process of the toolkit is divided in three phases and every phase has several steps. As SMEs like to approach product innovation projects in a result-oriented way, the phases are named after their main results: Focus, User-insights and Concepts.

Phase 1: Focus - This phase starts with getting to know the SME, the product, the market, the brand and the users. This first phase is not only meant to explore the firm and the design problem; intention is to make sure that the project will fit in their future plans. The end-result of this first phase is a well-considered focus that defines the direction of the project.

Phase 2: User-insights - Aims at gaining insight in the user context.

Phase 3: Conepts - The third and last phase contains the concept development. At the end of this phase, there should be a final concept and a plan to turn it into a product.

Figure 7.7: an overview of where the different steps belong in the three phases of the project.



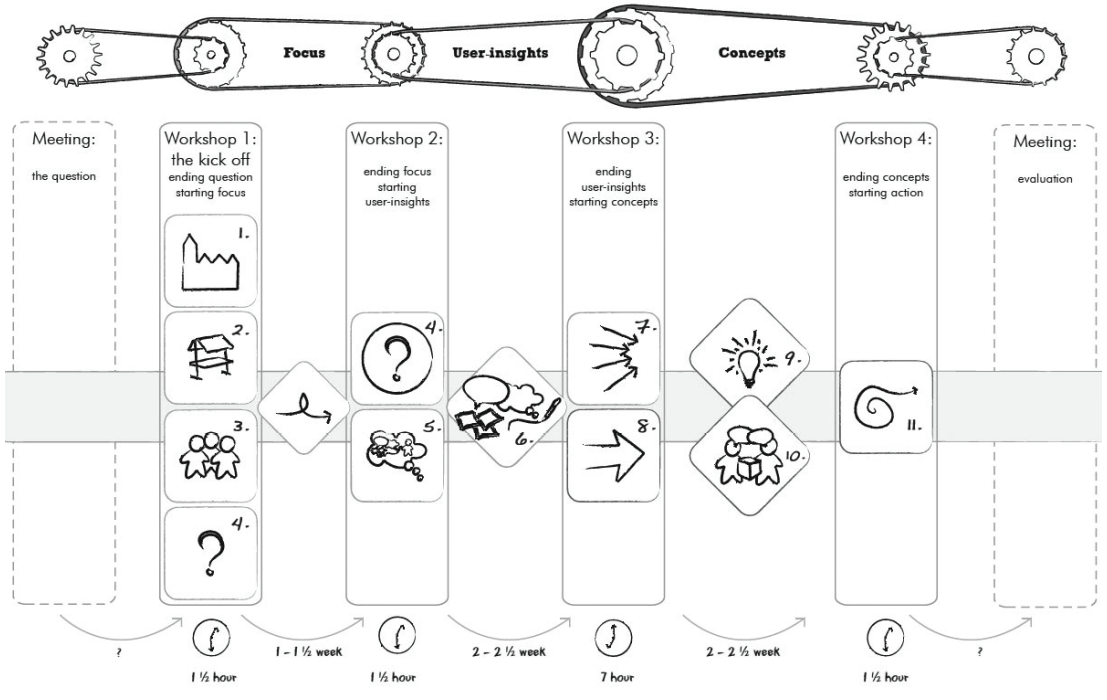


Figure 7.8: An overview of the approach of the toolkit, which reflects a design process. Four workshops are used to start and end each of the phases.

step 1

Getting to know the enterprise

Obtaining useful information on the internal situation of the company. For Muzus it is important to find out what the capabilities and the weaknesses of a company are in order to fit the process and the results to their context.

step 2

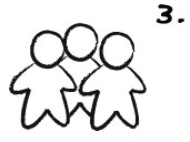
The product & market

Retrieving useful information on the external situation of the company. A good look at the way the firm currently markets its products and market developments are important input to determine the project focus (step 4).

step 3

Getting to know the users

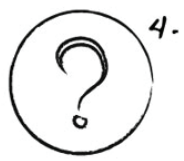
Retrieving useful information on the stakeholders of the project. Marijke's analysis showed that not all SMEs have a good understanding of their different stakeholders. It is not always clear to them that their buyer is not necessarily the same as their end-user.



step 4

Defining the focus

Formulating a focus for the project. The focus is based on the initial question of the SME, incorporating the findings of the previous steps. Attention should be paid to the client expectations of the project, the collaboration and the end-results.



step 5

Preparing the user research

This step involves determining which methods will be used, what kind of people will be involved and what kind of questions will be asked. It is also important to prepare the mind-set of employees and the entrepreneur of the SME to enter this phase, for example by reducing prejudices. Practical issues like task assignments and planning are defined as well.

step 6

Carrying out the user research

Collect rich information about the user. In this step it is important for Muzus and/or the SMEs to have direct contact with users of the target group. This step should stimulate SMEs to discuss more abstract matters with their users such as the user's dreams, goals in a broad context of the product, what motivates them, etc. in order to be inspired and gather new viewpoints.

step 7

Converting the data into user-insights

In this step the findings from the user research in step 6 are analysed and converted into inspiring insights. This is a good moment to reflect on the assumptions that came forward in step 5, checking whether the results match the expectations.

step 8

Translating user-insights into design guidelines

Find directions for concept development. The design goal is taken into consideration and the boundaries for the design space are defined. The end-result of steps 7 and 8 is inspiring information and a directing set of design guidelines.

step 9

Developing the concept

Designing concepts based on the user information. This step aims at designing concepts. In iteration with step 10, the concepts can be optimized based on feedback from the users.

step 10

Concept evaluation & optimization

Enhancing the concept with feedback from the user. In this step, Muzus can show the SMEs prototypes that can generate useful feedback, which are different from the prototypes to start production, they rather aim at communicating the idea to both users and the SME for further exploration.

step 11

What's next?

Making the SMEs aware of the next steps for realization and implementation. Not all SMEs are equally experienced with the realization of a concept. Some companies know exactly how to proceed, while others need detailed guidelines

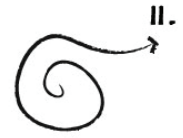


Table 7.1: Structure of the resulting toolkit

Process Steps

The eleven steps provide structure based on workshops and work in between the workshops (See Figure 7.7). Steps are the building blocks of the toolkit. Every step deals with an item that needs to be addressed during the process:

Marijke noticed that SMEs closely monitor the outsourced projects, afraid of unusable results and unlikely to adopt outcomes of a project if not closely involved during the process. Workshops play an important role in the toolkit of Muzus as it supports collaboration and all important decisions are taken during the workshops. The gearing wheels in Figure 7.8 visualize this. The workshops serve as connectors between each phase. In every workshop a phase gets started and/or ends.

Muzus oversees all the steps and methods. Step-by-step, the SME is guided through the process. Both Muzus and SMEs are supported by physical tools in the toolkit throughout this process shown in Figure 7.9.

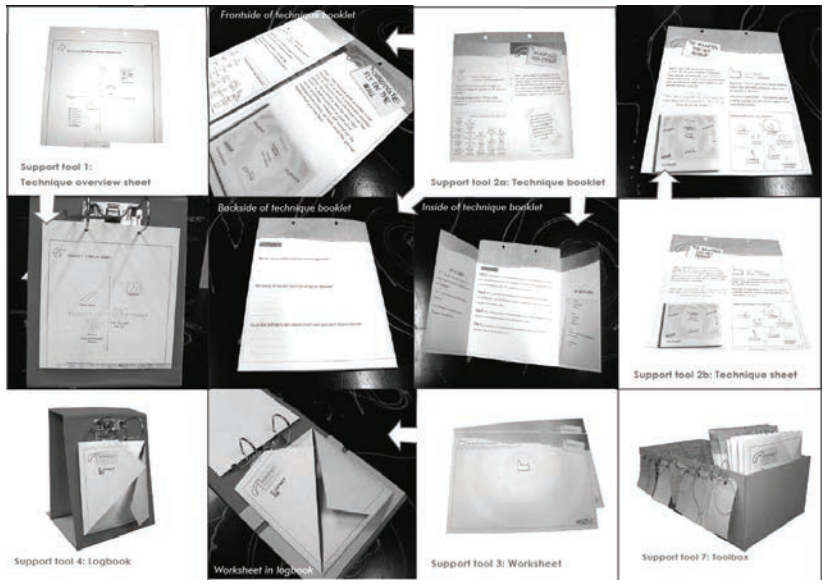


Figure 7.9: The physical elements: The logbook and toolbox

Marijke developed a set of physical elements that can be combined:

- -.A logbook for the SME in which a sheet with conclusions, information and insights is added for each step explaining the structure and the coherence between the steps. The SME can track insights and decisions taken, but also gain information about the technique used.
- -.A box with sheets for every selected technique. For some of the steps, Marijke developed worksheets or templates that can be used in the meetings to facilitate the conversation.

Figure 7.8 shows the different elements as they were created by Marijke to support both the SME and Muzus.

UCD Tools and Methods

In the first phase of her design process, Marijke explored current UCD methods and ended up with a large amount of possible methods. The methods in the long-list were based on the eleven identified steps and evaluated on their suitability for SMEs and Muzus. The compilation of methods yields three to seven methods for each step except for step 6 where a larger overview of UCD methods was needed. More would be unmanageable. In a project, one or two methods can be picked per step. The methods should fit the focus, target group and budget of the project. Marijke classified the methods for each step in two-by-two matrices to make the selection process for Muzus and the SME easier to discuss. The axes of these matrices are different for each step. Figure 7.10 shows an example of one of these matrices. The circles indicate preferred methods.
Figure 7.9 shows all the selected methods for each step of the process. This overviews enables SMEs to see how UCD methods relate to other methods and aspects already familiar to them.

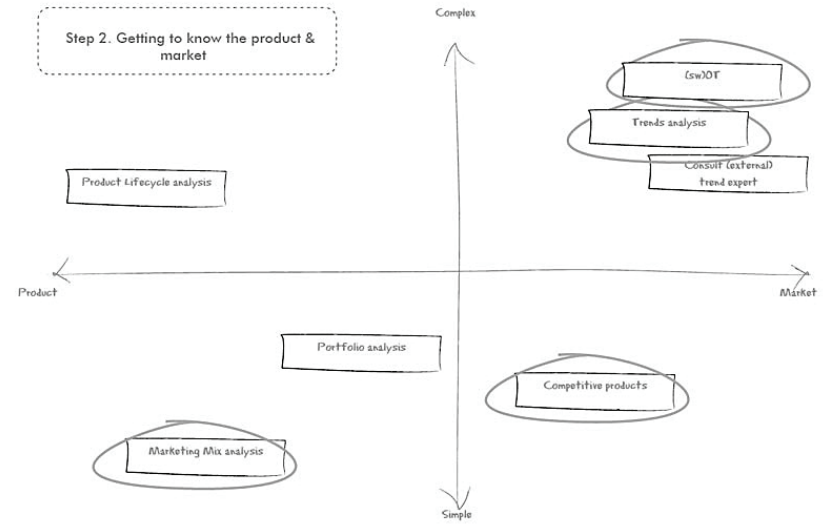


Figure 7.10: An example of one of the overviews of possible UCD tools and methods. This overview depicts the techniques for the second step: "Getting to know the product & market".

One of the most important steps is the one where the user research is carried out and actual contact with users takes place. This is the only step in the process with a multitude of UCD methods and methods. Marijke decided to divide them into 5 groups related to the underlying working mechanism to show the broad spectrum of available methods. This categorization is based on Sanders et al. (2010). An overview can be found in Figure 7.9.

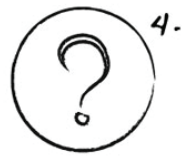
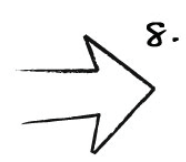
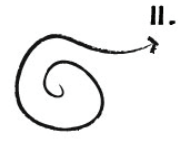
Inside the toolkit	Technique	
step 1 **Getting to know the enterprise**	1. Map the values of the firm 2. Analyze the capabilities of the firm 3. Guided tour through the firm 4. Strengths and weaknesses 5. Map the innovation hitory of the firm 6. Photo exercises through the firm 7. Talk to employees	
step 2 **The product & market**	8. Marketing mix analysis 9. Map competitive products 10. Opportunities and threats 11. Trend analysis	
step 3 **Getting to know the users**	12. Stakeholder analysis (system map) 13. Map the assumptions about the target group and prior knowledge 14. Customer journey	
step 4 **Defining the focus**	15. Wrap-up previous steps 16. Ansoff matrix 17. Purge expectations about the project and the collaboration 18. Future perfect brainstorm	
step 5 **Preparing the user research**	19. Discuss main questions 20. Making research plan Methods Tasks Planning 21. Purge initial ideas	
step 6 **Carrying out the user research**	22. What people SAY a. Have a chat b. Consult experts c. Extreme user interview d. Individual interview e. Group interview 23. What people DO a. Still photo survey b. Observation: fly on the wall c. Observation: fly on th eye d. Home visit e. Mini-internship f. A day in the life	
	24. What people THINK & REFLECT a. Probes b. Photo exercises c. Sensitizers 25. What people MAKE a. Collage making b. Generative interview c. Generative group session 26. What people DESIGN a. Brainstorming b. Sketching together c. Velcro modeling	
step 7 **Converting the data into user-insights**	27. Mindmapping impressions 28. What? So What? What next? 29. Transcribing 30. Re-lisening audio & making notes 31. Making statement cards 32. Look for themes	
step 8 **Translating user-insights into design guidelines**	33. Guidelines 34. Metaphor 35. Design vision "I want people to…, in order to…." 36. Infographics	
step 9 **Developing the concept**	37. Brainstorming 38. Sketching 39. Scenario 40. Scrap prototype 41. Role playing	
step 10 **Concept evaluation & optimization**	42. Plan mini-pilots & iterations 43. Expert review 44. Extreme user review 45. User review 46. Focus group 47. Compare concept(s) to guidelines (step 8) 48. What? So What	
step 11 **What's next?**	49. Action plan 50. New stakeholders map 51. Back casting	

Table 7.2: Selected tools and methods for each phase of the process

Supporting learning and adoption

Marijke developed three different scenarios for using the toolkit. Figure 7.11 depicts the three different scenarios and how Muzus and the SME collaborate.

Scenario 1 - Carried out by Muzus
In this scenario, Muzus carries out the major part of the work. During the workshops, the SME is updated about the work and the SME has a say in the continuation of the project. This scenario is mostly along the lines that Muzus nowadays executes a project. The emphasis of this scenario is on the end-results.

Scenario 2 - Carried out together
In the second scenario, Muzus and the SME team up to carry out the work. This scenario is of educational nature, because of the transfer of knowledge. Muzus trains the SME to fulfil (parts of) the toolkit themselves. The transfer of knowledge happens in a practical way. No lecturing about the different methods, but learning by doing. For example: In case two interviews are organized, Muzus takes the lead in the first one, so the SME can learn the technique. The SME takes the lead in the second interview, with Muzus support if necessary.

Scenario 3 - Carried out by the SME
In the third scenario, Muzus will coach the SME. Muzus supports and directs the SME in the workshops, but the SME will carry out the majority of the work. Marijke argues this scenario is only recommendable for SMEs who have completed scenario 2 at least once.

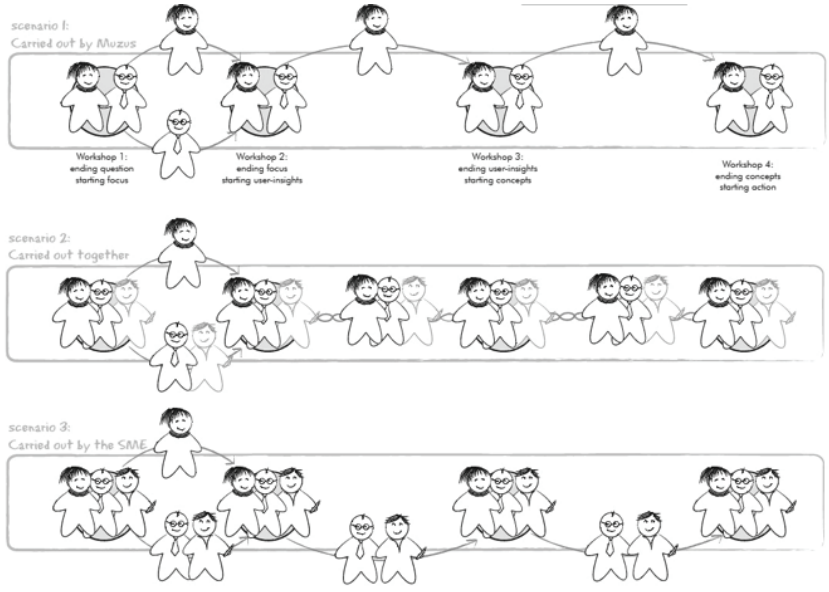


Figure 7.11: Three different scenarios for using the toolkit.

Suitable scenarios per type of SME
Scenario 1 is suitable for all types of firms. The in-house capability and the mind-set of the SME determine the suitability for the other two scenarios. The mind-set is related to the type of company, their drivers and needs. An UCD project can change their aspirations in terms of user involvement. The evaluation meeting at the end of a project is a good moment to talk about the company's aspirations for the future (mind-set) and make plans to realize them.

7.3.4 — Toolkit Evaluation with a case

Muzus used one of their ongoing projects with a client to evaluate the toolkit: Loeff's Patent. A Syntens advisor approached two design agencies to make a project brief for Loeff's Patent. Muzus used the toolkit to develop the project brief. Loeff's Patent selected Muzus based on the project brief and a presentation of Muzus.

> Loeff's Patent is an SME with four employees, manufacturing storage solutions for office archives. Products are based on a patent from Mr. Loeff, hence its name: "Loeff's Patent". The company was established by the current owner-manager (Rita). The patent has expired and the company is looking for new opportunities. Rita's husband, is responsible for production. Rita's sister is in charge of sales, and visits all the office supply dealers and the major clients. They have one more employee who is responsible for the contact with clients.

