

# Personas in Early Stage Product Design of a Medical Device



Master Thesis in Human Computer Interaction Design

Authors

*Stefan Bartlome*

*Simone Hänsli*

*Reiner Schlenker*

Coach

*Prof. Dr. Markus Stolze*

Universität Basel

Hochschule für Technik Rapperswil

Fachhochschule Nordwestschweiz

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## Declaration of authorship

We declare that we have developed and written the enclosed thesis completely by ourselves, and have not used sources or means without declaration in the text. The Master Thesis was not used in the same or in a similar version to achieve an academic grading or is being published elsewhere.

Solothurn, January 31, 2010

*Stefan Bartlome*

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*Simone Hänsli*

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*Reiner Schlenker*

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... especially all our interviewees who were generous with their time and expertise. Talking to users is essential and inspiring!

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## **Abstract**

This work covers the practical appliance and academic inspection of usability methods, in particular personas, in the early design stage of a medical device. User Centered Design has become an important factor for the development and launch of medical devices. International standards are demanding the appliance and documentation of the usability. The standards prescribe a usability engineering process throughout the complete development of a medical product.

For the practical part of the thesis user research was carried out in interviews with the primary usability stakeholders. Based on the interview data personas were designed and applied as primary personas to the different potential design strategies. The personas were introduced as posters to the industry partner together with the general concept of personas. The usability engineering process as demanded by the recently published standards was reviewed and brought in context of this study.

In the academic part methods for data acquisition and analysis are reviewed. The main focus is a critical inspection of the persona method. The current status of scientific research was explored especially looking on studies that proof or disproof the effectiveness of the method. From the different creation procedures described in the literature the best suitable approach for this work was chosen and documented in detail. A persona concept was created covering the design issues like naming, visualization and presentation. Additional attention is turned on applying unconventional methods like research in internet forums and the recruiting process in unfamiliar problem domains.

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## Chapter Overview

### *Chapter 1: Problem Outline*

This chapter outlines the initial position of this work. It consists of a short introduction into the problem domain, the motivation for the thesis, the goals and the scope.

### *Chapter 2: Exploration and Review*

In this chapter the problem domain is explored. It covers research about the general medical subject, the medical device itself and usability standards for medical devices. A functional review of the competitor's devices serves as the basis for the further steps of the user research. The research on usability standards for medical devices gives an overview about the recent developments in this field. It additionally links our results to the phase of the usability process described in the standards.

### *Chapter 3: Methodology and Approach*

This chapter covers the academic goals of the thesis. It contains research about the considered user centered design methods and the reasons why they were applied or dropped. The methods are critically reviewed and the specific approach of the applied methods is described. The chapter structure follows basically the chronological order of adopting the methods. It starts with the data acquisition methods followed by the methods used for analyzing the data.

### *Chapter 4: Persona Deliverables*

This chapter covers the main practical goal of the thesis, the personas designed for the industry partner. The persona concept based on the approach described in chapter 3 was translated into a concrete design of extended wall posters. The posters contain a complete description of the motivations and goals as well as pain points and future scenarios. Additional value was set on an appealing, professional design of the posters applying knowledge that was taught in the „Interaction Design“ part of the MAS HCID course.

### *Chapter 5: Further Deliverables*

In addition to the personas, accompanying results were produced within the practical part. These results contain artifacts for the medical device domain and bring the personas in context to the early stage of product design.

### *Chapter 6: Critical Review and Reflexion*

In this chapter the essential parts are reviewed and reflected. It contains a retrospect on the initial hypotheses, the overall cost of this work's personas and their success factors, and links the experience from this thesis to the last three years of the MAS HCID course.

### *Chapter 7: Glossary*

The glossary contains terms and abbreviations used in the report and additional important terms of the problem domain.

# 1 Problem Outline

## 1.1 Diabetes Mellitus and Insulin Pump Therapy

### *Diabetes Mellitus Type 1*

People diagnosed with type 1 diabetes suffer from the body's failure to produce insulin, usually ending in a complete breakdown of their insulin supply. The missing insulin results in high blood glucose values, that are deadly if not treated. Type 1 diabetes currently cannot be cured. After the clinical manifestation the patients need live-long external delivery of insulin for the regulation of blood glucose. The insulin therapy is complex with high demands on the patient's cognition and discipline. The goal is to level the blood glucose in a range near the physiological trends of a non-diabetic. Because this is hard to recognize by symptoms, diabetics need to measure their blood glucose regularly and, depending on the food and the body's activity, calculate individually the insulin units given to the body. Depending on the situation there is always the danger of a hyperglycemia (too high blood glucose) or hypoglycemia (too low blood glucose). Diabetics often suffer of late effects like heart, eye and kidney diseases because of poorly regulated blood glucose values.

### *Diabetes Mellitus Type 2*

Diabetes mellitus type 2 is diagnosed when a person has high blood glucose values because of insulin resistance, sometimes combined with insulin deficiency. It is rather a problem of responding to insulin than with the production of insulin, as it is with type 1 diabetes. In an early stage of type 2 hyperglycemia (too high blood glucose) can be managed or even reversed by increasing exercise and modifying the diet. As the disease progresses medications are typically needed. Some type 2 diabetics need insulin injections, especially with insulin deficiency.

### *Insulin Therapy Strategies*

There are four therapy forms established (Schatz 2006, p.57)

- Conventional insulin therapy
  - Two (sometimes three) daily injections of insulin
  - Strong diet with fixed meal times and carb amounts
  - No close-meshed blood glucose measurements
  
- Intensified conventional insulin therapy (ICT, basis-bolus-concept)
  - Separate application of basal and meal (bolus) insulin
  - Bolus according to blood glucose values and insulin plan
  - Fixed carb amounts in the meals
  - Four blood glucose measurements per day
  - Initial therapy for the first three months after type 1 manifestation



- Functional insulin therapy
  - Separate application of basal and bolus insulin
  - Bolus depending on blood glucose, absorbed carbs and correction factors
  - Flexible meal times and carb amounts
  - Four blood glucose measurements per day
  - High theoretical and practical skills of the patients
  
- Insulin pump therapy (Continuous Subcutaneous Insulin Infusion, CSII)
  - Continuous infusion by programmed basal profile
  - Meal insulin as bolus analogous to ICT
  - Flexible meal times and carb amounts
  - „Physiological“ insulin supply for individual needs
  - Cost intensive, complex technology
  - High theoretical and practical skills of the patients

Each therapy requires the patient as an active part to reach good results. Despite the technical development the patient's knowledge and empowerment is the main success factor. Therefore psychosocial topics like cognition, emotion and behavior are mandatory subjects in the modern diabetes therapy (Schatz 2006, pp.35-37).