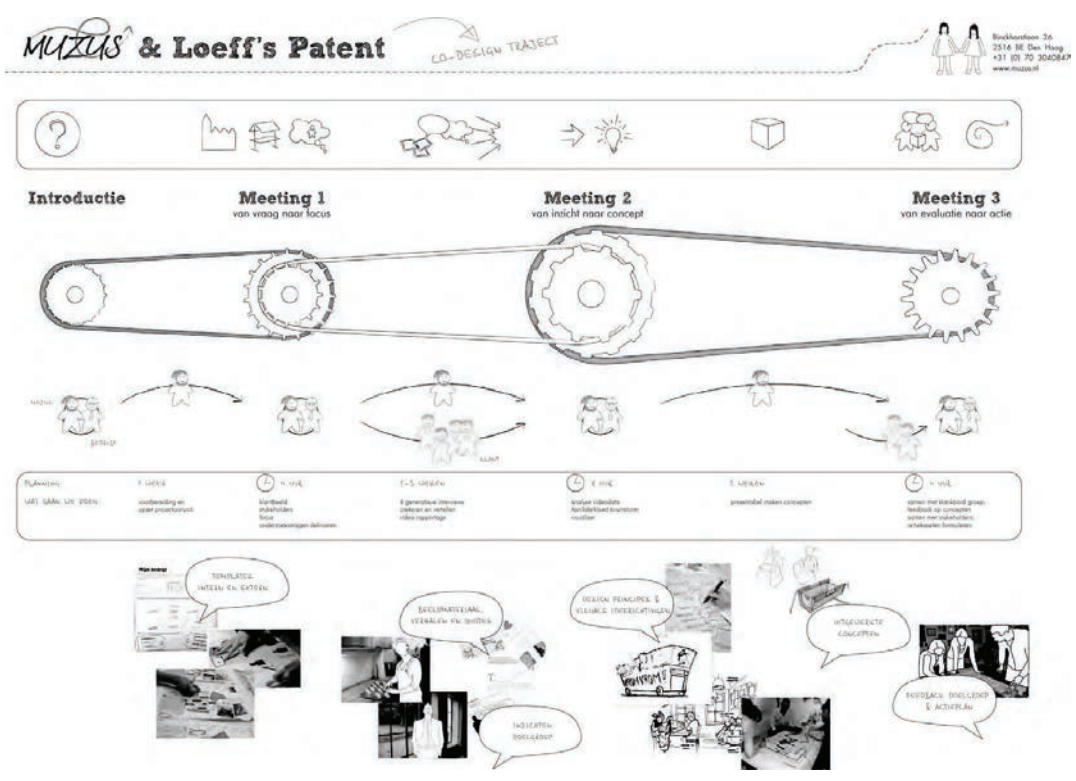


Figure 7.12: A schematic overview of the case using the structure of the toolkit.

The aim of the project was to explore new product innovation opportunities for Loeff's Patent. They know their large clients well as they develop custom made office archive solutions. Loeff's Patent also delivers office archive solutions for small companies through dealers. The focus of this project is on these unknown smaller clients. They want to get to know them better and develop targeted solutions using UCD.

Previously, Loeff's had organized dealer workshops to inform them about their office solutions so that they could advice SMEs. Loeff's frequently has contact with their larger clients to check whether things need to be altered. Occasionally clients called with ideas or suggestions, but Loeff's did not act on them. As Loeff's did not have any prior experience with UCD, Muzus chose to use the first scenario of the toolkit and carried out the project while decisions took place in joint workshops.

Focus

Loeff's wanted to start a client panel and co-create solutions with their clients. Their underlying question was exploring new opportunities as their patent had expired. For the SME the project had great importance as it dealt with their future and their chance at survival. It was of strategic value to them.

During the first workshop the team started with a tour of the company. Marijke: *"When you walk around in a company and for example at their production facilities, you really get a good sense of the company."* When discussing the focus of the project, the team used the templates of the toolkits Marijke developed. One of the templates they used was the persona-worksheet. The employees were asked to write down what they know about their clients. They used green stickers for what they know for fact and red stickers for what they presumed to know. Loeff's indicated they wanted a new product for the current market.

During the first workshop, one of the employees had difficulties getting away from the current way of working. Responsible for production, thinking beyond what is currently possible was difficult. It was good that all employees were involved in defining the focus at this workshop.

Involving users

Muzus interviewed several companies about office archive solutions. The interviews took place in context. Muzus experienced a lot of difficulties in finding clients that were able and willing to contribute. Office archiving solutions is a low interest subject. Marijke mentioned that for B2B projects it is always harder to find participating companies. They are hesitant to invest time in unprofitable projects. Muzus made a compilation video of all interviews, as Loeff's was unable to attend all of them. In the second meeting with Muzus involved Loeff's in analysing this video.

Communicating the user insights

Muzus communicated the raw data rather than their usual refined reports. There was no time to do a thorough analysis, create personas and make a report. Rita (the owner-manager) did not mind, as she came into contact with the actual insights and had time to absorb them. At the last meeting Muzus and Loeff's put together an action plan with the next steps, by whom and how, resulting in a brainstorm on their strategic vision.

Results

Rita has immediately taken steps to continue working on a strategic vision for the company. With the help of Muzus, Rita visited small creative companies to look at their archive. She discussed their current products and asked for their opinion. Rita was very enthusiastic. It gave her inspiration for small-scale archive solutions. Marijke: *"By developing an action plan at the last workshop, SMEs see the potential and immediately want to address other underlying issues and thoughts"*. Through immediate short term results, SMEs are able to see the implications of the new approach to developing new products.

7.3.5 — Evaluation on the use of the toolkit for each of the three challenges

Through the case and interviews with experts and owner-managers of other SMEs the toolkit is evaluated according to the three identified challenges. Table 7.1 on the following page provides an overview of the design decisions related to each of the challenges and an evaluation of these design decisions. The general insights gathered based on the design of the toolkit are as follows:

Getting a user-centred mind-set:

The first workshop and the templates used (especially the mentioned persona-template) confronted the SME with their current mind-set and made them aware of what they already know and assume to know about their users. In the final steps the SME became aware of how to continue with involving users and set priorities.

Learning to use UCD tools and methods:

Muzus left information on the tools and methods used as well as on the step taken behind for the SME. Furthermore the SME was involved in the preparation, the decision-making and the analysis. These measure enable the SME to actively participate, understand the process and learn how they could use this in the future.

Applying UCD for product innovation in the daily practice of an SME:

Key moments during the project were the workshops. The use of the templates and worksheets was powerful in creating focus and built on the existing knowledge and prior experiences of the SME. These templates are means from Muzus with a proven-track record adapted to the context of SMEs. They reduce time spend and make the preparation easier for Muzus. All employees were present at every moment of contact and the entrepreneur was highly involved, creating a lot of support and speeding up the process. The process and the outcome are central; not the methods. This gives a clear profile to the toolkit and builds on what SMEs are interested in, and familiar with.

Overview of design decisions	Design decisions of toolkit designer	Insights / evalution
Opening up towards users	Show the richness and inspiration of qualitative user research methods Show how user insights for strategic purposes The goal of the toolkit is to make the SMEs aware of the wide variety of available tools. Marijke selected UCD methods aiming for different kinds of knowledge and user involvement. Marijke attempted to select UCD methods based on the existing UCD experience of the SMEs, their attitude, capabilities and context.	As Marijke worked out the toolkit in detail containing a lot of information. As much as possible is standardized to save Muzus preparation time and to fit it to the limited budget of SMEs. De Jong Duke (SME) : *"This flood of pieces of approach has a big impression on me. It makes me think there should be at least one valuable for us. That there is something you can use."*
Learning to apply UCD methods	All of the methods and techniques are developed in detail so they are ready to use. Marijke made techniques sheets with information on the specific methods, how to use the method, to write down the insights and their relation to other methods. Marijke decided not to use the commonly used names from literature for the techniques. She chose to use accessible names, reflecting what they are about. For example: "home visit" or "having a chat". There are three scenarios for different degrees of familiarity with UCD in order to support different learning curves of SMEs. The third scenario is only recommendable for SMEs who have completed scenario 2 for at least once. Each scenario maintains the workshops as key moments throughout the process. But the responsibility and tasks shift depending on capability and the scenario selected.	Marijke not only selected UCD methods, but also methods for different purposes (such as marketing). By this, the SME sees how UCD relates to familiar methods and when to use the methods. Be transparent about he approach: Muzus: *"The techniques sheets can act as 'talking images'. To illustrate what we can offer to them. Some parts are open, and can be filled in on the spot. For example, we will do three interviews, on location and two workshops. So it remains custom for each client. After all it is together with the client that you decide how to approach the project."* About the different learning scenarios: Difrax (SME): *"This would be great. There is no one that offers learning more about UCD. Some sort of coaching. Good idea!"* Syntens advisor: *"After each phase you can rethink 'what am I capable of myself?' And choose again."* By making the scenarios modular, the approach can adapt even more to the expertise of the company. Providing SMEs with an active role in the project also supports mechanism 1 in getting a user-centered mindset, as contact often enthuses employees to do something for users. De Jong Duke (SME) om having an active role in the project: *"That's an interesting thought, that you can reduce the hours and make it interesting for small companies."*

Table 7.3: Overview of the design decisions and their evaluation of the toolkit developed for Muzus

Overview of design decisions	Design decisions of toolkit designer	Insights / evalution
Applying UCD for product innovation in the daily practice of SMEs	Marijke designed the physical elements to: - give a quick overview of all the techniques that are available per step. - explain the techniques in detail. - facilitate certain techniques with physical exercises. - document the support tools, such as the logbook in the storyboard for the SME. - bundle the support tools for Muzus. - allow SMEs to monitor the project Marijke designed the process of the toolkit by: - Define eleven distinct steps each with a clear focus and goal to achieve. - Group the eleven steps into three clear phases. Each phase is named after its result. - The entire process is built around workshops suiting the collaborative and active nature of SMES. Marijke has developed separate steps to: - Set the focus and question of the project - Take time to get to know the company and pay attention to prior knowledge Based on previous research and contact with SMEs.	Muzus: *"It's nice they can have something tangible of the entire project. I think it is a strong point of the entire toolkit."* By breaking up the design process and goals in smaller steps, the different aspects of UCD come to the surface. For example user research is split up in "Preparing", "Carrying out" and "Processing". Breaking up in steps makes it clear to SMEs what activities to expect when. De Jong Duke (SME): *"So you exactly know why and which approach they follow. I like that. I think as an engineer, and as an engineer you are always looking for what is behind. Why are you asking these questions? You're digging deeper."* Difrax (SME): *"Workshops would fit very well into our culture."* Marijke place emphasis on creating a good starting point, especially taking time to get to know the company and identifying existing knowledge has previously been overlooked.

Table 7.1: Overview of the design decisions and their evaluation of the toolkit developed for Muzus

7.4 — Designing a toolkit to support SMEs

The toolkit discussed in this section aims at supporting SMEs in applying UCD and addressing the three challenges under investigation: an individual gets a user-centred mind-set, an individual learns to apply UCD methods and an SME applies UCD for product innovation.

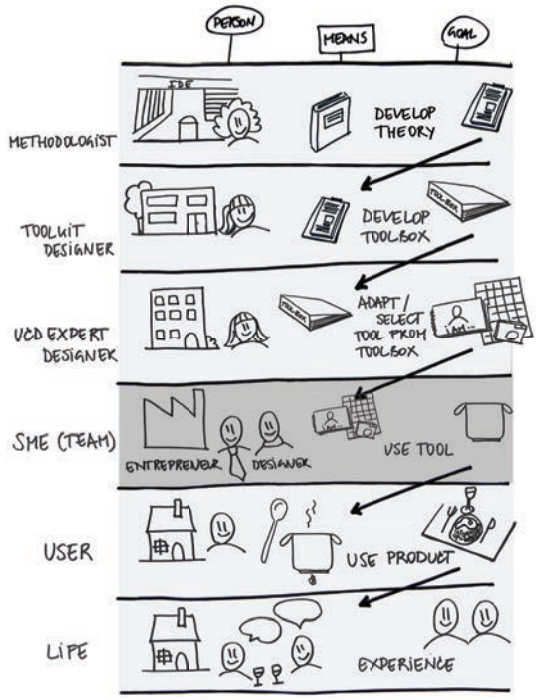


Figure 7.13: The toolkit aims at enabling a UCD expert to supporting SMEs in applying UCD.

7.4.1 — Context of Flanders InShape

Flanders InShape is a knowledge institute founded by the Flemish industry and branch associations, which considers user-centred approach to be valuable for companies. Sensibilisation campaigns of Flanders InShape on UCD made more and more SMEs in Flanders aware of the necessity of user-centred design. As there are many UCD methods available, SMEs are losing oversight. A lot of information on the rationale and application of these methods resides in research and education organizations throughout Belgium, out of the field of view of SMEs. When to use what methods remains difficult for SMEs as good and insightful cases are missing.

Flanders InShape issued a tender with 14 different research projects to acquire more knowledge on how UCD could be applied in SMEs for two reasons:

1. In the early years of Flanders InShape, they did not have much knowledge on UCD themselves and they wanted to involve experts in the field.
2. Flanders InShape recognizes that raising awareness on UCD is no longer enough, knowledge transfer is more important. There is a need for an accessible solution/process introducing SMEs to the world of UCD and guiding them during this journey.

The project brief to which organizations could apply for funding was targeted at creating a tool to support SMEs in involving users for product innovation. I followed one group of organizations that responded to this call:

Artesis: The Master in Product Design program of the Artesis University of Applied Sciences in Antwerp is the first and so far only Master in Product Design in Belgium. Since a couple of years some of the staff members started research projects to gain more knowledge on product design. One of these subjects is UCD. Four employees contributed in the creation of the toolkit. One of them, Ann de Keersmaecker contacted me to get input on UCD for SMEs and remained my contact throughout the development of the toolkit.

Verhaert: is a design agency providing support for the entire scope of product innovation and development. They support governments and companies with a wide variety of services to develop new products and transform them into new business opportunities. They are active in the domains of medical, automotive, fast-moving consumer, industry, ICT, navy, and others. Verhaert uses UCD as a holistic approach for product development. Two employees of Verhaert were involved in the development of the toolkit.

Namahn: is a user-centred IT design consultancy. They help companies in the creation of digital products and services by involving users (in contrast to a technology oriented approach). They design products and services for both B2B and B2C. Namahn organizes trainings and workshops to support organizations in 'User-centred design' and 'Information Architecture'. UCD is one of the core-competencies of Namahn. Three employees of Namahn contributed in the development of the toolkit.

The aim of the toolkit:

Develop an accessible solution to introduce and support SMEs into the world of UCD. Within a short period of time (1 or 2 days), the toolkit should provide insight in the typical characteristics of UCD, the relevance of UCD, an interesting method for the specific context of the SME and how they can start making use of these methods. The toolkit can be used in a variety of ways based on criteria such as the kind of market (B2B or B2C), the previous experience with UCD and the type of product (hardware, software, service) to be designed. In a distinct way SMEs need to be familiarized with the multitude of UCD methods and learn different angles of approach.

The project team adds the following ambitions to this aim:
The toolkit needs to make people enthusiastic and convince them to make use of UCD and the toolkit. Examples are primary means to communicate the different /UCD methods and their use. Cases and workshops can help. The first step is to create awareness; the second is making use of UCD with support of an expert. The main goal is not to convince but to enable. SMEs need to have some interest otherwise it is a too laborious process.

7.4.2 — Design process of the toolkit

The project consists of four phases each ending with a workshop to ask for the feedback of SMEs (see figure 7.14 for an overview of the design process, in yellow the moments where SMEs were contacted). The team strives to continuously (iteratively) adapt the approach to the needs of the future target audience. The four phases are:

- Inventory of existing UCD methods
- Screening and classification of existing UCD methods
- Positioning the UCD methods in a generic design process
- Designing an approach to enable SMEs to use the selected UCD methods

The entire project builds on the expertise of the different team members, both academic and industrial, in general product design and on UCD specifically. Additional knowledge was gathered to develop the toolkit from literature and a questionnaire sent to SMEs. This questionnaire addresses the following topics:

- Previous experience with and knowledge of UCD
- Familiar UCD methods
- Type of information needed by SMEs
- Desired approach for support in using UCD

The HCD Roadmap was developed in three iterative cycles each with feedback from SMEs. The first iteration aimed at exploring what UCD methods are already familiar to SMEs and to get feedback on how to present the information on UCD methods for SMEs. The project team proposed three different concepts. The second iteration aimed at making a selection of suitable UCD methods and developing a visualization of a roadmap.

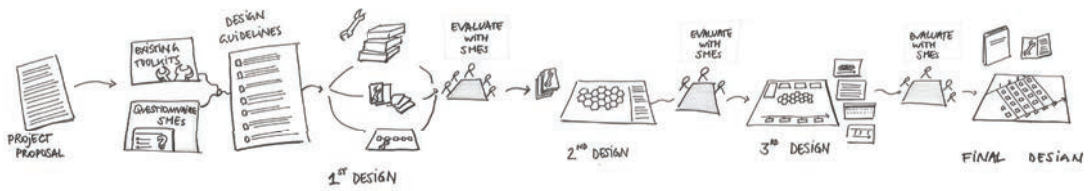


Figure 7.14: the design process of the toolkit. In yellow the moments where SMEs were actively involved in the development of the toolkit.

7.4.3 — The resulting toolkit

General:

The physical toolkit consists of a roadmap on a poster with a manual, a set of tool cards and stickers. Everything fits in a box. The roadmap is a block with different sheets. For every project a sheet can be taken from the block to use in a specific project. There is a certain amount of stickers enough for several projects. If necessary, the stickers can be ordered.

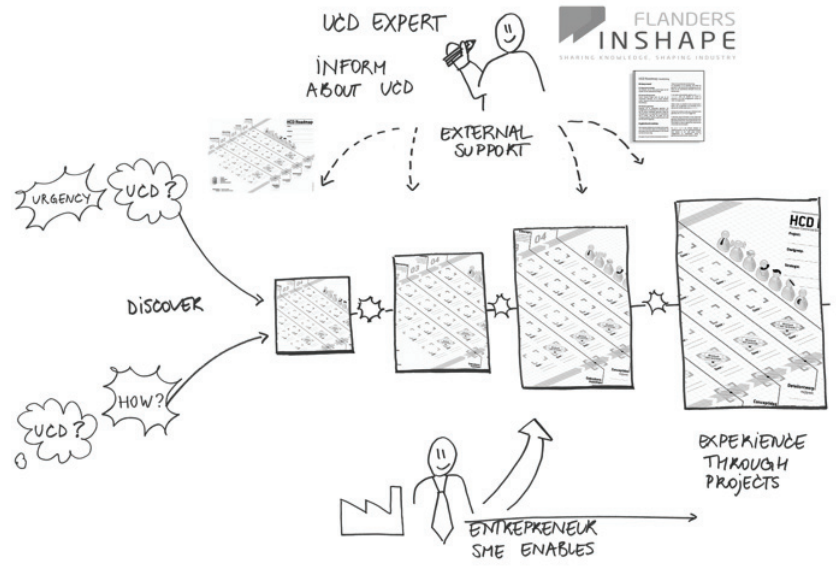


Figure 7.15: Positioning of the toolkit within the proposed approach.

During a workshop a faciliator with expertise in UCD makes use of the roadmap to determine when to use which UCD methods. Stickers are used to consolidate the choice. With the help of a manual explaining each of the methods the SMEs are able to apply the methods themselves. For novice SMEs, the facilitator will be closely invovled at the start of this process.

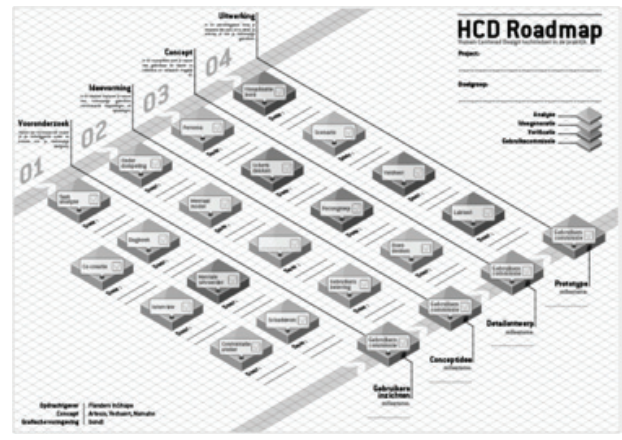


Figure 7.16: General overview of the toolkit for Flanders InShape: a roadmap and a manual with general information and a selection of UCD tools and methods.

There are two key moments on the roadmap:

1. The workshop at the start of the project where the following decisions are made: determining when to use a UCD method and selecting what UCD method to use (depending on the project and its goal)
2. Using the UCD method during the project when back at the company.

Start of the design process:

The Human Centred Design Roadmap (HCD Roadmap) starts with a workshop provided by facilitators of Flanders InShape. The Flanders InShape employee gives information on UCD in general and shows the SME how to use the toolkit for support in their project. The following activities take place at the beginning of the workshop:

- Explaining the background of User-centred design and what it can bring to the SME
- Explaining of the use of the HCD Roadmap
- Appoint responsibilities to and engage the employees of the SME
- Start framing the goals and the starting point of the project.

In this workshop, the following steps are taken:

1. Framing of the project
2. Introduction of the team members (what is their name and their responsibility in the project and the SME)
3. What is the current design phase of the project
4. Who is the user or stakeholder?
5. Introduction of the roadmap
6. Look at and make a selection of the tool cards
7. Use the roadmap (select a UCD method for each of the design phases)
8. Elaborate on how to use the UCD methods

The workshop ends with a concrete plan on how to tackle the project.

UCD Tools and methods

The project team started by putting together a large list of familiar UCD methods[1] completed with UCD methods from the classifications and toolkits that were investigated at the start of the design process of the toolkit. This resulted in a large list of UCD methods to choose from. The methods are selected based on their diversity, fit to the context of SMEs and low required skill level. On the right, an overview of the selected UCD methods.

Selected UCD methods:
- Task analysis
- Diaries
- Interviews
- Observation
- Immersion
- Experience map
- Mental model
- Persona
- Scenarios
- Sketch thinking
- Do thinking
- Co-creation
- Confrontation studio
- Lab test
- Field test
- Visualization board
- Mental go-through
- Focus group
- User committee

Each UCD tool and method is explained by the use of a tool card. Figure 7.17 shows the manual of the UCD roadmap and Figure 7.18 shows one of the UCD tools (task analysis).

The UCD tools and methods are grouped into four categories:

- methods to gain insight into the tacit and latent needs and wishes of the users (blue),
- developing ideas and concepts with users (yellow),
- verifying the developed ideas and concepts with users (pink) and
- validating the findings with a user committee (green).

These categories indicate the different ways of user involvement in the design process.

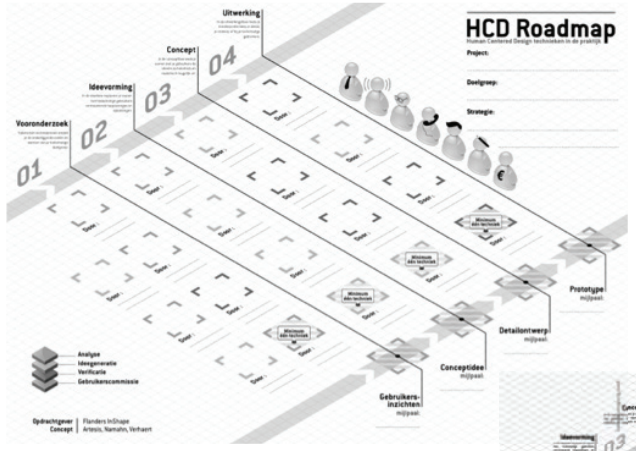
Applying UCD in a product innovation process

The toolkit is based on a UCD roadmap (see Figure 7.18) that was created based on the four phases of a design process: Analysis, idea generation, concept development and detailing. Figure 7.18 shows the roadmap with the four phases of the project: the analysis of the project (also called Fuzzy Front End), the idea phase, the concept phase and validation. Each phase ends with deliverables. Stickers depict the tools and are used to indicate which UCD tool or method is selected for the specific design phase. There are different types of stickers each referring to a different goal for which UCD can be applied: analysis of the situation, idea generation, validation and communication (depicted by the coloured blocks in Figure 7.16). these different goals are made explicit to encourage SMEs to apply different types of UCD methods in each phase of the design process.

Figure 7.17: The manual of the UCD roadmap with an explanation of the different steps to be taken to use the roadmap, the different building blocks of the roadmap and how the UCD methods are categorized.

Figure 7.18: The tool card of 'Task analysis', indicating what the goal is, what you need, who should be involved and an example of a case where the UCD tool was used.

[1] An overview of the familiar methods and their description can be found on: http://www.namahn.com/methods



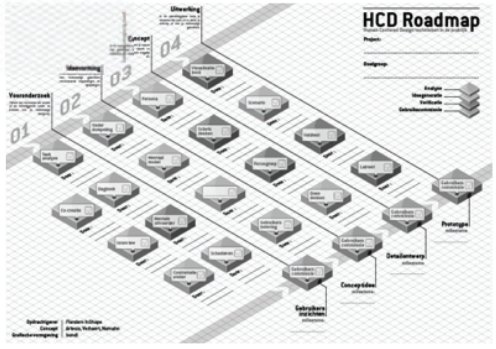


Figure 7.19: The roadmap with the four design phases, places for the tool stickers and indications of deliverables after each phase.

The figure on the right shows the roadmap with the stickers

Learning and adoption of UCD

In order to support the SMEs in learning how to use the UCD methods and how to adopt UCD within their practice, the facilitator of the workshop plays an important role. The facilitator is responsible for informing, supporting and inspiring the SMEs. Once the workshop is over, the responsibilities are transferred to the SME. It is up to the SME to contact the facilitator to receive additional information and support while using the UCD methods. The manual and the tool cards provide information and help on how to implement the results.

7.4.5 — Evaluation of Flanders InShape toolkit by Flanders InShape:

In July 2013, I re-contacted Flanders InShape to get additional information on the use of the HCD Roadmap in their practice (this was out of the scope of the project team as the development of the Roadmap finished in September 2011). The following came forward: Remco Lenstra (Flanders InShape): *"For us, the added value is that it enables us to frame new knowledge for SMEs within their existing design process. We use the toolkit to enable SMEs to redesign their own processes and how to involve their users during these processes."*

Flanders InShape mentioned that, as they had been scarcely involved in the development of the toolkit, they lacked knowledge on the selected UCD methods to support SMEs in using them. The tool cards give "steno" type information (short sentences, bulleted process and tips). That is not enough information to use the toolkit. Flanders InShape decided to acquire more in depth information by themselves. This took time and resulted in a book: "Cecilia's keuze" (Cecilia's choice, see Figure 7.20).

[2] www.usewell.be

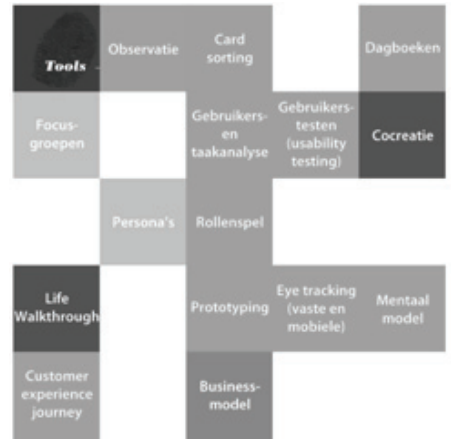


Figure 7.20: Book published by Flanders InShape regarding UCD in SMEs.

The first half of this book consists of a general introduction on UCD explaining the "what" and "why" of UCD. The second part of the book consists of a description on UCD methods and cases explaining the "how". The book is developed specifically for SMEs. Remco Lenstra: *"This book originated from our frustration that we were 'not yet' able to use the UCD methods ourselves. The book provides enough information to make use of the methods. Only after the publication of the book we started to use the roadmap."*

At the moment Flanders InShape frequently uses the Roadmap for general presentations (often in combination with some theory on the balance between company strategy and user input) and about four times a year they use the Roadmap for projects with SMEs (for example Etap, Beaulieu, Durlet and many others). Remco Lenstra: *"The background of UCD appeals to many and is very usable for SMEs. It fits their way of work very well and can be combined with their own strategies. The Roadmap has given us the answer to the "how" question while before we could only answer the "what" question."*

Remco Lenstra further mentions: *"The Roadmap is probably the best toolkit that came out of our financed projects. At the moment I teach at the HOWEST University of Applied Sciences where I teach 5 classes of two hours each. I have used both the Roadmap and Usewell (one of the other projects that were financed[2]). Now half a year later I have already 30 to 40 designed products that are developed using both toolkits."*

An evaluation of the Flanders InShape toolkit based on the three mechanisms can be found on the following page.

7.4.6 — Evaluation on the use of the toolkit regarding the three challenges:

Table 7.2 provides an overview of the design decisions related to each of the challenges and an evaluation of these design decisions. The general insights gathered based on the design of the toolkit are:

Overview o design decisions	Design decisions of toolkit designer	Insights / evalution
Opening up towards users	Ann wanted to show the wide array of available UCD tools and methods to create awareness about its potential. She expects the more "simple" tools (interviews, observations, testing prototypes) to require less skill and will be adopted quicker than others. Even though SMEs recognize the value of these more difficult tools (design probes and generative techniques) they take more time to learn. The goal of the tool is to make the SMEs aware of the wide variation of tools. For this reason the project team selected UCD methods that aim for different kinds of knowledge, have different kinds of user involvement and are used in the different phases of the design process. The design of the roadmap encourages SMEs to select several methods each of a different kind in each of the design phases. The project team chose to make tool cards based on the IDEO method cards (IDEO, 2009). They added case examples and a more elaborate description of the tool or method. The case examples give insight in how the method can be used and for what reason.	The roadmap does not elicit awareness on how to use UCD in a broader sense within the company. It does not enable or allow the SME to make small company wide changes to become more user-centred. The case examples are very helpful in communicating how the UCD method is used in practice. They might however be not detailed enough to actually provide insight in what steps are taken and what decisions are made in using the UCD method. SMEs might experience difficulties distinguishing the (often subtle) differences between the UCD methods and how they can be used in their project.
Learning to apply UCD methods	The SMEs cannot start using the HCD Roadmap on their own; they need an introduction on UCD by someone knowledgeable. Even with the manual, the SMEs need support to make use of the roadmap and the UCD methods. The facilitator has an important role in achieving this. The aim of the roadmap is to guide and support SMEs in selecting UCD methods and informs them about the purpose and use of the different methods. The SME gets information on how to reach users best, and what he can expect from the users. The facilitator gives the initial background information and helps in choosing. The manual and the tool card support the SME after the workshop. The project team attempted to select UCD methods based on the experience of the SMEs with UCD, their attitude and capabilities as well as their context. By defining different groups of UCD tools and methods, the SME is encouraged to use a variety of methods in each phase. The manual was designed to enable the SME to continue using the roadmap. The manual contains practical tips and examples.	The HCD roadmap is aimed at informing SMEs and inviting them to try out new UCD methods. Applying UCD builds on this first experience. By becoming aware of the possibilities of UCD the SME can be stimulated to, for example, hire a design agency or a UCD expert to support the SME in applying UCD. Without the help of a facilitator, the SME will not be able to use the HCD Roadmap. Eve after a first workshop it will remain difficult for SMEs to use the Roadmap. The focus of the toolkit lies in supporting to make a choice of a UCD method fit for their project and providing background information, and applying the method themselves, if necessary with the help of an external partner.

Table 7.4 Overview of the design decisions and their evaluation of the toolkit developed for Flanders InShape

Overview o design decisions	Design decisions of toolkit designer	Insights / evalution
Appyling UCD for product innovation int he daily practice of SMEs	The tools are put on stickers, which can be put on the roadmap (see figure 7.22). By filling in the roadmap and making choices the SME gets an overview of the project and the assigned employees. The project team chose to use the design phases of a standard process to ensure familiarity for SMEs. By using the entire design process the SMEs are invited to look beyond the already known UCD methods used for validation. The emphasis now lies on the early phases of the design process that have a large influence on the user-friendliness of a design. After each design phase, deliverables are indicated to make each phase as concrete as possible and ensure in-between results. This enables the SMEs to remain motivated using the UCD methods.	SMEs have very informal design processes and it was a challenge to name and select design phases that are relevant for all manufacturing SMEs. In the end, the project team decided for clarity to use the commonly used design process of Verhaert. Stating what deliverables each phase ends with is a good choice fitting the contexts of SMEs very well. Some of these deliverables, like for example "user insights", might remain rather vague to SMEs without prior experience with UCD. The manual could give an idea of what the different deliverables could look like.

Table 7.4 Overview of the design decisions and their evaluation of the toolkit developed for Flanders InShape

7.5 — Evaluation

Using the gathered insights about the design of both toolkits I reflect on the design decisions regarding the three previously identified mechanisms and how the toolkits aim to support SMEs for each of the mechanisms. Furthermore, the recommendations that were the starting point for the development of the toolkits as well as the proposed approach for adopting UCD in SMEs will be evaluated.

7.5.1 — General considerations:

The two toolkits discussed in this chapter are different from the toolkits described by Tidball et al. (2010) as they are developed in close collaboration with the two types of users of the toolkits, the UCD expert (Flanders InShape and Muzus) and the SME and are used collaboratively. Because of this, the toolkits bring value to the users and fit their context.

There is an incredible diversity amongst SMEs. It is impossible to find an "average" SME. The project team of Flanders InShape encountered difficulties to design a roadmap that fits and appeals to all SMEs. **Toolkits should not aim at supporting all SMEs.** Based on the evaluation of the toolkits, the main aims of the toolkits is to encourage SMEs to focus, make a selection amongst the provided methods and design the toolkits for flexible use by the SMEs.

Many of the impulses deal with **strategic considerations** of the company. The starting point of this thesis was on product innovation. However, during the Pressure Cooker project the SMEs realised how the user insights can be used for marketing, future plans and strategy. Both toolkits focus on the design process but the gathered user insights can be used for a wider application within the company, to support the company in creating a future vision.

Both toolkits are based on the use of **workshops to support the collaborative character of both approaches**. Muzus has a series of workshops each covering a different phase of the design process. The roadmap of Flanders InShape has one main workshop where the entire process in planned. The decisions are made making use of templates, either by different kinds of templates (Muzus) or in the form of a roadmap (Flanders InShape). Information for the SMEs is provided on physical tool cards or technique sheets.

The toolkits require a **different relation of the SMEs towards external organizations**. Instead of merely hiring a design agency to do the job (such as previously with Muzus), or follow advice from a consultancy (similar to previously with Flanders InShape) the toolkits invite SMEs to become partners in the project and do the project collaboratively. Marijke describes it as follows: *"It is a completely different way of collaborating or hiring an external company. It is not like: we let them do their things, so we do not have to. Instead, they hire us to learn something, and Muzus is better in some areas. They really want to learn from the project and understand what goes on, and make use of their own experience and put their emotions into it."* Ann describes is as: *"If I have to give SMEs tips for using the toolkit, it would be that they do not have to take all aspects too seriously. They are already doing a lot well. Just look at every part of the company and see what fits well. Maybe they were not aware of some of the things they do? You should pay attention to what already takes place."*

7.5.2 — Evaluating the recommendations

Chapter 6 starts with a set of recommendations grouped according to three identified mechanisms. Design decisions taken by both Marijke and Ann revealed that some recommendations are more important than originally anticipated while others had to be added. These changes are discussed based on the three underlying mechanisms:

A. Opening up towards users

SMEs already have a mindset oriented towards their users and their clients. Integrating this mindset within designing can be supported through the following two recommendations added based on the evaluation of the two toolkits:

Show how user insights can be used for strategic purposes:
Some of the user insights gathered during a product innovation project can have a larger impact on the company. In the evaluation case with Loeff's Patent, the entrepreneur recognized the potential for a different approach for sales, as well as new opportunities for the future and contributions for their company strategy. SMEs like to be informed and supported how to use these insights to define what steps need to be taken next and to develop a future vision for the company.

Enthuse and engage employees through actual contact with users:
SMEs value actual contact with users most from all the different steps taken in the process supported by the two toolkits. The other moments feel like mere steps to make actual contact possible. It is this moment where they become inspired and engaged to design product for their users. Many of the employees of SMEs gain empathy and step willingly in the world of their users, they convey this enthusiasm to other employees and to their work.

B. Learning to apply UCD methods

One recommendation was added based on the evaluation of the two toolkits and three recommendations were more important then expected:

Facilitate for different levels of UCD skills:
The toolkit designed by Marijke has three different scenarios actively involving SMEs in the design process by shifting responsibilities and tasks between Muzus and the SME. By the three scenario's, the toolkit provides a learning curve for SMEs having different levels of knowledge on UCD. It gives insight in what can be learnt by the SME by giving them learning goals during the project.

Supply with an active role in the project:
Through active participation SMEs will be more involved and learn how to perform parts of the process.

Be transparent about the approach (no black box):
SMEs value the ability to understand themselves why the UCD expert takes certain steps and decisions regarding their process. To quote one of the SMEs that evaluated the toolkit of Muzus: *"So you exactly know why and which approach they follow. I like that. I think as an engineer, and as an engineer you are always looking for what is behind. Why are you asking these questions? You're digging deeper."*

Provide insight how UCD relates to tools and methods they already know:
This enables SMEs to understand where UCD can be used in their product innovation process. This builds on the design decision of Marijke to also make use of non-UCD tools and methods for her toolkit.

C. Applying UCD for product innovation in the daily practice of SMEs

Four recommendations were more important then expected:

Setting and questioning the focus of the project and the envisioned result
Marijke and Ann created both a dedicated moment in the process of the toolkit to setting and questioning the focus of the project. SMEs have difficulties setting the right expectations for a User-centred project and need support in setting clear goals for the project in order to be able to define boundaries that fit the nature of SMEs.

Allow SMEs to monitor and direct the project, for example by building in checkpoints and providing intermediate results:
SMEs are focused on quick applicable results. Therefore each of the eleven steps in the process of Marijke delivers a concrete result. The design process of Ann's toolkit is focused on creating deliverables after each design phase. SMEs valued these results and remained engaged. The different steps in each of the toolkits and their according deliverables are also decision-making moments, which enable SMEs to monitor and direct the project.

Engaging other stakeholders within the SME such as marketing people, service staff, etc to increase support within the SME:
Both Marijke and Ann took measures in the design of their toolkits to involve employees from different parts of the SME. Because of this more support within the SME can be created and the gathered insights from the project can be applied wider in the organization.

Pay attention to initial ideas and prior knowledge:
This recommendation is closely linked to the previous one, through for example the involvement of other employees, but also by taking devoted time to reflect upon the existing ideas and knowledge with the SME the toolkits enable the SMEs to add to their current practice and build on what I already present.

These changes lead to a new set of recommendations. The recommendations that have changed or compared to the overview presented in Chapter 6 are indicated in with an elongated bar. The ones that are new are in bold.

Table 7.5 (on the next page): Overview of how insights are translated into recommendations with the according chapters of origin. In gray the recommendations that were stressed in developing the toolkits. In bold the new recommendations formulated based on the results from the toolkits.