#### *Insulin Pump Therapy (CSII)*

The most advanced method today is the therapy with an insulin pump because it comes closest to the natural insulin supply of non-diabetics (Lohmüller-Wiegelmann 2006, pp.16-17). The pump enables continuous supply with fast absorbed insulin for basal insulin rates and additional insulin delivery of so-called „boluses“ to compensate the additional rise of glucose after meals. The basal insulin rates are programmed into the pump according to the patients individual insulin profile. The constant supply of the basal insulin does not require the need of additional action by the the patient. Before meals that cause the blood glucose to rise the pump user measures his blood glucose value, calculates the affiliated carbs and the amount of the bolus insulin. She or he gives the boluses by operating the insulin pump.

The therapy with external insulin supply is required by type 1 diabetics, for type 2 patients it is the last step of the therapy if all other therapy forms fail (Schatz 2006, pp.130-134). Thus most of the pump users today are type 1 diabetics. Especially for younger type 2 diabetics the supply of external insulin is recommended (Schatz 2006, p.132) and for the future type 2 diabetes might become an interesting market (Heinemann & Thomas 2009, p.200).

## 1.2 Initial Position

*Not for public use*

## 1.3 Practical Goals

*Not for public use*

### 1.3.1. Qualitative User Research

This thesis is based on qualitative methods for user research as they were taught in the master's course „Human Computer Interaction Design“ (HSR, Rapperswil, Basel University and FH Nordwestschweiz). The intent was to get a picture of individual user goals and needs for the development of a new insulin pump.

### 1.3.2. Design Strengths and Flaws of Existing Pumps

Existing insulin pumps are well-engineered devices that keep diabetics alive. However they have potential flaws in their functionality and their interaction design. We wanted to identify the strengths and pain points when using the devices. The data were acquired by talking to insulin pump users and, in rare cases, observe them when operating the pump and by research in internet forums.

### 1.3.3. User Typology and Design Strategies

Users are different in age, behavior, motivation, culture and cognitive skills. User-friendly products consider these differences and are designed by focusing on the needs and goals of their target audience (Cooper & Reimann 2007, pp.77-79). The general design and functionality is similar for the insulin pumps that were established in the market at the time we held the interviews. The pumps cover the complete range of functionality for every user group and age.

Most likely the insulin pumps of the next generation will be more diverse in their general design and functionality to serve individual needs, some alternative approaches are under development or will be launched soon (Heinemann & Thomas 2009, p.200). To be successful with models that are designed for a dedicated target group one need to know as much as possible about the user and her or his motivations. One of our goals was to identify potential areas of user segments. Based on qualitative user research we ....

- ... developed a persona concept for our industry partner.
- ... create design strategies for different insulin pumps.
- ... link the user needs with the strategies.

The persona concept as described in chapter 4 (see page 46) was introduced to the industry partner and considered as a suitable method to classify the users and their individual needs. Especially the process of modeling the persona was documented and reflected critically because there are quite different methods in the literature described on how to develop personas out of the user data.

The design strategies are based on the main needs and goals of diabetics as identified in the interviews. Here additional data from physicians, forums, one diabetes consultant and new tendencies on the market are taken into account.

### 1.3.4. User Centered Design Methods for the Industry Partner's Development Process

Our industry partner is convinced that usability and user experience are important factors for the development of innovative insulin pumps and the successful market launch. Latest standards for the development of medical devices ask for usability methods to get approvals. We introduced user centered design methods for an early design stage. We inspected the mandatory usability standards and learned to know the processes of the industry partner to see if and how usability methods can or need to be integrated.

## 1.4 Academic Goals

The academic goals cover the scientific part of the thesis and addressed to the public. They derive from the main focus of the thesis on personas and new product development and from our interest in the applied UCD methods.

### 1.4.1. Inspecting the Persona Method

Creating personas is one of the main subjects of the thesis. Our industry partner already knew about personas and was very interested to get knowledge in this method and of course get personas as a result of our work. But there is a quite controversial dispute about the effectiveness and acceptance of personas in the literature and in usability and design circles. There are also very different concepts about the modeling and generation process of a persona as well about the cost of the method. Our own personal experiences with personas – taught in the master's course as well as from practice – gave the reasons to have closer look at the following aspects of the method:

- Inspecting the different concepts for the persona creation.
- Choosing the approach that suited best for our project.
- Researching scientific studies about the effectiveness of personas in theory and practice.
- Analyzing the practical use of personas its success factors and pitfalls.
- Discussing alternative methods in integrating the user into the design process.

### 1.4.2. Data Acquisition Methods in Unfamiliar Problem Domains

When starting with the thesis the problem domain was completely new to us. Developing and launching medical devices means high regulations to get product approvals. The insulin pump itself is a specialized, life-supporting device and its operation was also completely new to us. We considered and analyzed different acquisition methods in beginning. Some of them turned out to be less suitable than originally thought and were not applied, for example contextual inquiries.

### 1.4.3. User Centered Design in an Early Product Stage

For new product development user research has a different focus than for existing product strategies. Domains like product innovation, marketing and design are stronger involved than the actual development especially if the product strategy is not fixed. This is the case with the product of our industry partner and we were often faced with questions relating to these subjects. We looked at different UCD methods and how they fit for these needs:

- Personas were intended for a general user typology without defining one single primary persona.
- Design strategies: Based on the user research different design strategies were created, for each we tried to define a primary persona.
- Mood boards: we created persona specific mood boards to additionally visualize the persona's attributes.

## 1.5 Scope

### *In Scope*

This thesis focuses on user research in the initial phase of product development. Based on the first discussions with the industry partner and the initial hypotheses described in chapter 1.2 (see page 3) we wanted to investigate the practice and problems of the pump operation. An appropriate method for this kind of data gathering are contextual inquiries (Beyer & Holtzblatt 1998, pp.36-66). During the first informational talks and interviews it became obvious that the common use of a pump is not a big problem. Diabetes itself is such a complex „disease“ that operating the pump does not challenge the common pump user, which can be compared to the operation of a mobile phone.

The next generation of insulin pumps is on its way or has just been launched. The models seem to develop into different directions and the industry partner has not finally decided about the product strategy for their pump. Therefore we shifted the initial scope and set our main goals in a broader context:

- Identify different user types
- Create personas
- Assigning a persona as the primary user to potential design strategies

### *Out of Scope*

Our work does not cover interaction design work like prototyping or a detailed user interface design for the pump display, a separate control unit or additional software. The following subjects, methods and artifacts were out of scope:

- Prototypes and user interface design
- Card sorting for designing menu structures
- Task analysis
- Usability tests
- Program code

Although it was not always easy to set the scope between the usability focus of the thesis and marketing subjects we wanted to concentrate on the stakeholders that are directly involved in the usability of the device. So we did not conduct interviews with secondary stakeholders like health insurances. They indeed approve the pump but the decision about the model is made entirely by the diabetic, in some cases influenced by the doctor or diabetes consultant.

We did not talk to type 2 diabetics because the pump users at the moment are predominantly type 1 diabetics.