	Mechanism	Insight
A	**Opening up towards users**	A prerequisite to start a UCD project is the attitude of involved people. Without interest in UCD, applying UCD has no value.
1		SMEs are more oriented towards and accustomed to quantitative research methods and usability testing than to qualitative methods for the early design stages.
2		Designers indicate they are experiencing threshold in getting UCD "sold" internally.
		In many cases user insights are also of strategic relevance aiding the SME to develop a future vision.
		When employees are presented the opportunity to observe or talk with users they become motivated to apply UCD and use the gathered insights.
B	**Learning to use UCD methods**	Designers lack knowledge on how to apply UCD, and are uncertain if they apply it well.
3		No functionaries, lack of specialized knowledge. No dedicated staff for UCD.
4		No functionaries, lack of specialized knowledge. No dedicated staff for UCD.
5		SMEs are interested in actively participating in user involvement and taking over from a UCD expert.
6		SMEs are experiencing a threshold in using methods they do not know or see the immediate value of.
7		Need for hands on information and experience on how to make use of the UCD tools and methods in the future.
8		Designers want to know what they can expect from UCD and how to communicate it to others.
9		Designers indicate they are interested in gaining more tacit and latent knowledge from users.
		SMEs like to know how UCD tools and methods are different or comparable to what they already know and in which stage of the design process they can be used.
C	**Applying UCD methods for product innovation in daily practice**	SMEs act hands on, want to see immediate results of how it can be valuable to their practice.
10		SMEs have project based product innovation
11		Often, projects in SMEs lack of focus and structure
12		SMEs are result driven.
13		SMEs have a flexible structure but limited resources.
14		The entrepreneur has a large impact on the company.
15		The flat structure and lack of functionaries enable SMEs to involve employees across the organization
16		SMEs have close relations with users and clients and can act in a short time span upon their needs and desires.
17		Innovation in SMEs is rarely strategic, they mainly react or respond to internal and external impulses.
18		Results of UCD can have implications for the company strategy and need time to get implemented.
19		Help of expert is needed to set-up research, select method, formulate questions and do analysis.
20		To increase uptake of results in an SME, the project needs to add to current state, often captured in tacit knowledge of employees.
21		Low degree of formalization, short communication lines.

Chapter	Recommendation	Meta-level
3 & 4 & 5	Enable SMEs to become curious, willing and gain empathy for users.	
4	Show the richness and opportunities of qualitative user research methods in relation to quantitative methods e.g. through examples of insights or of cases..	UCD expert
3 & 5	Provide designers means to explain the value of applying UCD methods.	Toolkit designer
7	**Show how user insights can be used for strategic purposes.**	UCD expert
7	**Enthuse and engage employees through actual contact with users.**	UCD expert
4	Inform employees of SMEs about UCD, when to use UCD, how to use UCD and for which purposes.	
5 & 7	Facilitate for different levels of UCD skills.	Toolkit designer
5	Support employees of SME in applying UCD methods.	UCD expert
4 & 5	Show how the UCD techniques work so SMEs can apply these methods themselves in the future to a certain degree.	UCD expert
4	Provide UCD methods with a low threshold for use.	UCD expert
5 & 7	Supply employees and the entrepreneur with an active role in the project.	UCD expert
4 & 7	Be transparent about the approach (no black box).	UCD expert
4	Inform employees about UCD methods that enable gaining tacit and latent knowledge such as design-led methods.	UCD expert
7	**Provide insight how UCD relates to tools and methods SMEs already know.**	UCD expert
5	Let SMEs experience UCD by making use of UCD in ongoing projects.	
3	Support SMEs in applying UCD within their ongoing projects.	UCD expert
3 & 7	Set and question the focus of the project.	UCD expert
3 & 5 & 7	Allow SMEs to monitor and direct the project, for example by building in checkpoints and providing intermediate results.	UCD expert
3	Enable to use UCD methods ad hoc within a short time span and with little budget.	UCD expert
3 & 4 & 5	Involve the entrepreneur of the SME, making sure he enables employees to make use of UCD.	UCD expert
5 & 7	Involve employees across the organization in applying UCD such as marketing people, service staff, etc.	UCD expert
3 & 5	Build on the good existing contacts of SMEs, easy basis to recruit users.	UCD expert
3	UCD can be applied in some cases to deal with internal or external impulses and provide a starting point to apply UCD.	SME (team)
3 & 5	Make sure that the project is embedded in a larger trajectory.	SME (team)
4 & 5	Make use of a UCD expert to guide the SME throughout the adoption process.	SME (team)
5 & 7	**Pay attention to initial ideas and prior knowledge.**	UCD expert
3 & 5	No need for formal reports, communicating user insights is based on the SME having actual contact with users and face-to-face meetings.	UCD expert

For this study the main aim was to explore in practice how SMEs could be supported to apply UCD in their practice. I was interested in detailed information how the three identified mechanisms could take place:

1. Opening up towards users
2. Learning to apply UCD methods
3. Applying UCD for product innovation in the daily practice of SMEs

The proposed approach from Chapter 6 combines these three challenges in a single approach. In this study two toolkits were in order to explore the three challenges and the approach in more detail in practice. The toolkits provided more insight into the activities taking place within each project. In Chapter 6, the activities are described in general terms like "raising awareness to change the mind-set", "using UCD tools and methods", "Empathy process" and "design process (see Figure 7.21). Now this can be described in more detail.

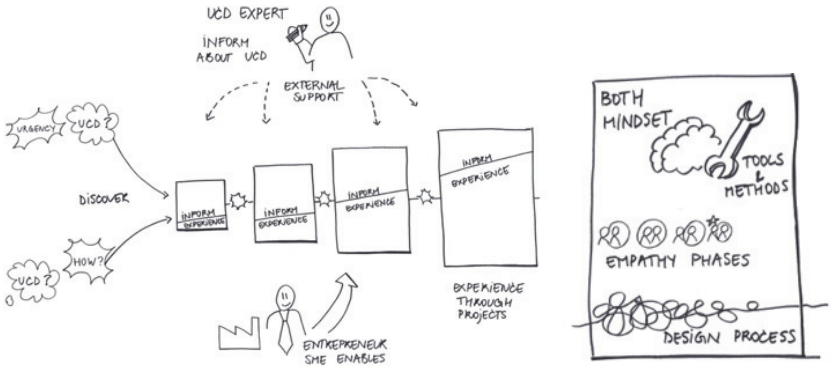


Figure 7.21 The initial process as proposed in Chapter 6 and detail of activities taking place during the projects.

The toolkits also provided more insight on how the UCD expert could support SMEs and how this support changes over time (as suggested through the use of three different scenario's by the toolkit of Muzus): it moves from informing towards coaching. The amount of time spend by the UCD expert also decreases over time as the participation of the SME increases.

The toolkit of Flanders InShape includes the entire design process for engineering and on top of that proposes usability testing methods. The toolkit of Muzus focuses on the Fuzzy Front End of the design process, up until the concept phase. This part of the design process is where the expertise of Muzus lies. After the design of a concept Muzus enables the SME to take over the design process. The design process depends on the type of involved UCD expert and the expertise of the SME. If the UCD expert is specialised in the front end of the process, and the SME lacks in house design and engineering capabilities, another design agency needs to be involved.

The primary objectives of the design of the toolkits were informing about and letting SMEs experience UCD. Creating awareness for UCD and enabling the SME to gain empathy for its users received were addressed primarily in the beginning of the processes. Marijke has developed several templates to support the facilitator in this process of awareness creation. These templates enable the SMEs to reflect upon their current practice, who their current users are and what they already know about the user. Through creating awareness about their current thinking of the users, the SMEs were able to step into the world of their user in actual moments of contact and thereby gaining empathy for their users. Implicitly, the process of empathy in design is defined as one of the tasks of the facilitator of the workshops. (S)he is responsible for supporting SMEs to step into the world of the user, immersing the SME in user information, let them connect to the user stories, and use this as a basis for product innovation. In both toolkits awareness and empathy were a priority especially at the beginning of the project. Later on their importance decreased, and the making use of the gathered insights increased in importance.

The user-centred mind-set enables SMEs to discover opportunities for their company, even on a more strategic level. The facilitator has an important role in supporting the SME how to use these insights beyond the scope of the project. In the case of Loeff's Patent, the company became aware of the value of strengthening its relation with the office supply wholesaler.

In both design processes, determining the focus of the project is emphasised as well as providing intermediate results that provide input whether the SME is still on track to answer the underlying question of the focus of the project. The process to get from the focus to the result shows the typical characteristics of a 'fuzzy' design process with its exploration and iterations. SMEs need a structured set of steps with each a clear focus and result. With the aid of a UCD expert they are able to deal with the activities that take place in each step to move from focus towards result.

Both in the design of the two toolkits as in the different cases of the Pressure Cooker, active participation of the SME through collaboration with the UCD expert was an important part of the process. In most cases workshops were core ingredients in facilitating this collaboration.

One of the main aspects of the approach is its iterative project-based nature. The toolkits itself are only used in one case, developed with SMEs or evaluated by SMEs and experts. The time restrictions limited the ability to use the toolkits repetitively in order to explore the gradual increase of the learning experience offered by the toolkit. Because of these limitations, this aspect of the process could not be evaluated and research over a longer period of time is needed.

The insights above influence the proposed approach for supporting SMEs in applying UCD in SMEs by providing a better understanding of what takes place in each project.

Key changes to the general approach are (depicted 7.22):
- the changing support of the UCD expert from informing to coaching and
- using the user insights on a broader level for the entire SME (future vision, marketing...)

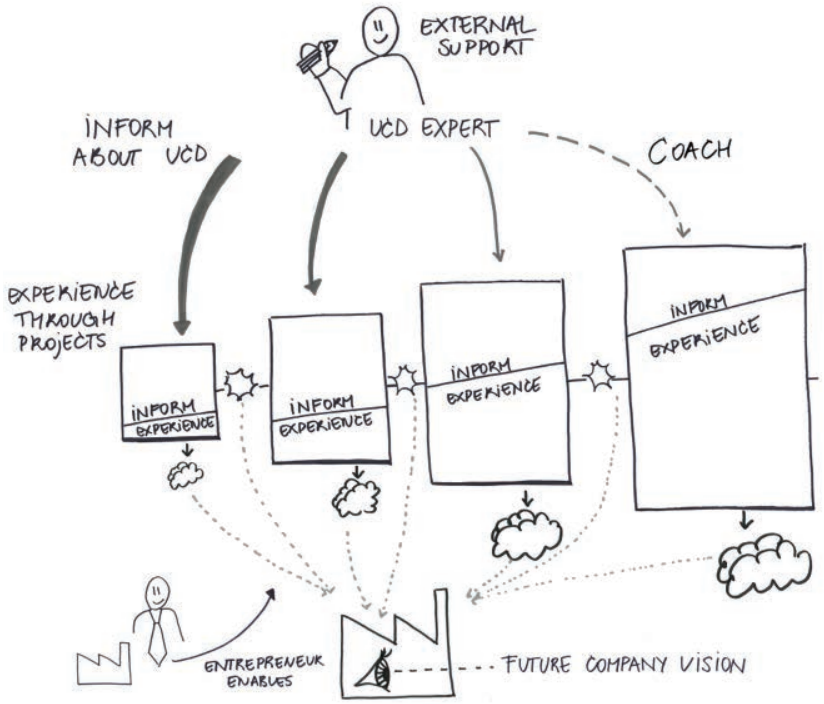


Figure 7.22: The more detailed approach for spporting SMEs in applying UCD based on the insights of designing the toolkits.

Key changes to the detailed project are (depicted 7.23):
- the importance of the active collaboration through workshops
- relating the UCD tools and methods to other methods such as from marketing and business (SWOT, Porters 5 Forces,..),
- the focus at the start and the according result at the end of the project achieved through intermediate result
- using best practices of the UCD experts for example in the form of templates.

The proposed approach provides an overview of the elements that influence the successful use of UCD methods in SMEs and how they are arranged along the product innovation process. The following strategies enable the SMEs to utilize their strengths:

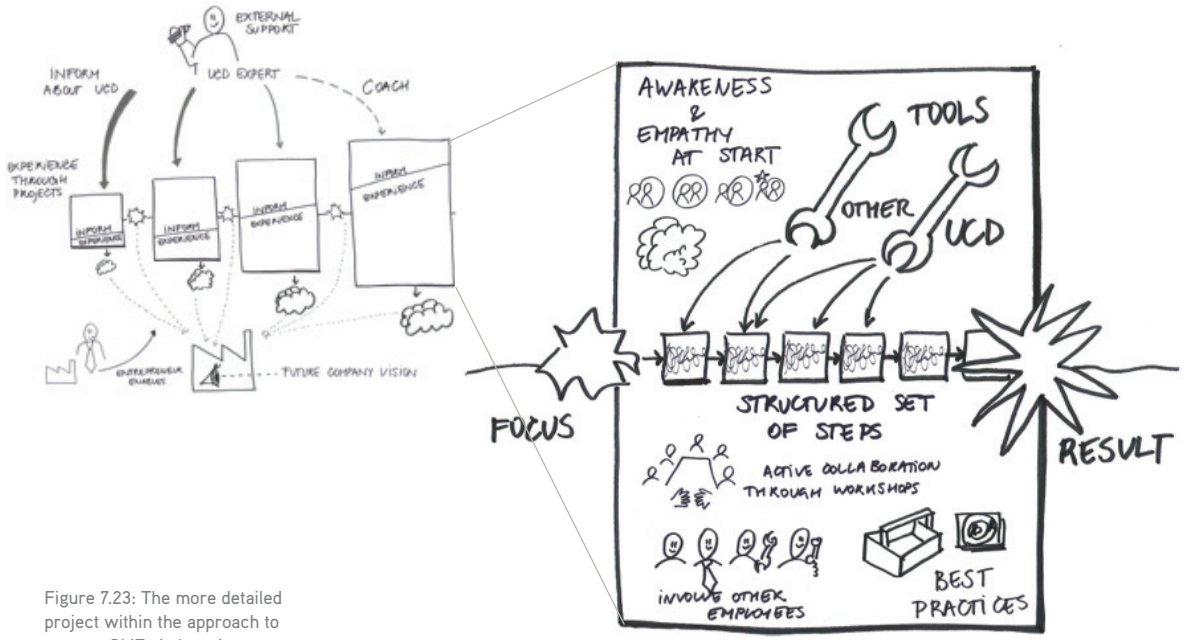


Figure 7.23: The more detailed project within the approach to support SMEs in learning to apply UCD

- Build experience and learning through iterative projects,
- An engaged entrepreneur that enables the projects to take place and have a wide impact in the organization, make sure that s/he is involved,
- Involving employees across the organization,
- Active collaboration through workshops,
- Taking over activities and responsibilities of the UCD expert,
- Making use of existing contacts of the SME.

The following strategies focus on supporting SMEs in applying UCD:
- Setting focus of the projects,
- Deliver concrete and intermediate results,
- A structured set of steps each with a specific goal,
- Support by an expert, which makes use of their best practices,
- Offering a learning experience that changes from informing to coaching by giving, employees increasing responsibilities along the projects,
- Using user insights to build a long term future vision,
- Relating the UCD methods to known methods to SMEs,
- Awareness and empathy enables SMEs to discover opportunities,
- UCD expert acts as a facilitator to support SMEs to step into the world of the user, immersing the SME in user information, let them connect to the user stories, and use this as a basis for product innovation.

These aspects enable SMEs to raise their knowledge level of UCD. Many of these aspects are not always clearly distinguished and have a large influence on each other. The following chapter presents the overall conclusions of this thesis and discusses each of the main research questions.

Academics:
Designing the toolkits enabled to gain further insight into how the three identified challenges can be addressed to support SMEs to apply UCD.

UCD experts and toolkit designers:
Insight in how SMEs can be supported on a detailed level and what the underlying considerations are.

Governmental organizations:
Examples of how SMEs can be supported with applying UCD in their practice.

Chapter 8

Conclusions

The aim of this thesis was to gain insight on how SMEs can apply UCD tools and methods for product innovation. Case studies and research through design taking place on different meta-levels was chosen as the approach to investigate how to support SMEs in their journey of applying UCD for product innovation. The cases investigated what UCD tools and methods are suitable for SMEs and the barriers and enablers they encounter in this process. Insights gathered by those cases lead to an approach and a set of recommendations that were explored in more detail by designing two toolkits in practice. This chapter presents the overall conclusions, reflections on the research and ends with recommendations for future research and tips for SMEs, UCD experts and design agencies.

8.1 — Conclusions

The initial intention of this research project was to explore UCD tools and methods suitable in the context of SMEs. Gradually I realized that to be able to apply UCD tools and methods, SMEs first needed to become aware of their users and their potential contribution to product innovation. The focus of this thesis shifted to introducing the user-perspective to SMEs as a starting point for an experience-based learning process for applying UCD.

In the following sections I outline how SMEs can utilize their strengths to apply UCD in product innovation. The previously presented research questions and the three primary challenges facing SMEs in applying UCD are used as a structure.

8.1.1 — Knowledge aim

This project's knowledge aim was to explore experience-based learning in the context of SMEs and on the subject of UCD. The outcome is an approach that aims to support SMEs in applying UCD. This approach was build using the insights gathered in ten cases. Some of the elements of the approach for applying UCD in SMEs have been derived from existing literature. The combination of these elements was not yet developed in a structured approach for SMEs. I re-evaluated the process using the insights gathered based on designing two toolkits with the process as a basis. By constructing an approach based on the findings of the different studies, I was able to evaluate whether the approach fulfilled the context of SMEs and was able to address the research questions in an operational way. As Mintzberg and Westley (2001) suggest with a "doing first" approach: using this approach a situation which Is novel can be addressed and a simple set of rules can help people move forward. The developed approach to support SMEs in involving users enabled me to move forward and explore the phenomenon in practice. The approach was further operationalized and detailed from an abstract level dealing with challenges to a concrete and practical level with attention for the activities taking place in each project phase of the process. The process of applying UCD in SMEs (as presented in Figure 8.1) is a combination of a design process commonly used by SMEs, three challenges (opening up towards users, learning to apply UCD and adopting UCD in the daily practice of SMEs), the elements that enable SMEs to make use of UCD within their practice (an engaged entrepreneur, being supported by an expert and how to use the gathered user insights within the organization) and has varying degrees of learning experiences. The resulting knowledge can be employed to inform and inspire SMEs and UCD experts in applying UCD in SMEs.

8.1.2 — Aim for practice

The aim for practice is to enable SMEs to make use of UCD in their product innovation practice by providing UCD methods and tools to practitioners in design practice.

SMEs and UCD experts working for SMEs can use the cases presented in Chapter 5 as examples, they are a source of information on the following subjects: what methods can be used for which situation, how are the methods used, the implications of the user insights for the company, what are possible barriers and enablers during a project and which considerations to have when using UCD tools and methods for SMEs. The recommendations presented in Chapter 7 help UCD experts in developing their own set of tools and methods to support SMEs. The two toolkits give SMEs and UCD experts insight in suitable tools and methods for SMEs, phases in the design project, and how learning can be supported.

Throughout this thesis I attempted to illustrate findings by the use of examples of companies struggling with similar issues or by showing how they have tackled the challenges they encountered when applying UCD. This thesis has a large amount of examples (the ten cases in Chapter 5) and information on how to approach UCD in SMEs (with the toolkits presented in Chapter 7).

Hopefully the presented anecdotes have shown the usefulness of UCD when developing new products. The process of developing new products using UCD is not an overnight event. In the case of the breast pump, many years of getting acquainted with UCD are at its basis.

8.1.3 — General conclusions on UCD in the context of SMEs:

Based on the previously discussed studies, this section provides an answer to the research questions of Chapter 2.

The **first research phase** focused on the **current status of applying UCD** tools and methods in SMEs. The research questions addressed in this phase were:

1. **What characterizes the practice of SMEs as compared to large companies in relation to a user-centered design approach?**
   (detailed explanation in Chapter 3 on p57 and further)
   A UCD approach for SMEs is different from that of large companies and primarily comes down to the specific characteristics of SMEs with relation to product innovation. The main characteristics of a UCD approach for SMEs are: based on impulses, project based, quick iterations with users and clients, no separate phase in the design process, low threshold and expertise level needed for employees and the owner-manager plays a central role in enabling UCD to take place.

2. **What UCD tools and methods do SMEs currently use in product innovation activities?**
   At the moment, SMEs primarily use quantitative market research methods or more established UCD methods such as interviewing, observation, prototyping, lead users and usability testing. These methods are commonly used and generally well understood. Design-led UCD methods (for example, in the area of participatory design) are still underutilized, as many SMEs find it difficult to assess the credibility of such methods.

What are the barriers and opportunities for UCD tools and methods in SMEs?
(detailed explanation in Chapter 4 on p 84 and further)
Barriers:
Designers experience resistance to actually start trying out UCD (not only design-led methods) due to a lack of knowledge on the use of UCD methods in general and because they need internal support from the organization (primarily from the owner-manager). They seek justification to take time for UCD, and verification if they are correctly applying the methods. Designers would like support of an expert to check the set- up of their research and to review the method selection.

Much of the **available information on UCD is diluted and spread over different sources**. There are many attempts to create toolkits showing an overview of what is available, but actual in depth examples of UCD projects are missing. It is this type of examples that designers and SMEs claim to need to either convince others of the benefits and use of UCD, or as an inspiration and information source to apply UCD.

Designers struggle to **recruit users for participation**. Recruiting takes place ad hoc and under time pressure with little means. Therefore designers usually involve people from their own network. Another consequence of the time pressure is that designers limit the amount of time for analysing the obtained information. Its importance is underestimated due to a lack of skill.

For the designers, **formulating a project focus can be difficult**. Design-led UCD methods need a broader perspective of the user-context so that the user can reflect on their experiences, at the same time, the project needs focus to obtain valuable results for the company. Finding this balance is a challenge for inexperienced designers.

Opportunities:
The design processes at SMEs are often informal and ad hoc. **Designers are very flexible in adopting their process and approach to the circumstances**. To limit costs, SMEs sometimes make use of trainees to do the actual user research. Student projects can take advantage of university knowledge. To further confine time and budget used, some SMEs rather involve external or internal experts (such as technical staff doing installations or repairs for the user, or the customer service department).
Designers are curious to know how design-led methods could be used in their context and what kind of information they can bring.

The **second research phase** focused on the **suitability of design-led UCD tools and methods** and examines how these methods could be used in SMEs. This phase addressed the following research questions:

3. **Which design-led UCD tools and methods suit the context and capabilities of SMEs?**
   Many methods are suitable for SMEs; some require more skills and experience than others (for example generative techniques and design games). Designers in SMEs use and adjust UCD methods to suit their own contexts and available means. All SMEs required support in applying the methods. Some newer UCD methods, such as contextual design, were easily applied by SMEs.

4. **What are the barriers and opportunities for design-led UCD tools and methods in SMEs?**
   (detailed explanation in Chapter 5 on p 196)
   Barriers:
   One of the main struggles SMEs deal with is **lack of resources**. Each time an investment needs to be made, this is done with a great deal of thought and consideration. Due to the lack of engagement of the entrepreneur some cases had a tough time to make progress.

   Gaining support within the organization: When presenting the results of the case internally to other employees that were not involved in the case, many of the cases ran into misunderstanding or objections. The collected user insights suggested in many cases a change of strategy for the company. The internal resistance limits the acceptance of the results.

   The main barriers related to the team come down to **difficult collaboration by lack of a clear division of tasks, a lack of trust and different backgrounds**.

   Another consequence of the time limitation was that the teams were only able to either dive deep into one type of user, or investigate a wider context in limited depth. Most teams chose to **focus on one type of user with as a result a lack of diversity** as preferred by the SME. Due to the large amount of insights gathered and the novelty they bring, SMEs tend to feel overwhelmed.

   Opportunities:
   The acquired insights during the case were not only valuable for the product-to-be-designed but had a **larger impact on the organization**. It made the SME aware of the opportunities of UCD, gave them a better idea about who their users are, and the different kinds of stakeholders involved. The SMEs' flat organizational structure involved not only designers.
   SMEs consider UCD as a way to **change the relations with their clients**. Towards thinking along about product innovation instead of "you ask we deliver". SMEs have a close relation with their users providing a basis for UCD.

   The **commitment of the SMEs** speeds up the process. In some of the cases SMEs took over part of the responsibilities.

   Based on their previous experiences, **SMEs have a lot of knowledge about the context of use, their products and their users**. External designers and UCD experts can make use of this knowledge and build on it.

   As the case progressed, **the intermediate results** and the direct contacts with users increased the interest, engagement and enthusiasm of the SME. This had a positive effect on the progress of the case. To get the most out of it, many of the SMEs devoted more time to the case.

Main research question:

How can SMEs utilize their strengths to apply UCD for product innovation in their practice?
When dealing with the previous research questions, I realized that it is not a matter of SMEs being able to apply UCD methods in the design process. In the cases other aspects surfaced that have an impact on the application of UCD: what the team is willing and able to do with the information gained from involving users. This is the first challenge I observed for SMEs in applying UCD: **become aware of their users and getting a user-centered mindset**.

Conceiving the initial idea or design brief, setting appropriate requirements and constraints, and implementing the design as planned turned out to be tremendously important for the ability of a company to deliver new products based on user experience.

The studies showed that how product development takes place is not only determined by the prescribed process but also depends on the team that performs the process, how the project is set up, and the organization where the project is executed. This in turn is influenced by the type of market a company operates in. The skills and attitudes of the product development team influence how the individual steps of the process are executed. The properties of the organization and the market a company operates in have a considerable influence on the resources that are available to a development team, and the conditions they have to deal with. In other words: making products based on user insights requires an integrated, organizational approach. Figure 8.1 presents the approach developed based on gathered knowledge that supports SMEs in making use of their strengths to involve users for product innovation.

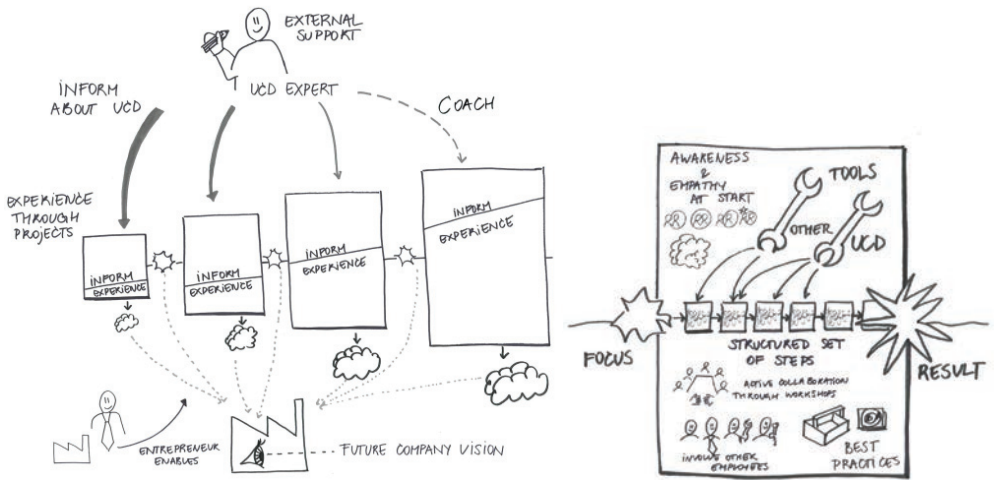


Figure 8.1: Process of how SMEs can apply UCD for product innovation, and a detail of one project.

The second observed challenge for SMEs to apply UCD emerged during conversations with designers. They are looking for more information on UCD, including design-led, tools and methods. They wanted to learn on how and when to apply them. On top of that they were interested in support in learning the skills to apply UCD.

The previous studies showed that SMEs need to be supported to apply UCD for product innovation. An external design agency or UCD expert can either be hired to apply UCD methods for the SME, or can support the SME in their learning process to apply the methods.

Chapter 7 concluded with an approach for SMEs to apply UCD by utilizing their strengths (Figure 8.1). SMEs struggle to find a way to apply UCD in their current practice. More specifically how they can make use of their strengths in doing so. This challenge is the third challenge I took a closer look at. The following section further describes each of these challenges:

8.1.4 — Challenge 1: Opening up towards users

When SMEs think about their current practice, who their current users are and what they know about the user, awareness can be created of their existing and prospective users. By creating awareness, SMEs are able to step into the world of their user and gain empathy for them. Implicitly, the process of gaining empathy in design is defined as one of the tasks of the facilitator of the workshops. (S)he is responsible for supporting SMEs to step into the world of the user, immersing the SME in user information, let them connect to the user stories, and use this as a basis for product innovation.
People are afraid to get away from the comfort zone and get out to the world of their users. It is a large step to take to learn from and act on the user perspective (involving users in the design projects). SMEs need to learn making use of its strengths, adding UCD to the current way of work, by making them aware of the opportunities offered by UCD.

8.1.5 — Challenge 2: Learning to apply UCD tools and methods

At the interviews on the current state and the cases (Chapter 5), I noticed that the main issue for the designers is how to learn to use the existing UCD tools and methods within their context, how to mobilize their users, extract user insights and how to deploy these insights for product innovation purposes.

Rather than creating new UCD tools and methods or adjusting the existing ones, SMEs need support in applying the existing wide range of UCD tools and methods. SMEs start with using and extending the known, more traditional and established methods like for example ‘interviews’ and ‘observations’. They go through a learning curve and quickly recognize how they can and need to be used. With the design of the toolkits in chapter 7, it became clear that there is a need of relating the application of UCD methods to the current use of other kinds of product innovation methods. Some SMEs already know methods like a SWOT-analysis. To what extent UCD tools and methods add to these types of methods, or relate to them, help SMEs in recognizing how UCD tools and methods can be applied and for what purposes.

In learning to make use of UCD, SMEs still need to be supported.

Effective use of UCD requires making use of SMEs' strengths (e.g. flexibility, iterative approach, project based development, involvement of different internal stakeholders, existing relations), by adding to the current way of work and making them aware of opportunities users/clients present. Supporting SMEs needs to take place on two levels: learning the skills to use UCD methods through experience-based learning in the form of projects and supporting the organization to integrate UCD into their general way of work.

SMEs lack the capacity to employ full-time, dedicated UCD experts. An external expert (either a design agency or UCD expert) can support SMEs. The UCD expert has a range of responsibilities: support the SME in developing a brief, create and maintain focus, conduct user research and coach the SME to perform parts themselves, teaching them about UCD tools and methods and UCD in general. As suggested in the proposed approach this process takes place in small steps, each time scaling up the project, the required skills and the learning capabilities. SMEs do not need to become UCD experts but can be taught basic skills to understand the value of UCD, how and when it can be used. As some of the results have a broader impact on the company and its strategy, UCD experts need to become knowledgeable on using user insights as a basis for wider application within organizations. The primary focus remains on involving users for product innovation, but the gathered insights might be valuable wider within the organization.

UCD experts tend to develop a long-term relationship with the SME. SMEs make use of UCD experts with a design background or a design agency with UCD capabilities. Their design background guarantees straightforward, intermediate and "usable" results for the company to develop new products.

8.1.6 — Challenge 3: Applying UCD for product innovation in the daily practice of SMEs

With the flat hierarchical nature and the informal division of functions and responsibilities at SMEs, marketing managers, sales representatives and the entrepreneur may get involved in the project. With UCD, low-hanging fruits for the SME can easily be identified and are used across the organization. In Chapter 3, the characteristics of SMEs related to product innovation were elaborately discussed and strengths valuable for the use of UCD came to surface: their flexibility, closeness to the market, and committed entrepreneur. The main barriers SMEs have to overcome in product innovation are their limited resources, unfamiliarity with UCD and their lack of information. Product innovation in SMEs is more ad hoc than it is structural and organized. The initiative for innovation mostly comes from the entrepreneur. Once the entrepreneur is engaged, there is a great deal of flexibility, budgets can be re-evaluated and employees can dedicate time to involve users.

SMEs start new product innovation projects based on either internal or external impulses as described in chapter 3. I encountered during my research the following reasons of SMEs to start applying UCD:

- Opportunity caused by changes in society or politics (Schilte: new law was the basis for the development of new types of schools)
- Expanding to new markets (either in type of target group or geographical, for example Eijffinger that expanded to the Chinese market)
- Urgency: being unable to deal with a problem internally and recognizing the need to do things differently (Loeff's patent struggled to start developing new products when their patent expired).
- Desires to structurally innovate based on user insights. Difrax involved users by hiring user experts in the company and by organizing customer panels ad hoc. They felt that innovating from a user perspective could take place in a more structured and rich way.
- Examples of other companies. When seeing other companies innovating successfully using UCD, or hearing about the opportunities it presents, some SMEs decide to try out UCD (Alrec became aware of the opportunities offered by UCD after talking with a Syntens advisor).

The type of design brief already provides a good idea of what UCD method to choose. Other factors play an important role as for example the context (as was the case for Jansen Medicars), the type of user (Scala) and the accessibility of the users (Verheul Trappen). There is not necessarily one appropriate method; often multiple UCD methods can be used. SMEs need to become aware that there is room for experimentation with UCD methods and that they are not rigid structures. It is about the underlying mechanisms of the method and not about actual precise replication of the method.

All of the cases in this thesis have taken place in the setting of a design process aiming to develop a new product based on user insights. The design process started with a design brief and continues until the development of a concept. This design process was a close collaboration between the SME and the UCD expert. SMEs valued this collaborative and active approach of being informed about UCD through workshops and getting immediate results based on user involvement. By applying UCD methods in on-going product innovation projects SMEs recognize their practical value.

Making use of user insights within the organization

The Co-Design Pressure Cooker started off with product innovation projects. Without realizing it, the actual product design results were less important than the other project results. Not only were concepts for products created, many of these products were combined with services. In the case of Verheul Trappen, it was a service for stairs to give the user a sense of safety that was the main reason for success. The designed concept had a physical form and was only intended to support the service. In many projects strategic opportunities were identified based on the user insights. Alpine (making hearing protection for construction sites) realized that the product positioning for hearing protection for musicians had to be different. Rather than blocking sounds it was about improving sound perception. Based on user insights they created a different product, other sales and marketing strategies and a whole new website. Premaxx said at the end of the project: "We have so many new ideas, and the user insights we gathered will help us further for the next

four years". Bammens did not anticipate the effect of user insights on the organization. They wanted a new kind of waste bin but the final concept was a product-service combination: waste collection as a game. They were overwhelmed by the user insight that they had to make changes in the company culture.

8.2 — Academic Contribution

The previously discussed conclusions bring four main academic contributions of this thesis to the front. This section elaborates on the implications of these four academic contributions.

1. **SMEs have many overlooked strengths.**

Existing research on product innovation in SMEs is primarily quantitative-based and is structured using innovation questions that are similar to those of large companies. Because of the current research approach important implicit strengths of SMEs are overlooked. My thesis displays, through the multi-method qualitative approach, valuable strengths and relations of SMEs with regard to their product innovation activities that previously haven not been addressed in SME literature. For example, where SME literature concludes that a single decision maker is a hazard as this typically I true for large companies: "an owner-manager can completely block out all initiative for innovation" the rich data in this thesis demonstrates that such a finding should be interpreted differently due to the changed context: "Only one person needs to embrace innovation".

2. **UCD demands a different approach if it is applied in SMEs in comparison to large companies.**

All present UCD knowledge is based on product innovation cases from large companies and from research projects conducted in academia. However, product innovation processes are different for SMEs and large companies. This thesis shows that UCD for SMEs needs a different approach in comparison to large companies. More specifically, the studies presented in this thesis bring forward that a UCD approach for SMEs is linked to the main characteristics of product innovation in SMEs (such as impulse driven, ad hoc, flexible, iterative, based on intermediate results). A typical UCD approach for SMEs needs to facilitate this product innovation process and allow a UCD approach to be applied with a low required skill level, making use of the present knowledge and contacts and without the planning-heavy structure of large companies.

3. **Introducing UCD in SMEs has a large influence on the organization.**

This thesis shows an important effect of introducing UCD in SMEs: the influence a UCD approach has on the organization itself. In the study discussed in chapter 5, many of the participating SMEs experienced an organization change process because of the UCD approach taken or the results gained from applying the approach. As explored in Chapter 6, a UCD approach in SMEs asks for both a bottom up approach (based on Jokela, 2004) by empowering employees as well as a top down approach (following Venturi et al. 2006), due to the importance of owner-managers in SMEs and their ability to allocated resources to applying UCD. Because of the nature of SMEs, they have very few layers of decision-making. In the larger SMEs I recognized the following layers: owner-manager, managers (such as sales or operations managers) and employees. In the small SMEs, the layer of managers was absent. This absence of managerial layers aids SMEs in getting change implemented in the organization. Literature on different concepts that can aid organizations in changing discussed in organizational change literature primarily addresses challenges in organizational change that are related to the nature of the company. Studies such as that of Dutton et al. (2001) and Howard-Grenville (2007) discuss practices of large companies that deal with top management looking for ways to involve employees in the change process through for example "catching managerial attention", "generating productive resistance" and "establishing change initiators". Many studies in organization change literature is based on single organization investigations, primarily with large companies using a retrospective approach. The cases presented in this thesis are examples where either the employees aimed to apply UCD in their daily practice, while others had an owner-managers seeking for new approaches to address new possible markets. Even though my main aim was not to investigate how SMEs can be supported in this organizational change process, the studies discussed in chapter 5 and 7 provide a wealth of empirical data, collected in various organizational contexts at the moment of decision-making.

4. **Designers also act as a facilitator and coach to support SMEs in a learning process towards applying UCD in their daily practice**

The role of designers as bringing design solutions to companies (either as internal designer or as external hired designer) is elaborately discussed in this thesis. In literature (such as design research, design management, engineering design or innovation management literature) this is also often discussed (Wakeford, 2004 and Design Council, 2011), but not towards SME specifically. This thesis extends this discussion in the literature towards the role of designers (internal and external) in the context of SMEs by showing how SMEs can learn to apply a UCD approach, coaching them in making use of UCD methods and recognizing opportunities presented by users (see the approach as discussed in chapter 7). Furthermore, the study discussed in chapter 5 brings forward that external designers also serve as a "teacher" or "coach" for SMEs, sharing responsibilities in a collaborative UCD approach. In SMEs, designers take up another role, an overlooked role in the current SME literature. The research presented here provides a basis to further explore this new role for designers.

8.3 — Emerging themes

In this paragraph I reflect on the conclusions discussed earlier and discuss them in relation to the wider context of design research.