## 2 Exploration and Review

*Pages 7 to 20 are not part of the public version of this document*

## 3 Methodology and Approach

### 3.1 Overview of Considered Methods

In the beginning we discussed various methods for the acquisition of data because the problem domain was new and insulin pumps are not a common device. The users are diabetics and the usage patterns are focussed around the live-supporting delivery of insulin to the body. Some of the methods were considered as not beneficial for our purposes and were dropped. Other methods turned out to be less useful as originally thought. The following table lists all methods that were taken into consideration. The reasons for applying or dropping the methods are described in detail in the following chapters.

<i>Method</i>	<i>Type for this thesis</i>	<i>Applied/ Dropped</i>	<i>Note</i>
Forum Research	Data acquisition	Applied	
Contextual Inquiry	Data acquisition	Dropped	
Diary Method	Data acquisition	Dropped	
Questionnaire	Data acquisition	Applied	Online Survey
Interviews	Data acquisition	Applied	
Recruiting	Data acquisition	Applied	
Mood Boards	Data analysis	Applied	
Personas	Data analysis, result	Applied	Focus of the thesis
Scenarios	Data analysis, result	Applied	Within the persona descriptions
Lead Users	Data analysis, result	Dropped	
Design strategy analysis grid	Data analysis, result	Applied	
Online Surveys	Data acquisition	Applied	
Task analysis	Data analysis	Dropped	See „Scope“, page 6
Card Sorting	Data analysis, structuring	Dropped	See „Scope“, page 6
Affinity Diagram	Data analysis, result	Dropped	See „Scope“, page 6
Competitor Analysis	Data Acquisition	Applied	See „Today's Insulin Pumps“, page 9

*Table 1: Methods Overview*

## 3.2 Research Internet Forums

Insulin pump users are quite well organized within the internet. There are many websites and forums about that subject. Researching internet forums was very valuable when we started with our work. It delivered an overall picture of the insulin therapy and insulin pumps.

The forums are also a good source for finding pain points the pump users are dealing with. Muise (2010) describes this technique to find pain points of the target market when selling things over the internet. He recommends using tools to browse well known problem-websites and forums for keywords. But this is rather a quantitative method. It tends to data mining (Gopalan & Sivaselvan 2009) which definitively is not in the scope of this study. The described method by Muise would not discover complete unexpected pain points that are not covered by the keywords. This is also the case for online survey questions especially if asking closed questions.

To explore an unknown problem domain searching internet forums is a good qualitative research method to find pain points and strong points. However it has always to be kept in mind, that statements taken from internet forums are often very hard to proof because the originators are not always known. For scientific research such sources need always to be indicated.

## 3.3 Contextual Inquiry

Contextual inquiries (Beyer & Holtzblatt 1998, p.36) were considered as the ideal method to gather data. Based on our first assumptions that the pump operation itself was complicated the method promised to be ideal to expose the pain points. With the contextual inquiry method one can analyze the user, his or her needs and goals and the environment by observing and interviewing while he or she actually uses and operates the pump. The contextual inquiry method is one of the most important usability methods (Richter 2007, p.18).

After the first informal interviews with physicians, diabetics and interest group leaders this method was dropped. The users interact with the insulin pump infrequently and most tasks cannot be scheduled. The only task that can more or less be scheduled is giving a bolus, which is straightforward and not complicated at all. Some tasks like adjusting the basal rate profile are done once a year or even less often. Another reason is that the users cannot operate the pump for a demonstration purposes because it is a life saving device and an operating error can be harmful.



### 3.4 Diary Method

The diary method is an alternative data gathering method that was also mentioned in the master's course. The method is also called Diaries (Goodwin 2009, p.188), Incident Diaries (Courage & Baxter 2004, p.588) or Diary Studies (Kuniavsky 2003, p.370) with little differences in the description. The method is powerful but has limitations. Structured diaries can bias the responses (Kuniavsky 2003, p.375) especially in such a specific and unfamiliar domain. On the other hand it is important to keep the diary task simple (Goodwin 2009, p.188).

The method was dropped as well. Pump users seem to be indeed an ideal audience because they should record the related data like blood glucose values or taken meals (Walsh 2006, pp. 85-98). On the other hand the candidates might be fed up with additional regular reporting tasks. Goodwin (2009, p.188) reports high dropout rates and self-reporting errors. The main reason for discarding the diaries was again the fact that the pumps usually run for months without causing any problems and that it is not possible to ask targeted questions.

### 3.5 Questionnaire

Questionnaires are well qualified for gathering quantitative data (Richter 2007, p.61). They are recommended as a supplementary method to other usability methods (Richter 2007, p.62). Surveys or questionnaires were not considered for gathering qualitative data about the pump usage. We used an online survey to find out about the use of personas and mood boards by practitioners.

### 3.6 Interviews

#### 3.6.1. Interview Types

The interviews became the main method for acquiring data. Interviews are suitable to get qualitative and quantitative data. Three interview types can be distinguished (Courage & Baxter 2004, p.258):

- Unstructured (or open-ended): The interviewer starts with talking points, the participant can answer as detailed as he likes. The questions are open-ended and the received data are of qualitative nature.
- Structured: The interview consists primarily of closed-ended questions and the interviewees choose from the options provided. The interviewer does not dig deeper into a subject. The data received are quantitative.
- Semi-Structured: A combination of the structured and unstructured type, also for the nature of the data received. The interview can start with a set of closed-ended and open-ended questions.

Our objective was to acquire qualitative data about the motivations and goals of the users. Additional demographic data like age, gender, profession, diabetes incidence were also of interest. The semi-structured interview type was chosen as the best form to reach these goals.

Another important issue is to decide if the interview is conducted in person or over the phone. Face-to-face interviews require travel cost and time but there are some disadvantages when conducting interviews over the phone (Courage & Baxter 2004, p.260):

- Phone interviewees end the interviews before participants who are asked in person.
- Phone interviews are more hesitant to reveal sensitive information.
- The participant cannot be watched for body language, facial expression.
- Phone talks can be perceived as impersonal.

With developing online communication technologies like Skype some of these negative factors might be compensated, for example when the video option is used. Taking into account additional factors from the problem domain we decided to conduct the interviews in person:

- There are areas of sensitivity especially with diabetes related topics.
- If it comes to explain something at the pump it is hard to do this via the phone.
- For us establishing a personal relation to the interviewees was important.

Because of logistic and scheduling issues two interviews were held over the phone. One in the conventional style and one as a video interview via Skype.

### 3.6.2. Preparing for the Interviews

The overall time of one interview was planned for 60 to 90 minutes which lies within the maximum recommended time of two hours (Courage & Baxter 2004, p.262). In most of the cases this was sufficient to cover the complete range of questions. For the interviews we designed a questionnaire for each interviewee group (see Appendix for a template example):

- Pump users
- Pen users
- Pump users that switched back to the pen
- Diabetes consultants
- Doctors

Based on the discussions with the industry partner, first informal interviews and our research in internet forums we identified the following topics for our questions:

- Demographic data
- Life with diabetes: The success of an insulin therapy is directly linked to the attitude of the diabetic. Did he or she finally accept the diabetes? Is there a good know-how and empowerment? How is the blood glucose levelling?
- Motivation for the insulin pump
- Satisfaction with the pump

- **Functionality:** Which are the important functions? Frequency of use? Which functions are missed?
- **Pain points:** The pain points give information about design flaws in general and in detail for specific features. If common pain points from existing pumps can be eliminated the user satisfaction rises.
- **Wishes/visions for the future:** When developing a new product user wishes or future visions can give important ideas for innovations.
- **Other**

With the growing experience the questionnaires were reviewed and improved from time to time. The general topics listed above generally proved to be the right ones.