8.3.1 — Perceiving a change in applying UCD over time

This research project started in 2008. At a meeting with Froukje Sleeswijk Visser, she pointed me to the unknown context of SMEs applying UCD. During her research project (from 2004-2009) she had noticed a growing interest from large companies in User-centered methods in the fuzzy front end of the design process. At the start she had difficulty in getting companies to participating. By the end of her project, she had to refuse several request. I witnessed a similar change throughout my research project. Many SMEs (especially the "Innovative followers" as discussed in Chapter 3) make use of new methods once they are considered "established". Large companies have paved the way in using user-centered methods and shown how they can be beneficial for product innovation. The SMEs I met in 2008 were new to UCD. By the end of my project more and more SMEs had come into contact with UCD and started to use UCD tools and methods. This awareness and use of UCD methods can also be found with the involved UCD experts. Froukje Sleeswijk Visser had to be at the same time a designer, a user researcher and researcher as there were no UCD experts able to use for example design probes and generative techniques. I, on the other hand, was able to involve knowledgeable UCD experts that gained even more expertise by my research project. They made use of the cases to gain expertise on newer UCD tools and methods (like for example WeLL Design and P5 consultants that made use of design probes for the first time in the Co-Design Pressure Cooker cases). Other organizations adopted this shift: Syntens for example has been working the last couple of years on providing more knowledge relevant for product innovation in SMEs by organizing "Innovatiekringen" (innovation circles) on specific themes.

8.3.2 — Insights from long-term contacts with SMEs during this project

Involving users in product innovation has an informal character, starting by having more elaborate conversations with current clients/users. Making use of the insights gathered through user involvement in the organization takes time. I have followed three SMEs over a period of four years: Difrax, Tilcentrum and Bammens. In these years, I witnessed following changes at these companies:

Tilcentrum: The entrepreneur of Tilcentrum initiated many of the new product innovation projects of the company. As they have no in-house designers or engineers, he outsources the design of new products to student projects and to engineering agencies for further detailing for production of the designs. At first the main focus of the student projects was on further developing an idea or 'proof of concept' developed by the entrepreneur. I encouraged the students that I mentored, to involve users during the design of the product. After two projects, the entrepreneur decided to let the students explore the context and look for product opportunities. The outcome was the lifting aid used for surgery of obese patients (as discussed in Chapter 4). The entrepreneur of Tilcentrum was delighted by the approach of the students and the final design. This encouraged Tilcentrum to participate in the workshops organised in collaboration with Syntens (as discussed in the previous section) to learn more about UCD in general. Tilcentrum now uses UCD to explore new opportunities for products instead of only using ideas from the entrepreneur.

Bammens was one of the companies that participated in the Pressure Cooker project in 2009. A product-service combination concept was developed using a design game and was based on user insights. The company responded: "We just wanted a fancier bin". So they developed a fancier bin. In 2012, the SME came back as they wanted to know how delivering services could be interesting for them. They participated in the workshops organized with Syntens to explore what a product-service combination could look like for their company in the context of waste collection in offices. At that time, they did not have any product related to offices, and they had identified it as an interesting market for the company. The assignment for the students was to explore what the product-service combination could consist of and how Bammens could deliver both products and services. Bammens is further developing the concept. Bammens needed some time to 'get used to the idea' of also developing services, which was a result of designing by involving users. These user insights made Bammens re-evaluate their business and this took time.

Difrax involved users in the design process before and participated in the Pressure Cooker to learn new ways to do so. At that time (2009) they only used a customer panel. Difrax participated in different projects Muzus organised with students from TU Delft. The past years, Difrax has gained confidence in developing products for markets where they have big competitors (for example a steriliser for baby bottles and their breast pump competing with Philips Avent and Medela).

Bammens and Difrax gradually have taken steps to increase user involvement and shifted the focus and starting point of new projects. The three companies prove that in a couple of years and doing many trials, a company can become more user-centered, changing its mindset and culture (going through different levels as discussed earlier with the model of Sanders, 2009).

In the course of this research project, several of the SMEs filed for bankruptcy. At the time of the Pressure Cooker, they were already struggling to continue the company. BAT continental is a company in the building industry and this industry was hit hard during the economic crisis. The Pressure Cooker project was not going to prevent this from happening. Premaxx was also experiencing a rough period at the time of the Pressure Cooker. They are a very small SME (only 4 employees) and they wanted to explore the opportunities of a stronger tie with their customers as they experienced a lack of customer familiarity with their products.

8.3.3 — Differences between B2B and B2C SMEs

UCD can take place in both B2C and B2B contexts by involving both clients and end users. Getting to know the users/clients and involving them in product innovation results in more than just new products, as discussed in Chapter 4. The many examples in this thesis are from both B2B and B2C companies. B2B SMEs have the challenge of addressing other stakeholders and clients than those they are already familiar with. B2C SMEs experience challenges in approaching their users and recognizing other kinds of users valuable for their company.

SMEs tend to have close relations with their clients and suppliers but need support to make use of this working relation. UCD can aid SMEs and their suppliers to move from "push" strategies for product innovation towards "pull" strategies (Kotzab and Otto, 2004). Involving users and clients is not only asking them how many products they will buy from you. It is, instead, about developing and strengthening relations with clients and users by asking them what they think of the products and what they would like to have. By thinking together about product innovation, clients become partners in product innovation. SMEs consider UCD as a means to change the relations with their clients. Towards thinking along about product innovation instead of "you ask we deliver". In the case of Jansen Medicars, WeLL Design supported Jansen Medicars to develop the relationship by documenting the insights as means to communicate the results to the stakeholders. At Jansen Medicars, engineers as employed, thus the results they produce to communicate to the stakeholders are rather "finished". Because of this, stakeholders feel like they cannot give any feedback anymore. WeLL Design contributed by providing sketches, which enable stakeholders to give feedback. The case of Scala provides another example of how relations are changed through the use of UCD. For Scala involving users has become relatively easy. They can structurally make use of input of their users to develop new products, and actually co-design the content as well as the media around the magazine with its users. The insights gathered with UCD can be used to create support within the organization for an idea as it is validated with users. The entrepreneur of Verheul explained: *"We had an idea within the organization, but not everyone supported the idea. I really liked the idea but my business partner was a little sceptical about it. I was confident it would prove to be useful so we tested my idea during our case. My partner joined the creative session and by seeing how users think about it he got convinced about it as well."*

8.2.4 — Making use of user information, user involvement or co-creation

As presented in Chapter 4, there are different degrees to which one can apply UCD for product innovation. This can range from desk research to active participation of users in the design process. Often, information on users is used and actual involvement of users is limited. In the context of this thesis, user insights were not only gathered by commonly used methods like interviews, observations. I explored more 'participative and design-led' methods, giving users an active role in the design process. Design probes were used to sensitise users for the moment of contact with the UCD expert and the SME.

During these contacts, generative techniques or a design game were used to share insights and prototype new products as a way to involve users.
There is a tendency in design research literature to aim for co-creation with users (Prahalad and Ramaswamy, 2004) or participatory design (Bødker and Iversen, 2002). Co-creation with users does fit the natural way of work for SMEs but is not necessarily the sole opportunity for UCD in SMEs. Some SMEs already organised "customer panels" where concept sketches are presented and discussed with the users.

For many SMEs, involving users is already a large step to take. The SMEs recognized the value of design probes, generative techniques and design games but are hesitant to use these in their own practice as they lack the skills to do so. This was one of the aims of this project to explore how SMEs can be supported in either gaining the skills or making use of someone that has the skills.

8.4 — Discussion of the research approach

This section evaluates the research approach used for this thesis and its possible limitations.

8.4.1 — Choice of approach and methods

This thesis has a pragmatic approach using case study research and Research through Design. In the context of this discussed research project, SMEs, UCD experts and toolkit designers were my users, and I investigate how I could design an approach for them by involving them in applying UCD methods. This is a similar approach to what Roschuni et al. (2013) refer to as double ethnography: "To build researcher–client relationships, understand both user and client needs, and overcome institutional inertia, this paper proposes viewing user research clients as users of user research outcomes. This reframing of the crafting of communication across boundaries as a parallel internal human-centered design process we refer to as a double ethnography." As Roschuni et a. I have made use of the methods I look into as means for research.

Initially I focused on the suitability of UCD tools and methods on a practical level. Later on this focus shifted towards a more abstract level. By investigating what aspects, barriers and enablers influence the process for applying UCD in SMEs and later on to patterns assembled in an approach to support SMEs in applying UCD. Because of this I experienced difficulties in formulating and constructing the project theoretically, and turned back to literature in Chapter 6. Figure 8.2 shows some of the developed models.

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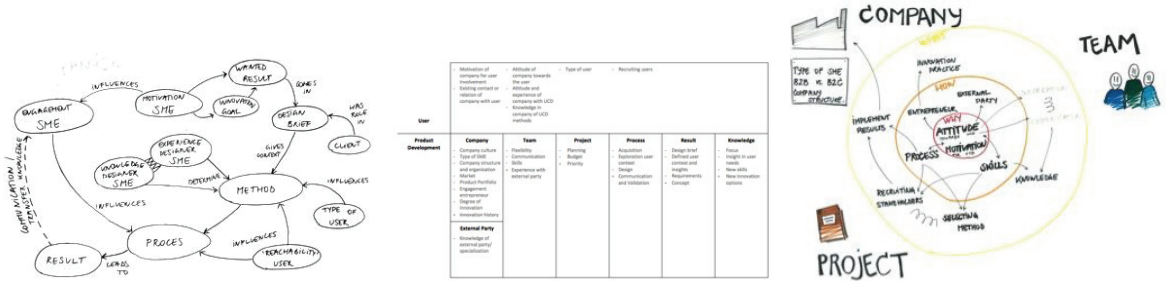

Figure 8.2: An overview of the diversity of models developed to unravel the factors and patterns for the theoretical framing.

To frame the different studies, I made use of the overview of meta-levels in design research developed by Stappers (2009). These overviews became a red wire in my thesis clarifying at what abstraction level I operate for the related study (See Figure 8.3). Moving between the levels of abstraction has changed from being a difficulty to one of the strengths of this research project. It provided knowledge on different levels and enabled me to link insights gathered across the levels.

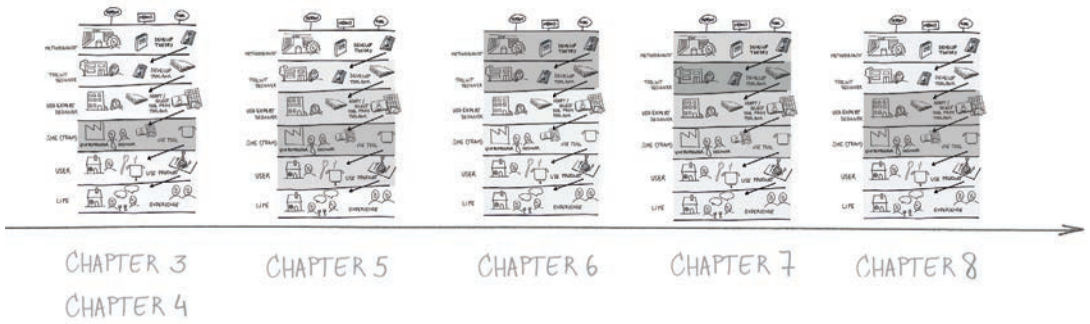

Figure 8.3: Switching between different meta-levels in design research throughout this thesis.

This thesis is built on alterations between gaining knowledge from practice and from literature. Figure 8.4 visualizes these alterations for the reader. These alterations reinforce one another. Observations from practice are framed using literature, and theoretical models and processes are explored in practice.

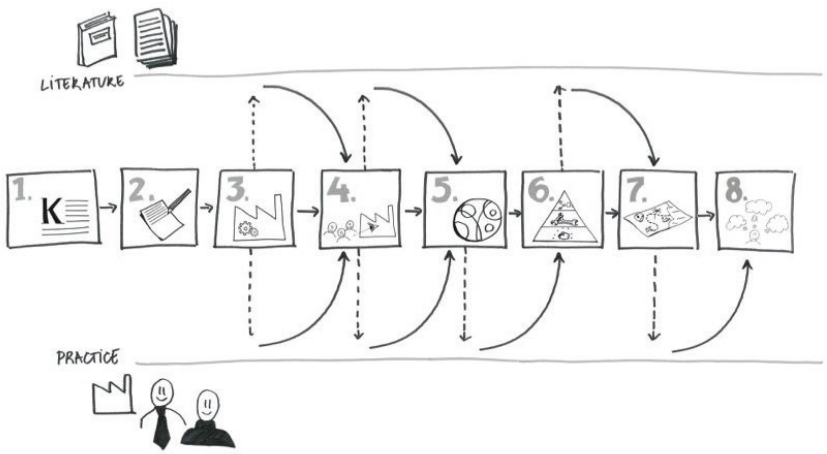

Figure 8.4: Switching between insights gathered from practice and from literature.

Case studies:

One of the main characteristics of doing case studies, as done in this thesis, is that there are no constrained methods for data collection and analysis. By data gathering in a holistic case study, a researcher needs to find a balance between the developed research method and the real life situation. It is important to keep the aim of the research in mind. At the same time, a researcher should deal pragmatically with the opportunities that the case provides in order to reach the goal. The holistic approach is necessary to understand the complexity of applying UCD in SMEs. The phenomenon under study is new and has many different perspectives. The explorative nature of this research project allowed me to take the complexity and elements of practice into account. My aim was to get insight into what plays a role and the kind of role instead of isolating and testing one or two variables. The involvement of a variety of companies, receivers of information and design practices in the studies make it possible to explore the phenomenon in vivo and provides insight in a variety of contexts. For this research project, this method was the best approach for the research questions posed.

Research through design:

In the study discussed in Chapter 7, where the two toolkits were designed, Research through Design was used as approach. Generally, in Research through Design, the person that is doing the design activities is the same person that is taking care of the research activities. In this regard the researcher is both the designer and the researcher within a project. The researcher takes measures to be able to reflect on the design decisions taken (it is precisely in the design decisions that much of the knowledge is gathered). Here a different challenge pops up: design decisions are primarily tacit knowledge and are hard to explicify. Therefore I have taken measures to bring the underlying decisions

At the start of and during this research project I have explored the option of using an action research approach. The fundamental idea of this approach is that the social world can only be understood by trying to change it (Brydon-Miller et al., 2003). My take is that action research generally starts from an understanding of a situation and checks through predetermined actions whether the understanding is correct, evaluates the actions and changes the understanding for another cycle of actions. Setting up an action research project makes use of a distinct set of steps. At the start of this research project there were only very few SMES applying UCD and research on the phenomenon was absent. For this reason, this research project started without hypothesis and was not theory driven. This absence of starting point made me experienced difficulties in creating the understanding to start from and I was not able to determine what actions needed to be taken. Research through Design enabled me to decide on the actions during the course of the projects. Now that more SMEs are applying UCD, and having a better understanding of the context, I would opt for action research.

8.4.2 — Limitations of the research approach:

I identified the following limitations of the taken research approach:

Framing the explorative studies in a theoretical context

The explorative nature of the studies and the amount of collected data was difficult to analyse and frame in a theoretical construct. This journey has taken considerable time and thoughts. I struggled determining what aspects to select and the abstraction level of the collected data. I moved from thinking in terms of elements to patterns and challenges. In a broad exploration of this research project it is difficult to find a balance between the different abstraction levels and determining the level of detail of data. Lesson learned is to frame the research project better by a literature study at the beginning of the project, particularly by choosing the disciplines I would (not) study in depth. Due to the explorative nature of the research project, the conclusions were not yet validated by for example an experimental study. This was not the aim of the study, but is worthwhile considering for future research projects.

Dealing with many different organizations

The interviews and workshops of chapter 3 and 4, the cases of chapter 5 and the design of the two toolkits involved a large amount and diversity of companies and organizations. Over 20 SMEs, more than 30 design agencies, more than 8 UCD experts, two governmental organizations and many other non-commercial organizations have been involved in these studies. Dealing with all of these viewpoints was a challenge. Even though many different organizations have been included in this research project, the focus was primarily on the situation in the Netherlands. To which extent the results are also applicable in other countries remains un-investigated.

Sample of SMEs:

Looking back at the variety of SMEs that were involved I realize I have been able to include many different kinds of SMEs, both B2B and B2C. Still, in the new research project I am currently undertaking, I explore how SMEs in networks create Product-Service Systems. The SMEs I work with operate in the textile industry, work mainly with suppliers and are very B2B-oriented. These supply chains bring up different questions and I identified other kinds of challenges in their situation.

Being closely involved to research and design activities taking place

In the Pressure Cooker project the research activities took place collaboratively with other researchers, by this collaboration, my influence on the research activities could be limited. In the study where the two toolkits were designed, I acted as a supplier of information, as moderator and as researcher. These different roles limited my ability to keep a distance, being the only researcher present and doing the analysis. This may have caused limited robustness.

8.5 — Recommendations for further research

This research project has explored the phenomenon of UCD in the context of SMEs and has revealed different aspects. There are however many aspects, which could be given further consideration. Below I list several topics that merit further investigation.

Explore how UCD can be applied in other SMEs without manufacturing or internal designers

The focus of this research project was on manufacturing SMEs. Most of the cases were about developing new products. This focus was chosen to frame the project and its context. There is a wide variety of companies classified as SMEs and not all them deal with this type of innovation. Still, the results of this thesis can be applied to other SMEs. One of the cases of the Co-Design Pressure Cooker was with Scala Publishing. Even though they "manufacture" magazines, they do not see themselves as part of the manufacturing industry. They understood the benefit of taking a user-centered approach in developing their magazines and the contact with their readers. There have been cases with local municipalities, care institutes, insurance companies etc.

Focus on the organizational issues regarding implementing user insights in the wider company (beyond product innovation)

As designers, and user researchers we usually focus on gathering user insights and communicate these insights either by a designed concept, a presentation or a report to company. Many of the internal stakeholders were present at the user contacts or at the presentation of the results. They recognized the potential and opportunities offered by the insights. Only in a later stage of this research project I realised the challenge presented to SMEs. Many of the SMEs in the cases were unable to take up these user insights and make use of them in their organization. It is worthwhile further investigating how the SME as an organization can make use of the user insights in the wider company.

User insights not only lead to products but services as well

Many of the cases started off with the goal to develop a new product but ended up in a combination of a product with a service. These services present challenges for the SME as they consider themselves as "manufacturing" companies. They recognize the value of the services but struggle with the different business models related to Product-Service combinations.

Collaboration with other SMEs for UCD in product innovation

The results gathered in the case of Jansen Medicars are interesting for other companies working in the same context. The medical carts of Jansen are only one aspect of a future operating room. These other companies can be either suppliers of the SME, or fellow SMEs operating in the same context without being a competitor. There are many opportunities for SMEs to work with others to address a context. Challenges can be tackled together. SMEs working together in these so-called open innovation projects looks promising and deserves further investigation. I am currently investigating such collaboration in the CRISP project: Smart Textile Services. In the context of smart textiles, different kinds of SMEs jointly design new Product Service Systems.

Using design skills and mindset not only to design products and services. In the proposed process, the UCD expert with a design background is not only a combination of a user researcher and a designer; it is also a guide, a facilitator and a teacher. Research is therefore required on how designers can tackle these new roles. For example: supporting an organization in changing, learning how to coach organizations, how to work side by side with business people, how to design internal organizational processes, business models and learn to make use of their communication skills. Where can designers contribute in these other fields and how?