### 3.7 Recruiting the Interviewees

In many software projects the recruiting process is not a big issue. The users are well known and the recruiting effort is straightforward. For this work the recruitment became an important task and is considered as a dedicated method because we started on the green field, had only rare contacts to diabetics and the industry partner as a start up does not have an established user base.

We calculated a longer time frame for the recruiting phase and planned some buffer because we could not tell in the beginning how long the interview phase would last. Our intention was to spread our activities as diverse as possible to find the candidates. We considered internet forums, physicians and our private networks as the most promising recruiting channels.

For the forum postings and the doctors we wrote a cover letter with a short description of the subject of our studies. Additionally we designed a leaflet which was aimed for disbursement in the doctor's waiting room. In our private networks we spread the word by e-mails, informal talks and sometimes by accident.

The focus of the candidates was on the pump users but we also wanted accompanying data from interviews with doctors, diabetes consultants, people switching back to the pen and pen users that were skeptical to insulin pumps. Our initial goal was conduct about 20 to 25 interviews. In the end we conducted 18 interviews:

- 16 diabetics: 13 pump users, two pen users, one switcher
- One physician
- One diabetes consultant

### *Conducting the Interviews*

If possible we tried to conduct the interviews with two interviewers. One took the lead in asking the questions the other was focusing on taking notes. The questionnaire was completed by both of the interviewers to also have a control mechanism about the quality of the notes. The interviews were not recorded by video or audio. The results were entered on paper in the questionnaire and can be found on the CD-ROM.

## 3.8 Mood Boards

Mood boards are often used by graphic designers to develop design concepts and for the communication withing the design team (Wikipedia.org 2010). They can also be applied in other domains for visualization purposes. Mood boards serve as a visual tool to quickly inform others of the overall 'feel' or 'flow'.

### 3.8.1. Use of Mood Boards

Most experts describe the use of mood boards as a technique for designers. Mood boards are utilized to explore the emotional landscape of the product or service and they are an attempt to convey what the final design will feel like (Saffer 2007, p.108). Additionally mood boards can primarily be used to develop design concepts (Wikipedia.org 2010). They are a creative orientation to visualize the target audience (Stapelkamp 2006, p.565).

Kim Goodwin recommends that, when defining requirements, one should also communicate visually whenever possible (Goodwin 2009, p.341). She recommends to use mood boards as an additional communication tool, not only for the team members but for all stakeholders. The focus lies in communicating the design. Goodwin recommends to enrich personas with mood boards (Goodwin 2009, pp.229, 271). This is to depict a persona's interest, personal style, feelings and aspirations.

Mood boards were introduced in the Interaction Design part of the master's course HCID as a means for designers. Some students applied mood boards in their practical work not only for the design and were quite enthusiastic about the use of mood boards. Thus mood boards are an additional communication tool to enrich the personas visually.

### 3.8.2. Form of Mood Boards

Mood boards are a collage of images (Goodwin 2009, p.342), photos, colors, typography and any other means available (Saffer 2007, p.109). Traditionally mood boards were made on large sheets of poster boards, but mood boards can be created digitally, too (Saffer 2007, p.109).

### 3.8.3. How to Create Mood Boards

Kim Goodwin is not very extensive on how to construct a mood board to be used with a persona (Goodwin 2009, p.271). But she describes quite detailed how to create mood boards to visualize experience attributes (Goodwin 2009, p.341). Other authors like (Stapelkamp 2006, p.565) or (Saffer 2007, p.108) are suppressing on how to get to a mood board.

The mood boards were designed based on Goodwin's approach. The important attributes were identified and grouped. Royalty free photos that characterized the attributes were selected and purchased. The resulting mood boards can be found in chapter 5, page 77. Because of time, cost and unidentified primary persona we created mood boards for two personas that serve as examples on how to enrich personas visually.

## 3.9 Personas

### 3.9.1. It's a Kind of Magic – The Creation Process and Effectiveness of Personas

When studying a human factors discipline or reading the adequate literature it sometimes looks like personas *guarantee* the successful design of a user-friendly product. Personas are omni-present in the usability literature and in practice they are used for various purposes. It is quite surprising that there is not much research done about the different methodical approaches, success factors and the pitfalls when establishing personas in teams and processes of real life projects (Chang et al. 2008, p.439), (Long 2009). Is there no problem at all in practice? Or are personas in the end overestimated and they are not used as effectively as they could? Discussions in usability forums and newer articles and papers deliver a quite different picture about the benefits of personas than those described in the standard literature. Our own personal experience from the master's course and in our jobs was also quite ambivalent. On the one hand we liked the persona concept as it was taught in the course and we could apply the method in our first year practical project. On the other hand there was always some skepticism about the methodical approach and the sustainable success in real-life projects. Personas are not always fully understood and quite often they are created from scratch without any data from user research (Chang et al. 2008, p.441). This was one of the main motivations to have a closer look at the method itself. For the personas created for this thesis we wanted to collect as much data about the following topics:

- The persona concept
- The creation process
- The areas of application and the scope
- The effectiveness
- Scientific studies about the proof of the method

On established usability platforms like IxDA ([www.ixda.org](http://www.ixda.org)) the pros and cons of personas are discussed frequently. In these discussions the advocates and opponents dominate the discussions and objective reviews are rather seldom. This might be an indication that the persona method is an easy target of criticism or the method is not as established and successful as the course books tell.

Ideally a persona is developed out of real user data gathered from interviews, observations and contextual inquiries. Additional data can come from marketing research, internet forums, etc. However, the main virtue of personas is directly linked to the quality of the user data gathered in interviews and observations (Cooper & Reimann 2007, p.81). In practice it is also common that personas are created from scratch (Chang et al. 2008). This type of personas is also called „assumption personas“ (Browne 2009). Although they should be handled with care, Browne reports that they can be useful for designers in early stages of the design process, especially to raise the stakeholder’s awareness in conducting qualitative user research and make the cases for funding the research.

### 3.9.2. Online Survey

To get answers from the field an online survey was created to find out how practitioners are using the persona method in their work. For example which naming convention is chosen or which methods are used to gather user data. Seventeen questions were designed and additionally people were invited to give other remarks, comments in case something important was not asked. The survey was created with a free online tool. The request to fill the survey was posted on 4 UX forums. In total we received 17 responses, 13 of them could be analyzed.

Whenever a result from our survey fits into a section below an excerpt from the questionnaire is reproduced and marked as „Interlude: Answer from the field“. All questions and the complete evaluation of the data can be found on the CD-ROM.

### 3.9.3. The Persona Paradigm

Personas were first introduced in the book „The inmates are running the asylum“ (Cooper 1999) to enable a differentiated sight to the users and their needs. A persona is an archetype user with individual attributes that describes individual goals and behavior patterns, using storytelling and visualization techniques to deliver a vivid picture of the users from different perspectives (Goodwin 2009, p.229). Personas help to avoid typical pitfalls during product development like the „elastic user“, „self-referential design“ and „edge cases“ (Cooper & Reimann 2007, pp.79-80).

Persona descriptions do not follow a strong structure and can be quite different in nature. There is no established standard format and the experts favor different approaches (Brown 2007, p.16). There are examples in the literature of a more narrative, scenario-like style (Goodwin 2009, p.230) as well as a structured table-style (Brown 2007, p.16). Hybrid forms are described as well.

Despite the broad variety of descriptions a basic pattern of persona characteristics can be identified. A persona ...

- ... has a name and a photo/illustration.
- ... has general individual attributes, like age, gender, family information.
- ... has specific attributes for the design domain, e.g. frequency of use, early adopter, resistance.
- ... contains motivations, goals, behaviors and needs related to the problem domain.

*Interlude: Answer from the field*

How useful did you find the use of personas in your project?

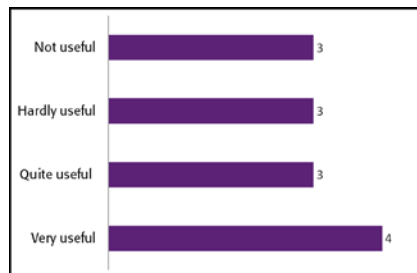


Figure 1: Are personas useful?

### 3.9.4. Benefits of Personas

Personas can help in the user centered design of almost every product that is used by a human being (Goodwin 2009, pp.231-234):

- Because users are not always available when you need them personas allow the design team to ask questions to a specific user and think about his or her motivations and needs.
- For the product definition personas are used for gathering and prioritizing requirements, stereotyping the users, focus on target groups and setting usability goals.
- During the design personas are a surrogate of the numerous and unnamed users out there and help to adjust the goals and design during various iterations.
- In the communication with various stakeholders personas help to get agreement about the user needs and how the design will satisfy these needs.
- In the bug fixing process personas can be used for prioritizing the fixes.
- For documentation purposes personas help to write the manuals or help systems for target groups, like end-users, power-users, administrators or developer.

### 3.9.5. Scope

Compared to other grouping methods like market segments personas have a different scope but there are overlaps in substance. The following graphic illustrates the scope of both:

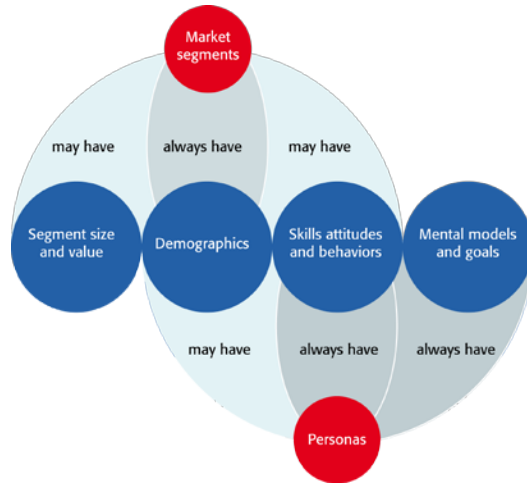


Figure 2: Personas vs. market segments

### 3.9.6. Persona Skepticism

From an empirical, quantitative point of view the persona method appears to be kind of fuzzy with inferences in the creation process as well as when applying the personas in practice. Scientists from this field have a problem with the fact that the data base for personas is created from very few users that might not be „representative“ (Chapman & Milham 2006). There are efforts to add statistical techniques to the persona method with the goal to eliminate this weakness and bring acceptance to stakeholders who set their values on representative data (Sinha 2003, p.830). The same paper reports that personas created from different usability experts might vary significantly. Unfortunately the author does not give a citation to proof this. Even if this would be the case, this statement should be carefully used when arguing that personas are not effective.

Some authors suggest not to use personas at all until there has been more research done on the method (Chapman & Milham 2006). Although the concerns might be legitimate from a strict scientific point of view this does not help to bring research forward. Proofing or falsifying methods under lab environments is an important part and for certain areas a must before the method is applied in practice. On the other hand it is also important to test the method in the field and for example „measure“ the success in single case studies. There are many success stories where personas helped design teams to get a clearer picture of their users. The persona concept was always designed as a qualitative method with a significant portion of subjectiveness. But subjectiveness must not be a negative factor when designing new, innovative products.

Side note: It is very interesting that the strong decline as well as a standard advocating book (Pruitt & Adlin 2006) and a praising article (Kreitzberg & Little 2009) about personas are written by people working for the same software company. Our guess based on our experience is that success of personas depends on how they are accepted and established throughout the whole organization, no matter about the company's size.



Another subject of criticism is that creating personas is cost intensive and the financial efforts are not always equalling the results. There are numbers in circuit that the average persona investment lies around \$47,000, creating four personas out of 21 interviews (Manning et al. 2005). A project that creates ten personas (out of 100 interviews) sums up to almost half a million dollars! These are impressive numbers and it is understandable that funding might hard to achieve when the stakeholders that decide about budgets are persona skeptics. The cost of our personas can be found in Chapter 6, page 89)

### 3.9.7. Measuring the Effectiveness of Personas

Research about the effectiveness and success is predominantly limited to single case studies and there are positive as well as negative examples. One study carried out a participant observation during a twelve-week project to learn more about what goes on in a design team when personas are used (Blomquist & Arvola 2002). Here the participants had not worked with personas before and the team members hardly used them. Another

Limited research has been carried in objective measuring the effectiveness of personas. One study looked at the effectiveness of personas in different design teams (Long 2009), another one does research about various usage by practitioners (Chang et al. 2008). While Long's study was designed carefully by measuring the results of nine different teams in three groups, Chang et al. only compared two teams. Their results represent hardly any measure about the effectiveness. Thus only Long's study is discussed in detail here.