8.6— Recommendations for practice:

Based on the conclusions of this thesis I have formulated several recommendations for the different audiences in practice as distinguished in the beginning of this thesis: the SMEs, UCD experts/design agencies that support SMEs, governments and students of Industrial Design Engineering. These recommendations are based on those presented in Chapter 7 and are discussed based on the three challenges.

General recommendations

For SMEs

— Collaborate! With an expert, go through the process together, take responsibilities, be active, do not demand and get served, rather make use of the opportunity to learn. Collaborate with fellow SMEs. There are other companies (suppliers or SMEs operating in the same context) that are not necessarily competitors but are struggling with the same subject. Split both the risk and the investment!
— Small incremental changes can be seen as steps for large radical innovation. These small incremental changes may feel like radical changes you.
— Do not stay behind your desk. Go to your clients, to your users, to retailers, and talk with them! Ask them all the questions you have.

For UCD experts and design agencies

— Invest in a long-term relation with SME clients
— SMEs are different clients in comparison to large companies. Treat them as such.

Opening up towards users

For SMEs

— Understand what UCD and involving users is and what it means for product innovation and our company
— See clients not only as the ones buying your products, but see them also as a source of information to do things better.
— Be open for new insights that give new challenges, they can be worthwhile considering, for discovery.
— Feel free to try out new things, and maybe fail, and try again in iterations, you will learn more each time.

For UCD experts and design agencies

— Enable SMEs to become curious, willing and gain empathy for users.
— Show the richness and inspiration of qualitative user research methods through examples

Learning to apply UCD tools and methods

For SMEs

— Be open to learning new things
— Start with close and familiar users and gradually move further.
— Learning new methods takes time and investment

For UCD experts and design agencies

— Pay attention to initial ideas and prior knowledge
— Inform SMEs about UCD, when to use UCD, how to use UCD and for which purposes.
— Show how the UCD techniques work so they can apply these techniques themselves in the future to a certain degree
— Be transparent about your approach and your choices
— Provide insight how UCD relates to tools and methods they already know.
— Facilitate for different levels of experience with UCD
— Let SMEs experience UCD by making use of UCD in ongoing projects

Applying UCD for product innovation

For SMEs

— Start small; make use of existing client contacts for improving current products, service and strategy. Use these insights to be inspired to work for long term.
— Take time to sit down and think about the actual problem or situation you consider working on.
— Be critical of your current way of work
— Share knowledge with other members of the project team, they are there to help you. Invite other employees of your company to join you, in many cases they can benefit from the results as well.
— Give the freedom to the designers to work on less focused topics. Dare to take the step to explore new markets.
— Share your experiences and knowledge with external designers and UCD experts, the only expert on yourself is you.
— Be flexible, act flexible.
— Make use of multiple encounters with your different stakeholders and invest in maintaining them for the future. Make them dedicated to your company.
— Take time to reflect upon the insights, and upon what it means for your company

For UCD experts and design agencies

— Set and question the focus of the project and the envisioned result
— Maintain a flexible approach and schedule
— Analysing takes time and cannot be left out (no need for transcripts, and joint analysis with the SME to cut down time, but analysis is valuable part of process)
— Give SMEs an active role during the project, give them responsibilities
— Allow SMEs to monitor and direct the project, for example by building in checkpoints and providing intermediate results
— Enthuse and engage employees through actual contact with users
— Involve the entrepreneur of the SME, making sure he enables employees to make use of UCD.
— Engaging other stakeholders within the SME such as marketing people, service staff, etc. to increase support within the SME
— Make use of the strengths of SMEs: different communication, short communication lines, good network, iterative nature, can adjust and change easily, etc.
— Show how user insights can be used for strategic purposes.
— No need for formal reports, communicating user insights is based on the SME having actual contact with users and face-to-face meetings.

8.6.2 — Governmental agencies and governments

Throughout this thesis, different projects could only take place with the support of governmental agencies and the government. The different student projects I mentored for SMEs made use of so called “innovatie vouchers”. These vouchers are developed by the Dutch government and are worth 2500 Euro’s (all paid for by the government) or 7500 Euro’s (of which the government pays 5000 Euro). SMEs can use these vouchers to collaborate with non-commercial organizations for innovation purposes. Each year there are a certain amount of vouchers available, SMEs only need to apply for a voucher, and can decide on what to use it for later on. Since 2011, these vouchers have been extended to commercial organizations. This decision enables SMEs to approach design agencies and UCD experts for support. SMES make good use of these vouchers, in many cases all available vouchers are handed out on the day itself. They are only handed out every half a year. For SMEs it remains however unclear how and where they can use these vouchers. More guidance is needed to support SMEs in the possibilities and the use of these vouchers.

Syntens and Flanders InShape are non-commercial organizations that aim at supporting SMEs. The Pressure Cooker took place with the support of Syntens. The design of one of the toolkits took place with the support of Flanders InShape. Syntens is going to major changes at the moment as they will become part of the Dutch Chamber of Commerce. Flanders InShape is experiencing difficulties in finding a balance between providing information and supporting SMEs without becoming competitors of UCD experts and design agencies. These organizations remain oriented at informing SMEs of other ways to innovate or at “passing on” SMEs towards other parties. SMEs need more support, and preferably over a long time period so they are able to adjust to the changes. The creative industry and knowledge institutions can take a role in this respect. They need to become more accessible, make use of example projects, invest in SMEs and develop relations with SMEs for a longer period of time. This type of collaboration amongst these three parties: knowledge institutes, creative industry and SMEs (in this case primarily manufacturing SMEs), is already acknowledged as one of the future directions for the Dutch Creative industry (Dutch creative Council, 2013).

In New Zealand, the local government launched an initiative (Better by Design) to support SMEs over a longer period of time to make use of design capabilities and use design as a means for their local industry to differentiate themselves. This project aims at informing and supporting SMEs about design and how they can apply it in their current product innovation practice.

8.7 — Implications for education

In Chapter 1, four audiences for this thesis were identified. One of these audiences is students from the faculty of Industrial Design Engineering (IDE) in Delft. The implications of this research project for these students cover different subjects.

This thesis provides insight on product innovation in SMEs, a context often overlooked in the current curriculum. Many examples used at lectures come from large companies, the 'usual suspects' that we think of regarding product innovation (Philips, Apple, 3M, Proctor and Gamble etc.). There is a high probability that our students start working for companies that still experience difficulties in product innovation and UCD. We should provide our students examples of such a difficulties and how to address them including examples from SMEs.

In large companies, there are dedicated product designers working in design departments who work on product innovation in teams. In SMEs, there is sometimes no in-house designer, and if there is, it is often only one. The dynamics of designing are different from what is thought at the faculty where most of the design projects take place in teams of students, based on the collaborative nature of product innovation in design departments. In SMEs, design is collaborative, but with the entrepreneur, a marketing manager and/or a sales representative. Designers are increasingly involved in different contexts (partly due to the big boom of Design Thinking). It is advisable to increase collaboration with other faculties like Architecture, Engineering, Policy Analysis, and Management to broaden the perspective of students and prepare better for the industry.

One of the Master programs is aimed at 'Design for Interaction' (DfI). This program focuses extensively on designing products based on user insights and with interaction as primary lead. Some of the main challenges identified in this research project are gathering user insights, adoption by the organization and developing products based on these insights and their strategic importance to the organization. DfI students at the moment lack courses on how to 'manage' user insights for wider application in the organizations they work for. As an example of this shift in expertise, two of my colleagues, Erik Roscam Abbing (with a specialization in brand driven innovation and strategic product design) started collaborating with Froukje Sleeswijk Visser (with a specialization in UCD and service design). Erik recognized the importance of involving users as a basis for strategic considerations; Froukje identified the need to put user insights in a wider perspective of the organization. Each has its' specialization, but makes use of the capabilities of the other.

8.8 — Final Remarks

8.8.1 — Developing workshops as means to support SMES to learn to involve users for product innovation

One of the key formats that proved successful in the conducted studies was the use of workshops where close collaboration took place between a UCD expert and the SME. Syntens and Flanders InShape organize workshops on a regular basis to convince SMEs to involve users in their product innovation. These workshops focus on handing over information by means of small exercises. They have a large "sending" character. Therefore I wanted to explore how workshops for SMEs can become more collaborative while showing how to apply UCD in an on-going project.
In June 2012 I was approached by Syntens to collaborate on organizing a series of workshops for SMEs. We took the challenge to develop a different format to support SMES on UCD. The faculty of Industrial Design Engineering has many educational projects where students work in teams for companies. We decided to base the workshops on one of these projects in a way that both the SMEs and the students participated in the workshops and the SME saw how the learnings were immediately applied in the student project. As preparation, we planned workshops on key moments of the design process to provide information on how users could be involved at that stage and to support both the students and the SME in dealing with the user insights.

Figure 8.5: A visual impression of the series of workshops. There was a close collaboration between UCD experts, students and SMEs.

The workshops (see Figure 8.5 for a visual impression) provided an opportunity to make use of the gathered insights and examples. Instead of using the workshops for "sending" information, the workshops were aimed at supporting the collaboration between the students and the SME, focusing on creating shared understanding on the subject of involving users, and supporting their progress in the project. Main requirements in the design of the workshops were:

- entrepreneur needs to be actively engaged,
- different employees of the SME are participating to ensure broader support within the organization,
- focus on creating awareness for wider application of the results,
- create accessible information (a custom-made reader),
- facilitating collaboration,
- preparatory exercises and presentations that enable reflection on the current practice and
- the combination with a student project to have the SME experience the information in a project and see immediate results.

The goal of the workshop series was to try out the format and "prototype" a new way of supporting SMEs. Two SMEs participated in the series of workshops (Tilcentrum and Bammens) and became more aware UCD and learned how they can apply UCD in their practice. Due to the collaborative nature of the workshops, the amount of students and employees involved of the SMEs, the format does not lend itself to large groups of SMEs.

The SMEs were very pleased by the results. Tilcentrum explored a totally new market. The designed solution is a combination of a product and a service. Something they are unfamiliar with. Thanks to the step by process they feel confident they can tackle this challenge. Bammens decided to explore the opportunities offered by the product-service combinations (as already signalled in the Co-Design Pressure Cooker) in a new application context (garbage collection in office buildings). Both SMEs indicated they were interested in doing the workshops again. They liked the format and would recommend it to fellow SMEs.

8.8.2 — Positioning this research project in current trends:

Within this thesis, involving users within SMEs was the primary focus, in doing so, and being supported by designers in this process; SMEs have also seen how designers approach product innovation and have become aware of the opportunities this way of working presents. Also in my attempts to support SMEs I have made use of designerly ways, materials and tools. The process has become very collaborative, making use of iterations of involving users and prototyping with the internal process of the SMEs and the wider impact of the user insights in mind. How SMEs can make use of not only UCD but designers in general and the different perspective it provides on their business resonates with the current boom of "Design Thinking". Being widely discussed in both management and design literature, Martin (2009) argues that there is, at the moment, a shift within large companies towards Design Thinking as an approach for product innovation, which differs from the analytical business thinking of the last few decades. Companies see Design Thinking as an opportunity to innovate better and change their organization to create value for their customers. In order to create value for customers, organizations often employ User-Centered Design (UCD) methods. These UCD methods are not only considered a central part in Design Thinking. They also provides Service Designers means to develop services centered around the experiences of users. Service design has three outcomes: the creation of a service that can be brought to market, that people fall in love with, and which makes good business sense for the provider (White, 2008). Service design is fundamentally a multidisciplinary approach dealing with interactions between people and simultaneously needs to address consumer desirability, technical feasibility and commercial viability. It is a process that demands close collaboration with the client, placing people at the heart of the process and where prototyping is crucial to success. In this respect, the approach for SMEs to apply UCD does not differ much: it puts the user central and makes use of technology to create a commercial viable solution for the user. The similarity with Service Design comes back in the challenges the SMEs face in dealing with the obtained results. In the previously described example of Bammens and Verheul Trappen, both companies were confronted with a product-service combination as a solution for the design brief. When starting from a user perspective this is often the case.

What is primarily different between applying UCD in manufacturing SMEs and Service Design is the focus of Service Design on the entire customer journey and repeated use of a product or service. Services require organizational principles, structures and processes new to the product manufacturer. Not only are new capabilities, metrics and incentives needed, but also the emphasis on the business model changes from transaction- to relationship-based (Oliva and Kallenberg, 2003). In this respect, applying UCD tools and methods might be a way to take a step in the transition of product oriented manufacturing SMEs to service providing companies.

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Summary

UCD4SME

Small to Medium-sized Enterprises involving their users and clients for product innovation

An increasing number of Small to Medium-sized Enterprises (SMEs) starts to realize the opportunities offered by User-centred Design (UCD) (Wakeford, 2004). The issue is that our understanding of UCD either comes from large companies or is developed in an academic setting (Repo et al., 2007; Sleeswijk Visser, 2009), without taking SMEs into account. Research that has been done on how UCD can be applied in the context of SMEs is scarce (Moultrie et al., 2005; Repo et al., 2007; Asboe, 2008; Pozzey, 2012).

SMEs are defined as enterprises with up to 250 employees (European Commission, 2005) often operating in niche markets (Nooteboom, 1994; Cawood, 1997). This covers a wide variety and large number of companies, responsible for nearly two thirds of all jobs in the EU. Research on SMEs and product innovation in general mainly stems from the business and management literature. It looks at aspects like the characteristics of SMEs (Nooteboom, 1994; De Jong & Vermeulen, 2006), their weaknesses (Acs and Audretsch, 1990) and what makes SMEs successful (Laforet & Tann, 2006).

This research project demonstrates that in order to make use of UCD in the context of SMEs, the strengths of SMEs play an important role (such as project-based development, involvement of different internal stakeholders and existing relations) by adding to the existing way of work and making SMEs aware of the opportunities that users and clients present.

The outcome of my research is an approach that aims to support SMEs in applying UCD for product innovation. This approach is a combination of a design process commonly used by SMEs (based on impulses, work with great

flexibility and iterations), and three challenges that are faced by SMEs when dealing with UCD (becoming aware of opportunities as they present themselves, learning to apply UCD methods and using UCD in the daily practice), the elements that enable SMEs to make use of UCD within their practice (an engaged entrepreneur, being supported by a UCD expert and how to use the gathered user insights within the organization) and has varying degrees of learning experiences. The resulting knowledge can be employed to inform and inspire SMES and UCD experts in applying UCD in SMEs in order to design new products that better fit the needs and desires of users and clients.

Research aims:

This project's knowledge aim was to expand existing theories on experience-based learning and UCD, to adapt them to the context of SMEs.
To address this aim, the following research questions were used:

- What characterizes the practices of SMEs as compared to large companies in relation to a user-centered design approach?
- What UCD tools and methods do SMEs currently use in product innovation activities?
- What barriers and opportunities do SMEs encounter when they use UCD tools and methods?
- What UCD tools and methods are suitable for SMEs?
- How can SMEs utilize their strengths to apply UCD for product innovation in their practice?

The aim for practice is to enable SMEs to apply UCD in their product innovation practice.
This research project focuses on SMEs that manufacture products either for other businesses (B2B) or for end users (B2C).

Research structure:

Chapter 1 introduces the research project and gives an overview of the thesis.
Chapter 2 discusses the research design.
The research questions are investigated in three different research phases (Figure 1). The first phase investigates the current state of UCD in SMEs. Using cases, research phase two explores how design-led UCD methods can be applied by SMEs. The third phase investigates how SMEs can be supported in utilizing their strengths in applying UCD.
For each of the three research phases, I elaborate on the actions that have taken place.

Results

The first phase (discussed in Chapter 3 and 4) explores the current state of UCD in manufacturing SMEs. One outcome of this exploration is a different understanding of SMEs in the context of UCD. Existing literature often overlooked the entrepreneurship and specific strengths of SMEs, their flexibility, their short communication lines, their flat organization structure, and the engaged entrepreneur.

This phase concludes with a survey of four design-led UCD methods (probes, generative techniques, contextual design, and design games) that can be used by SMEs and could bring to surface the more tacit and latent needs of users they are looking for.

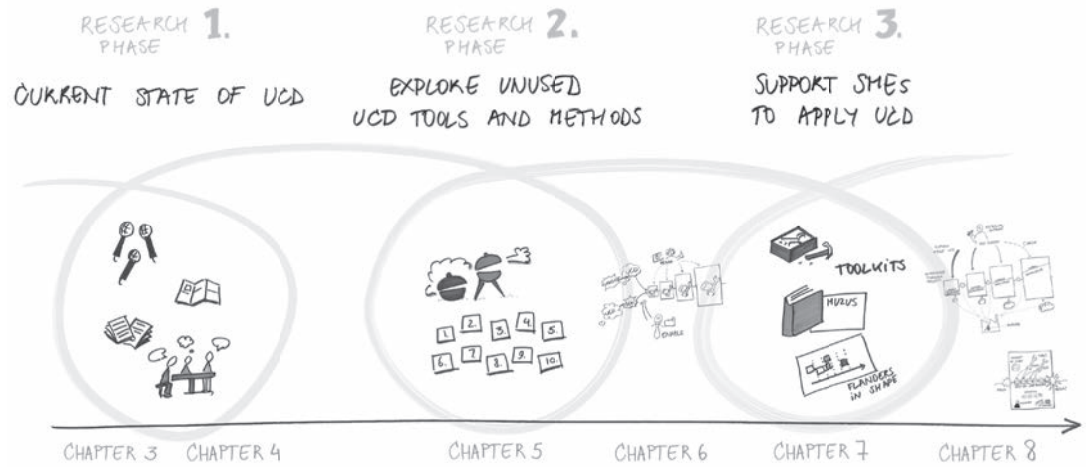

Figure 1: Research overview: steps taken within the research phases

The second phase (chapter 5) investigates in ten cases the use of these four design-led UCD methods. At first sight, time and budget were expected to be the main concerns, as they are the main arguments of designers and entrepreneurs of SMEs not to apply UCD methods. The results showed that the key concern for applying UCD is often neither time nor budget. Instead, when an entrepreneur is committed and enables employees to devote effort to a project, much is possible (e.g. reappointing budgets). Another conclusion is that although each case, started with a clear design brief to develop a new product, the end results included much more, such as new insights on aspects like marketing, services, visions for the future, and strategic considerations for the company. On the one hand this is a result of the fact that UCD not only investigates the use of a product but also its context and the user itself in a broad perspective. On the other hand the characteristics of SMEs, involving different kinds of stakeholders of the company, allow them to recognize additional opportunities that can be acted upon.

Although the UCD methods were considered suitable within the existing product innovation process, SMEs still found them difficult to implement. The real challenge was becoming aware of how users can be involved in the design process and how to adopt and apply the UCD methods in their own context.

In Chapter 6, I return to literature to reframe my research project based on the previously described results. Well-established models from literature were used as a basis to formulate an approach for SMEs to make use of UCD.

This approach covers how the SME as an organization could apply UCD for product innovation and how the individual employee of the SME learns to use UCD.