Long conducted a study with design students to measure and compare the effectiveness of personas. He formed nine teams that had to solve the same design problem. The teams belonged either to a group that used personas (with photographs or illustrations) or to one that did not use personas during the project. The quantitative results base upon scores the teams reached in terms of usability heuristics and the grades achieved during the project. The study wanted to answer the following questions:

*„Does using personas as a tool give designers any advantage in designing more effective and user-centred solutions?“*

*„Would there be a quantifiable usability difference between the designs from the persona-based teams over ones that did not use persona?“*

Despite these general questions the research had an additional element about the different presentation techniques of personas:

*„Would the use of the storyboards with illustrated user personas over the traditional method of using realistic user photographs and text-based scenarios have any significant difference on the resulting designs?“*

The results indicate that with personas better usability design results are achieved than without and that using photographs/scenarios is superior to using illustrations/storyboards, especially during early design stages. The design teams that were working with personas had better grades in the different parts of the project and they scored higher in Nielsen's usability heuristics. „Through using personas these design teams had a clear perception of 'who' they were designing the solution for and what the users' goals were“. Although such studies are valuable and help to look more objectively at personas

the results also have to be reviewed carefully. There are some factors which might have an influence on the quality of the results:

- The study looks only on the team-internal factors and the comparison of the presentation techniques is limited to the options „Photograph/Scenario“ vs. „Illustration/Storyboard“.
- The design teams consisted of third year industrial design students that might have knowledge about the persona method.
- In practice teams are often interdisciplinary and the team members might not know personas at all. Skepticism and refusal about the method could also eliminate the advantages measured by long.

### 3.9.8. Additional Success Factors for Personas

To get a more overall picture research should also consider external factors like the acceptance throughout organizations or the general „culture“ in which the use of personas is successful. The following topics might also influence the effectiveness of personas in practice:

- The stage of usability maturity of an organization (Nielsen 2006a) , (Nielsen 2006b): strategic decisions are often made outside the design teams but they might have a significant influence on the product strategy. Can personas and related concepts contribute positively on these decisions?
- The acceptance by the team members: Product development teams are often interdisciplinary and not everybody has the same level of experience with UCD methods.
- Remembrance of the persona's attributes: which factors help or limit the stakeholders to remember the characteristics of the personas, e.g. naming conventions, visualization techniques, general design?
- The content: Pain points, Goals, Motivations, Context, Scenarios
- The presentation form: Posters, presentations, websites, etc.
- The design quality: Typography, color use, visualizations

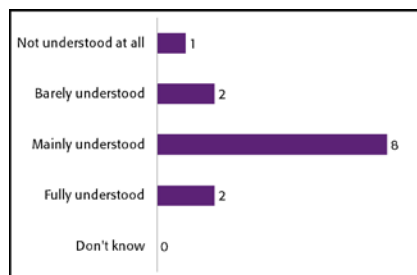
The topics above arose when it was discussed how the personas would be modeled, designed and introduced to our industry partner. Again there is not much research published that would give an objective answer to the questions above. One interesting paper is a case study about the development of the MSN Explorer at Microsoft where personas were applied in a large scale project (Pruitt & Grudin 2003). The authors describe their three year experiences in a large team and the following problem in the early persona efforts of the project are outlined (Pruitt & Grudin 2003, p.3):

- The characters were not believable.
- The characters were not communicated well.
- There was no real understanding about how to use the characters.
- The projects had no visibility with poor high-level support.

The results show that criteria like culture and maturity of a team are important success factors for personas. Although it is not easy to design studies that measure such criteria, further research should be carried out to get more objective data and leave the field of speculation about the method. Most likely there will always remain a kind of magic when personas are created and used. It will probably never become an exact method with a single established creation approach because some parts of the persona design process are very creative.

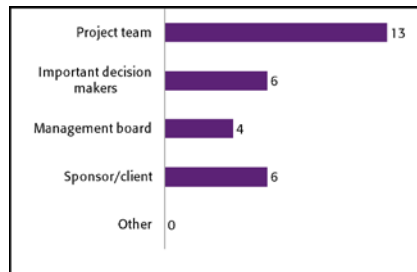
### *Interlude: Answer from the field*

How well was the persona concept understood by the people involved in the project?



*Figure 3: Do people understand personas?*

To whom in the company were the personas introduced/presented? (Multiple answers were possible)



*Figure 4: Distribution of personas*

#### 3.9.9. The Persona's Name

The name of the persona is essential. It is used in discussions and everybody should remember the persona and his or her character, goals or and motivations. A persona can be named by the following schemes:

- Ordinary first and last name, e.g. Louise Miller.
- Technical name, e.g. User01, Administrator02.
- First name only (ordinary), e.g. Sandra or Claire.
- First name ordinary, last name descriptive/alliterative, e.g. Barbara Buyer or Dina Diligent.

While Alan Cooper, the inventor of personas, does not mention this problem in his books one of his employees talks about this fact in an online article of Cooper's website. She suggests not to use descriptive names because the experience is that different associations are connected with one name (Halley 2008). As an example Joe Sixpack from the last U.S. presidential election is given. Joe Sixpack was mentioned recently in an IxDA discussion as a persona example outside of the UCD domain (IxDA.org 2008). People were asked about the picture they have about Joe and depending on ethnics and culture the answers were quite diverse. Halley argues that because of this example descriptive names should not be used. People working with the personas would have different assumptions about the persona when an descriptive name is used.

But is Joe Sixpack a good example of a persona or is he a persona at all? We think not. Joe Sixpack is the example for the average American analogous to the term „Otto Normalverbraucher“ or „Lieschen Müller“ in the German speaking countries (Wikipedia.org 2009). This is exactly the opposite of a persona. A persona does not reflect the average user but an individual. Joe Sixpack actually is a good example for the elastic user that according to Cooper should be avoided with the use of personas. It seems that there is quite some misunderstanding about the persona paradigm, surprisingly even among the experts.

Other authors also forbid to use descriptive, or as they also call it „silly“ names because these show that a persona is not a real person and in that case are not taken seriously by the stakeholders (Goodwin 2009, p.274).

### *The naming concept for this work*

Despite the concerns in the literature we decided to give our personas descriptive and alliterative names because we think that the following advantages do compensate the above mentioned potential flaws:

- A descriptive name is better remembered, especially by stakeholders who are not daily involved in the development process.
- A descriptive name gives already a hint about the goals and motivations of the persona, in meetings it is more effective because the team members do not have read the persona description again and again.
- It is no problem if a persona is not considered as a real person, far from it! Whenever the persona concept is introduced this fact is a must to be mentioned: A persona is a fictive person! And he or she does not represent the average user!
- A descriptive name is kind of artificial and works also in cultures with different naming habits.
- When developing the persona names we considered the concerns mentioned in the literature. Silly names were avoided and the descriptive name should be as unambiguous as possible. There was a first positive feedback about the names after presenting the personas to our industry partner. All participants including the CEO liked the naming convention and there were no signs that the personas were not taken seriously. Actually they started to use the persona names in first discussions. We got a note some days later from an employee who did not attend the presentation telling us that the personas already had a positive impact in the company empowered by the CEO personally.

*Interlude: Answer from the field*

Did the personas have descriptive (alliterative) names (e.g. „Alan Admin“), common names (e.g. „Joe Allison“), technical names (e.g. „User01“, or descriptive names/role names (e.g. „The Purchaser“)?

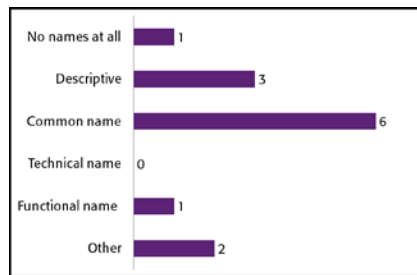


Figure 5: Persona naming

Was this naming helpful?

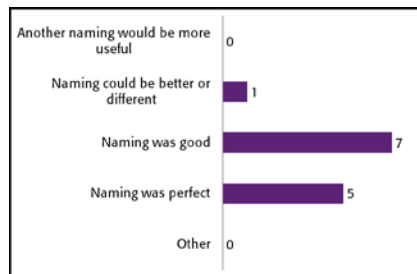


Figure 6: Helpful persona naming

### 3.9.10. The Visualization of Personas

Another critical factor is to give the persona a face. A photo or illustration helps the team to remember that the persona is an individual person and can significantly influence the perception of the personas (Pruitt & Adlin 2006, p.247).

*Portrait or additional context?*

Showing only the face of the persona or bringing the persona into a context is one of the first questions that should be answered when visualizing the persona. Creating visual collages around a persona is an additional option (Cooper & Reimann 2007, p.103).

*Illustration or photograph?*

There is no strong evidence in the literature about advantages or disadvantages from an objective perspective. The only study that did research on this favors photographs over illustrations (Long 2009). The course books are once more ambiguous. Goodwin considers photographs to be more valuable than illustrations because they are more realistic than illustrations and the acceptance in teams is higher but without giving a concrete proof of the hypothesis (Goodwin 2009, p.281). The only situation where Goodwin favors illustrations is if storyboards are a main additional method in the project because

then the team members do not have to translate between a photo and an illustration (Goodwin 2009, p.281). Pruitt & Adlin give a different picture, they think illustrations can be an interesting alternative to photos and give a story from the field (Pruitt & Adlin 2006, pp.249-251). Illustrations also bear the advantage that they can be composed to the special needs. Which visualization type is finally used for the personas might depend on additional factors like budget, artistic skills of the team members, personal taste or company culture. In each case the quality of the visualization should be the most important factor. If choosing the photo or creating the illustration is done last minute it is likely that the quality of the visualization might suffer.

#### *Stock photos, photos from Flickr or Picasa, self-shot photos?*

With the digital age it has never been easier to access photographs. But this also bears the danger that the visualization step is underestimated in the planning of the persona creation because one could think that to find a photo is no problem at all. There are some issues to be considered when using photographs:

- License models: There are many licensing models available, copyright laws have to be respected.
- Budget: Buying stock photos can be quite expensive
- Quality: Consistency in coloring, visual motif, dimension and resolution

When collecting the photos from different sources it is very hard to achieve a consistent identity of the photos and the result might look amateurish. On the other hand stock photos could look too professional and they should not be used (Pruitt & Adlin 2006, p.248). The authors suggest to hold own photo shootings for the personas which seems an interesting alternative (Pruitt & Adlin 2006, p.249). But to achieve good results in practice this has to be planned and budgeted carefully. Photos of the interviewees should be avoided.

#### *The visualization concept for this work*

Taking the above mentioned factors into consideration the following visualization concept was created for the personas in this work:

- The visualizations show key characteristics of the personas: we think that this helps the team members to remember the persona.
- Photographs: our artistic skills were not sufficient for creating good illustrations and the budget was limited.
- Using black and white images: Because most likely the photos were collected from various sources it was much easier to achieve a consistent look and feel when the photos are black and white. Because our persona posters have colored visual elements, the black and white photos would also harmonize better with this concept.
- Cropped photos: the background is eliminated which also helps to achieve a better consistency.

*Interlude: Answer from the field*

How were the personas visualized?

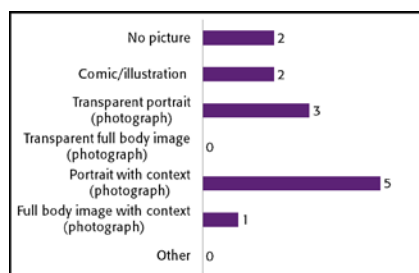


Figure 7: Persona visualization

### 3.9.11. Persona Modeling Procedures

To process the actual data from several interviews or observations is a task which should be performed diligently. The methodical approaches described in the literature vary significantly in the procedure itself and the extent of description. To process the data from the interviews there are different methods described in the literature:

- Affinity diagrams (Courage & Baxter 2004, pp.47, 714), (Pruitt & Adlin 2006, pp.189-208)
- Behavioral patterns (Cooper & Reimann 2007, p.99), (Goodwin 2009, pp.242-267)
- Latent semantic analysis, LSA, (Miaskiewicz et al. 2008)
- By applying elements of theatrical performance (Shyba & Tam 2005)

The LSA and theatrical performance methods were not known to the authors at the time of data analyzation and persona modeling. But they are worth to be mentioned because they represent two opposite concepts of the creation process. While the LSA method reclaims to create personas automatically from textual analysis of transcribed interviews, the method described by Shyba & Tam utilizes the artistry of theatrical performances to develop personas. For future research an objective comparison of these methods could be a valuable contribution. For example different teams could create personas out of the same user data with each team using one of the methods. The personas in this work were created following one single procedure. Using different methods and comparing them was out of scope. Only the two methods that were most familiar to the authors were evaluated and one of them finally chosen.

*Affinity diagrams*

Affinity diagrams are used not only for creating personas but are a general method for summarizing large amounts of data (Courage & Baxter 2004, p.715). The method is described in general by different authors (Beyer & Holtzblatt 1998, pp.154-161), (Courage & Baxter 2004, pp.715-721). To create especially personas from affinity diagrams is characterized in different extent. Courage & Baxter do not give additional hints and describe the procedure as more an art than a science (Courage & Baxter 2004, p.47). The most detailed description is called the assimilation method (Pruitt & Adlin 2006,

p.189) The key data points (factoids) are identified in the data sources, transferred to sticky notes and then assimilated in affinity diagrams. The factoids are grouped by factoid clusters and user categories. From the affinity diagrams subcategories are identified and from these persona skeletons are created. The persona skeletons are the base for the detailed persona design.

Affinity diagrams are a common method for summarizing data out of different interviews. Pruitt & Adlin consider this method to be quick, easily understood and collaborative (Pruitt & Adlin 2006, p.189). We used affinity diagrams for creating personas in the practical project of the first course year. Although it is indeed easily understood at first sight there are some problems we encountered when creating personas with this method:

- Deciding what is a „factoid“: the factoid term is quite ambiguous, data points of different types are summarized in one factoid.
- It is only sufficient to analyze the data of a limited amount of interviews. With our 16 interviews in the thesis affinity diagrams seemed to be not the ideal method.

### *Behavioral patterns*

A different approach for creating the personas is to identify behavioral patterns (Cooper & Reimann 2007, p.99). Goodwin describes the procedure in detail (Goodwin 2009, pp.242-267). A set of attributes with opposite behavioral variables is created and the interviewees are classified for each attribute. Interviewees that match frequently in their variables are circled. If the similarity is not that strong the circles can be indicated with dashed lines.