The third research phase (Chapter 7). Just describing an approach for adoption will not enable SMEs to effectively make use of UCD in their practice. This is why the third research phase explores how the approach for UCD in SMEs can be operationalized and describes two toolkits that were designed to support SMEs in UCD. One toolkit was designed to support UCD experts in applying UCD for SMEs; the other was developed to support SMEs to apply UCD themselves. The design decisions on the structure and content of the two toolkits provided knowledge on how to support SMEs on a concrete and applicable level. The toolkits consist of a structured series of steps that offer people a learning process informing them about UCD and letting them experiencing it.

Conclusion:

At the moment, SMEs primarily use quantitative market research methods or more common and generally well-understood UCD methods such as interviewing, observation, prototyping and usability testing. Involving users and clients requires more than just asking them how many products they will buy from you or how the current product can be improved. 'Newer' UCD methods (for example, in the area of participatory design) are underutilized. SMEs rarely use methods such as probes, storyboards and generative techniques. These methods of early user participation provide SMEs with new opportunities for markets and products. These new opportunities, because they are based on early user insights, limit risk for SMEs and enable them to move from users to participants and from clients to partners. Design-led methods also help SMEs to anticipate and respond to changes in society. By thinking together about product innovation, clients become partners in product innovation enabling SMEs to move closer to the needs of their clients and get continuous feedback. Still, many SMEs have difficulties to assess the credibility of these methods.

During the cases, design-led UCD methods such as contextual design were easily applied by SMEs. Many of these methods are suitable for SMEs but some require more skills and experience. The key issue is that SMEs need to be supported in implementing these UCD methods in their daily practice. Involving users in SMEs is a learning process. This learning process is an on-going process for the organization changing its mind-set and the individual employees learning the necessary UCD skills by experiencing it during projects. Effective use of UCD requires making SMEs aware of opportunities users/clients present and adding UCD to the current way of work by making use of the SMEs' strengths (e.g. flexibility, iterative approach, project based development, involvement of different internal stakeholders, existing relations). The entrepreneur is a key enabler in this process. Once the entrepreneur is engaged, there is a great deal of flexibility, budgets can be re-allocated and employees can dedicate time to involve users.

In general, designers in SMEs use and adjust UCD methods to suit their own contexts and the available means. Making use of user information in the design process and immersion in this information is a necessary part of UCD. Immersion enables to grasp the richness of the collected data. The main difference between SMEs and large firms is that in SMEs it is easier to involve different internal stakeholders at actual moments of contact and immersion in user data. Throughout this research project, marketing managers, sales representatives and the entrepreneur were often present. With the flat hierarchical nature in SMEs and the informal division of functions and responsibilities, low-hanging fruit for the SME can easily be identified.

The aim of this research project was to better understand how SMEs could be supported to involve users for product innovation purposes. This understanding led to the design of an approach to adopt UCD in SMEs based on insights from practice and theory. This formed the basis for the design of two toolkits. The toolkits make use of the SMEs' strengths and build on their existing product innovation process. They provide practical step-by-step information for SMEs to address the three main challenges: getting a user-centered mindset, learning the skills to apply UCD tools and methods and applying UCD in their daily practice.

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Samenvatting

UCD voor MKB

Productinnovatie door betrokkenheid van gebruikers en klanten van het midden- en kleinbedrijf

Een toenemend aantal kleine tot middelgrote ondernemingen (MKB-ers) begint te beseffen welke kansen UCD biedt (Wakeford, 2004). Het probleem is echter dat kennis over UCD van grote bedrijven komt of in een academische setting ontwikkeld werd (Repo et al., 2007;. Sleeswijk Visser, 2009) zonder rekening te houden met de context van het MKB. Er zijn slechts enkele studies bekend die onderzoek naar de toepassing van UCD in het MKB doen (Moultrie et al., 2005; Repo et al., 2007; Asboe, 2008; Pozzey, 2012).

MKB-ers zijn ondernemingen met maximaal 250 werknemers (Europese Commissie, 2005) die vaak in nichemarkten opereren (Nooteboom, 1994; Cawood, 1997). Zij omvatten een groot aantal diverse bedrijven die bijna tweederde van alle banen in de Europese Unie aanbieden.

Onderzoek naar het MKB en naar productinnovatie komt hoofdzakelijk uit de business- en managementliteratuur en kijkt naar verschillende aspecten zoals de kenmerken van het MKB (Nooteboom, 1994; De Jong & Vermeulen, 2006), de sterke punten (Acs en Audretsch, 1990) en wat het MKB succesvol maakt (Laforet & Tann, 2006).

Dit onderzoek toont aan dat effectief gebruik van UCD in de context van MKB-ers ,vereist gebruik maken van de sterktes van het MKB (bijvoorbeeld projectmatige ontwikkeling, betrokkenheid van verschillende interne belanghebbenden en bestaande relaties), door toe te voegen aan de huidige manier van werken en hen bewust te maken van de mogelijkheden die gebruikers/klanten bieden.

Het resultaat van mijn onderzoek is een aanpak om het MKB te ondersteunen in het toepassen van UCD voor productinnovatie. Deze aanpak is een combinatie van een ontwerpproces dat het MKB veel gebruikt (gebaseerd op impulsen, werken met veel flexibiliteit en iteraties), samen met drie uitdagingen waar MKB-ers mee te maken hebben bij UCD (bewust worden van kansen die zich aandienen, leren toepassen van UCD methoden, en het gebruiken van UCD in de dagelijkse praktijk) en met elementen die het MKB kan gebruiken in UCD (een geëngageerde ondernemer, de ondersteuning door een UCD-expert, hoe de gebruikersinzichten in de organisatie te gebruiken). De aanpak kent verschillende leerniveaus. MKB-ers en UCD-experten kunnen zich laten informeren en inspireren door de verworven kennis uit dit onderzoek en door deze aanpak voor gebruik van UCD in het MKB om nieuwe producten te ontwikkelen die beter aansluiten op de wensen en noden van gebruikers en klanten.

Onderzoeksdoelen

Kennisdoel van dit project was de bestaande theorieën over ervaringsgericht leren en over UCD uit te breiden en om ze toe te passen in de context van het MKB. De volgende onderzoeksvragen werden gebruikt om dit doel te bereiken:

- Wat kenmerkt de praktijk van UCD bij het MKB in vergelijking met de aanpak bij grote ondernemingen?
- Welke UCD-methoden gebruikt het MKB bij activiteiten voor productinnovatie?
- Welke moeilijkheden en mogelijkheden ondervinden MKB-ers wanneer ze UCD-methoden gebruiken?
- Welke UCD-methoden zijn geschikt voor het MKB?
- Hoe kan het MKB zijn sterktes aanwenden bij het gebruik van UCD voor productinnovatie?

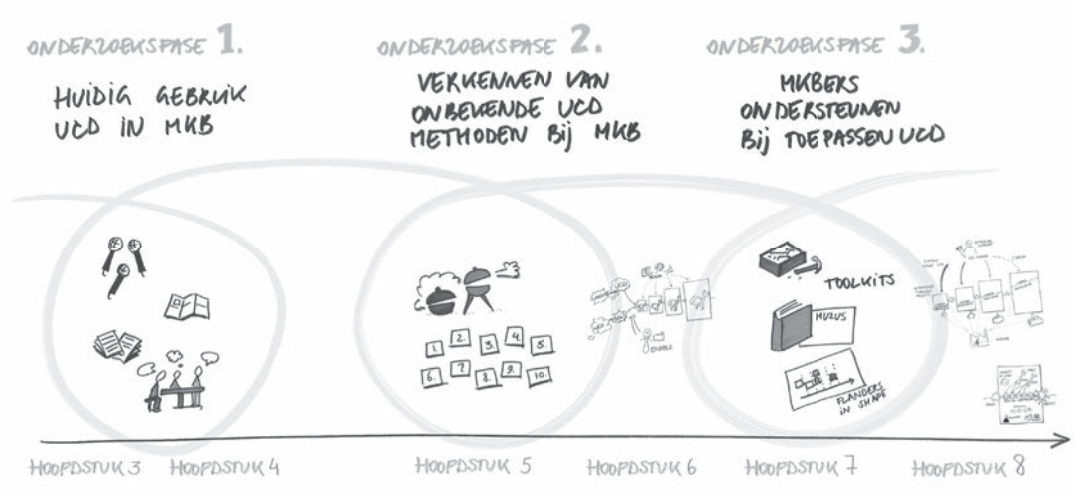
Het onderzoeksproject richt zich op kleine en middelgrote ondernemingen die producten voor anderen bedrijven (B2B) of voor eindgebruikers (B2C) vervaardigen. Het praktijkdoel van dit project is het MKB in staat te stellen gebruik te maken van UCD voor productinnovatie.

Onderzoeksstructuur

Hoofdstuk 1 leidt het onderzoeksproject in en geeft een overzicht van het proefschrift. Hoofdstuk 2 gaat in op de onderzoeksopzet.

De onderzoeksvragen van dit project werden onderzocht in drie fases. Die drie onderzoeksfasen vormen de basisstructuur in dit proefschrift en komen aan bod in hoofdstukken 3 tot en met 8. De eerste fase bespreekt het huidige gebruik van UCD binnen het MKB. De tweede fase onderzoekt via cases welke UCD-methoden geschikt zijn voor toepassingen binnen het MKB. De laatste fase verkent hoe MKB-ers ondersteund kunnen worden in het toepassen van een UCD-aanpak binnen hun productinnovatie praktijk.

Voor elk van de drie onderzoeksfasen, zal ik ingaan op de acties die hebben plaatsgevonden.



Afbeelding 1: onderzoeksopzet: stappen genomen binnen de onderzoeksfases.

Resultaten

De eerste fase (hoofdstuk 3 en 4) verkent de huidige stand van UCD in kleine en middelgrote productieondernemingen door middel van gesprekken, workshops en een vragenlijst voor MKB-ondernemers en voor ontwerpers die bij of voor het MKB werken. Eén van de resultaten van dat onderzoek is een andere perceptie van het MKB in het kader van UCD. De bestaande literatuur ziet vaak het ondernemerschap en de sterktes van het MKB zoals hun flexibiliteit, de korte communicatielijnen, de platte organisatiestructuur en de betrokken ondernemer over het hoofd.

Deze onderzoeksfase sluit af met een overzicht van vier ontwerpgerichte UCD-methoden die verder verkend zullen worden binnen projecten voor het MKB (probes, generatieve technieken, contextueel ontwerpen en design games). Immers, ontwerpers werkzaam bij of voor het MKB, gaven aan dat ze nood hebben aan methoden die de meer verborgen en latente kennis van gebruikers aan de oppervlakte kunnen krijgen.

De tweede fase (hoofdstuk 5) onderzocht het gebruik van de vier besproken UCD-methoden in tien cases met kleine en middelgrote productiebedrijven. Eén van de resultaten in deze fase is het belang van de ondernemer voor de succesvolle toepassing van UCD. Wanneer een ondernemer toegewijd is en medewerkers in staat stelt om zich in te zetten voor een project, is er veel mogelijk. Een volgende conclusie is dat het eindresultaat, door gebruik van deze vier UCD methoden, veel meer opleverde dan alleen een nieuw product, een nieuwe kans op de markt of een patent. Elke case begon met het formuleren van een duidelijke ontwerpopdracht om een nieuw product te ontwikkelen maar bracht ook nieuwe inzichten aan over marketing, nieuwe diensten, toekomstvisies en strategische overwegingen voor het bedrijf.

Dit toont aan dat UCD niet alleen het gebruik van een product onderzoekt, maar ook de context van dat gebruik en de gebruiker zelf in een breed perspectief plaatst. Die 'extra' resultaten zijn inherent aan de aard van de UCD-methoden. In het MKB zijn ook verschillende belanghebbenden binnen het bedrijf betrokken bij het ontwerpproject waardoor zij die extra kansen kunnen herkennen en benutten.

Hoewel de bestaande UCD-methoden geschikt zijn voor gebruik in het bestaande productinnovatie proces, vond het MKB ze nog steeds moeilijk toe te passen. De echte uitdaging lag in het bewust worden hoe gebruikers te betrekken bij het ontwerpproces en in het leren hoe UCD eigen te maken en in de praktijk te gebruiken.

In hoofdstuk 6, keer ik terug naar de literatuur om de verschillende uitdagingen uiteen te zetten die naar de voorgrond kwamen tijdens de analyse van de cases. Ik heb modellen uit de literatuur gebruikt om een aanpak te formuleren om UCD te gebruiken in het MKB en dit zowel voor medewerkers bij het MKB om hen te leren UCD te gebruiken als voor het MKB als organisatie om UCD voor productinnovatie toe te passen.

De derde onderzoeksfase (hoofdstuk 7). Enkel een beschrijving van aanpak voor het gebruik van UCD zal het MKB niet in staat stellen om dat effectief in hun praktijk te gebruiken. Dit is de reden waarom de derde onderzoeksfase bekijkt hoe het proces loopt om UCD in het MKB toe te passen, en twee toolkits beschrijft die het MKB in UCD ondersteunen. Ik werkte samen met ontwerponderzoekers om hen de toolkits te laten ontwerpen; één dat ontwerpers helpt UCD te gebruiken bij MKB-ers, een tweede dat MKB-ers ondersteunt in het zelf toepassen van UCD. De toolkits bestaan uit een gestructureerde reeks van stappen die mensen een leerproces aanreikt, hen informeert over UCD en hen dat laat ervaren.

Conclusie

Op dit moment maakt het MKB voornamelijk gebruik van kwantitatieve marktonderzoekmethoden of meer geaccepteerde UCD-methoden zoals interviews, observatie, prototyping en bruikbaarheid. 'Nieuwere' UCD methoden (bijvoorbeeld op het gebied van participatory ontwerpen) zijn nog steeds erg onderbenut. Slechts zelden maakt het MKB gebruik van methoden zoals probes, storyboards en generatieve technieken. Die methoden betrekken gebruikers al vroeg in het ontwerpproces. Ze bieden het MKB nieuwe mogelijkheden voor producten en afzet en spelen in op de behoefte van het MKB om meer onderliggende behoeften van gebruikers naar de oppervlakte te halen. De nieuwere methoden helpen ook het MKB te anticiperen en te reageren op veranderingen in de samenleving. Omdat ze gebaseerd zijn op vroege gebruikersinzichten, worden gebruikers deelnemers en klanten partners. Hierdoor begrijpt het MKB de behoeften van de klanten beter en krijgt het continue feedback.

Tijdens de cases werden vele nieuwere UCD-methoden zoals contextueel ontwerpen vlot toegepast door de MKB-ers. Hoewel veel van deze methoden geschikt zijn voor het MKB, vereisen sommige extra vaardigheden en ervaring waardoor het MKB ondersteuning nodig heeft bij de uitvoering van deze UCD-methoden in hun dagelijkse praktijk. Ondersteuning van het MKB moet plaatsvinden op twee niveaus: het ondersteunen van individuen in het leren van de vaardigheden om UCD-methoden te gebruiken en het ondersteunen van de organisatie om UCD op te nemen in hun manier van werken. De ondernemer is sleutelfiguur in dit proces. Als hij overtuigd is, is er een grotere mate van flexibiliteit, worden budgetten opnieuw geëvalueerd en krijgen medewerkers de tijd en de vrijheid om gebruikers bij het innovatieproces te betrekken.

Ontwerpers in het MKB passen UCD-methoden over het algemeen aan naar hun eigen context met de middelen die ze beschikbaar hebben. Gebruik maken van gebruikersinformatie in het ontwerpproces en het verdiepen van deze informatie, is een noodzakelijk onderdeel van UCD. Het verdiepen is nodig om de rijkdom van de verzamelde gegevens te begrijpen. Het belangrijkste verschil tussen het MKB en grote bedrijven is dat het gemakkelijker is om verschillende interne belanghebbenden te betrekken bij werkelijke momenten van contact en in verdieping in gebruikersgegevens. In tegenstelling tot grote bedrijven is dit niet beperkt tot ontwerpers en gebruikersonderzoekers. Gedurende mijn onderzoek waren de marketing managers, vertegenwoordigers en de ondernemer vaak aanwezig. Vanwege de platte hiërarchische natuur in het MKB en de informele verdeling van taken en verantwoordelijkheden, kunnen zo korte-termijnkansen voor het MKB gemakkelijk worden geïdentificeerd tijdens overlegmomenten.

Het doel van dit onderzoek was om beter te begrijpen hoe het MKB ondersteund kan worden om gebruikers te betrekken bij productinnovatie. Het onderzoeksresultaat is gebaseerd op inzichten uit theorie en praktijk, ligt aan de basis van een aanpak om UCD in het MKB toe te passen en vormt de grondslag voor de twee toolkits. Die maken gebruik van de sterke punten van het MKB en bouwen voort op hun bestaande productinnovatie proces. Ze bieden praktische stap-voor-stap informatie voor het MKB op drie niveaus: bewust worden van mogelijkheden bij het betrekken van gebruikers en klanten, verwerven van de vaardigheden om gebruik te maken van de UCD methoden en het toepassen van UCD in de dagelijkse praktijk.

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About the author:

Christine De Lille (1983) was born in Leuven (Belgium) and obtained a master's degree in Industrial Design Engineering from TU Delft (The Netherlands). Christine specialized in designing for people making use of for example Contextmapping. For her Master thesis Christine explored how companies can invite and involve users in developing ideas in online environments for Favela Fabric, an Amsterdam based consultancy, for her Master thesis. During her graduation project, she was asked to start a Ph.D. project at Utrecht University of Applied Sciences, which started in 2008. Christine's research focuses on how users can be involved for product innovation in Small to Medium-sized Enterprises.

In 2009, Christine was co-author (with Remko van der Lugt and Syntens) of a proposal for the Province of Utrecht to support local SMEs and creative companies that resulted in the Pressure Cooker project. This project formed the basis of her Ph.D. Project.

Christine's work has been presented at a number of international, peer-reviewed conferences such as: TMCE, IASDR and the Academic DMI conferences, a workshop at the Participatory Design conference, and published in different magazines such as "Tijdschrift voor Ergonomie" and "Product Magazine". Christine has been a frequent guest lecturer at other design schools (Haagse Hogeschool and Artesis University College Antwerp) and for a diversity of organizations such as CHI-NL, the Design Management Network in the Netherlands, Flanders InShape in Belgium and Technologisk in Denmark.

During her Ph.D. project, Christine was involved in the local organizing committees of the Mobile HCI conference in 2008 and the IASDR conference of

2011. To share her findings, she organized two Masterclasses : one in 2008 for designers working in or for SMEs, and one in 2012 for SMEs in collaboration with Syntens.

In Utrecht, Christine was coordinator and teacher of a number of courses such as Research Methodology, Smart Products and Conceptualisation and the Co-design Studio minor program. She is currently continuing her teaching assignment at TU Delft.

In 2012, Christine was invited to start with a Post-doc project at TU Delft within CRISP (Creative Industry Scientific Programme), a program aiming at creating a body of knowledge on designing Product-Service Systems and the changing role of designers in design projects. While working with SMEs for her Ph.D. Christine noticed that the results of her cases make SMEs aware of the need to add services to their core activities. Many of the SMEs were challenged to move from designing products to the design for services. At the moment she is investigating this transition with SMEs developing Smart Textile Services (moving from manufacturing textiles to smart textiles) within the STS CRISP project.

Christine is founder and co-editor of the CRISP magazines with 3 magazines already published and two more planned.

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AL WAT IK DRAGEN KAN