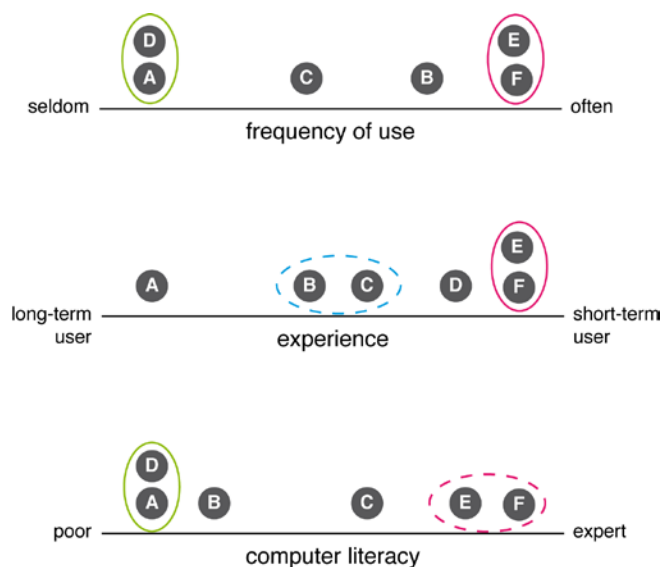


Figure 8: Example of behavioral attributes

A behavioral pattern might exist when the matches exceed more than a third of all the variables. From the behavioral patterns proto-personas are created. These are the base for the final detailed design of the personas.



### 3.9.12. The Persona Creation Procedure for this work

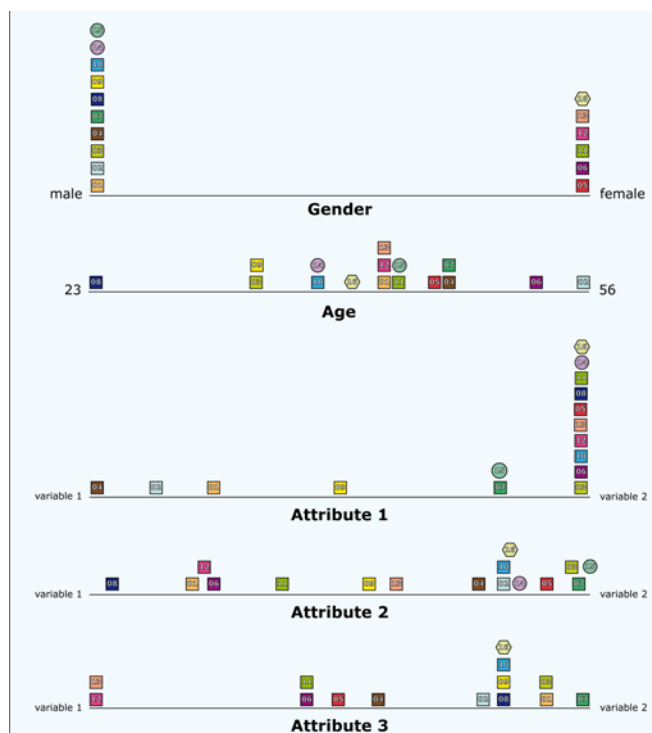
For the thesis we decided to model the personas by behavioral patterns as described in the previous subchapter. Goodwin described the procedure in detail and it looked more traceable than affinity diagrams. Because of the relative high number of interviews the intermediate results were clearer and the processing was considered to be much more convenient. We had previous experience with affinity diagrams and at that time there was a portion of uncertainty about the process especially when the personas were deduced from the affinities.

#### *Step 1: Define Behavioral Attributes and Characterize the Interviewees*

We defined 24 attributes related to the problem domain and characterized the interviewees for each attribute. The attributes were divided into different groups (the actual attributes can be found in the results chapter which is not available to the public):

- Demographic and general attributes
- Medical attributes
- General device attributes
- Feature related attributes

The demographic and general attributes cover gender, age and three additional characteristics.



*Figure 9: Demographic and general attributes*

The medical attributes are related to the health situation of the interviewees.

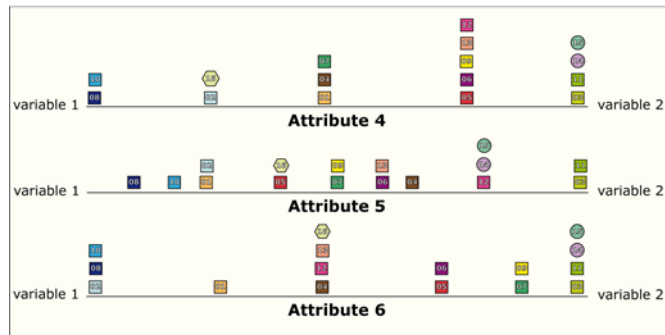


Figure 10: General medical attributes

The attributes related to the device usage characterize the general handling of the device.

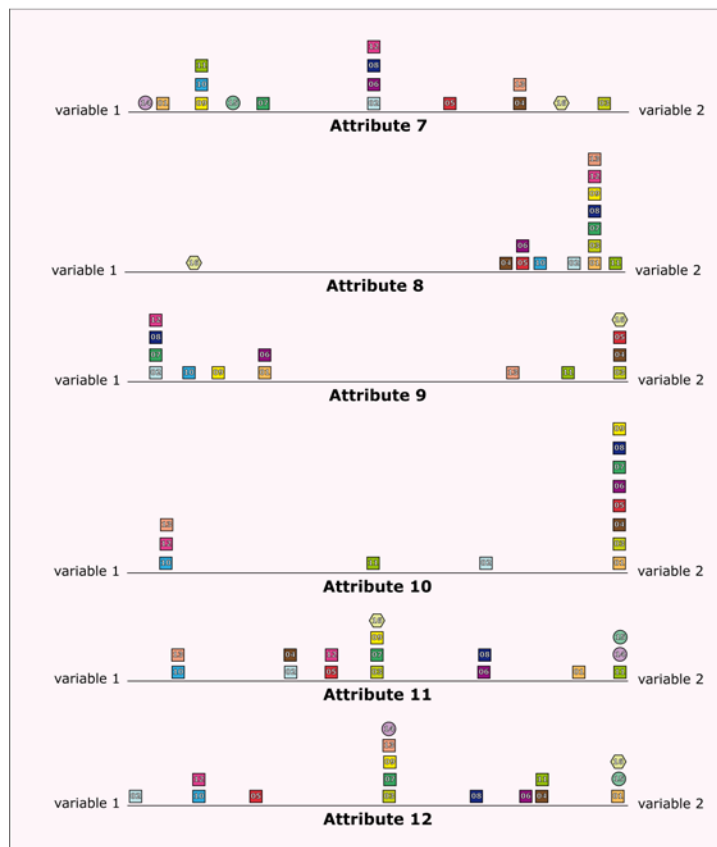


Figure 11: General attributes related to the device usage

The feature related attributes characterize the concrete usage of the device. For example, which features are used frequently? Which are important? Which are never used?

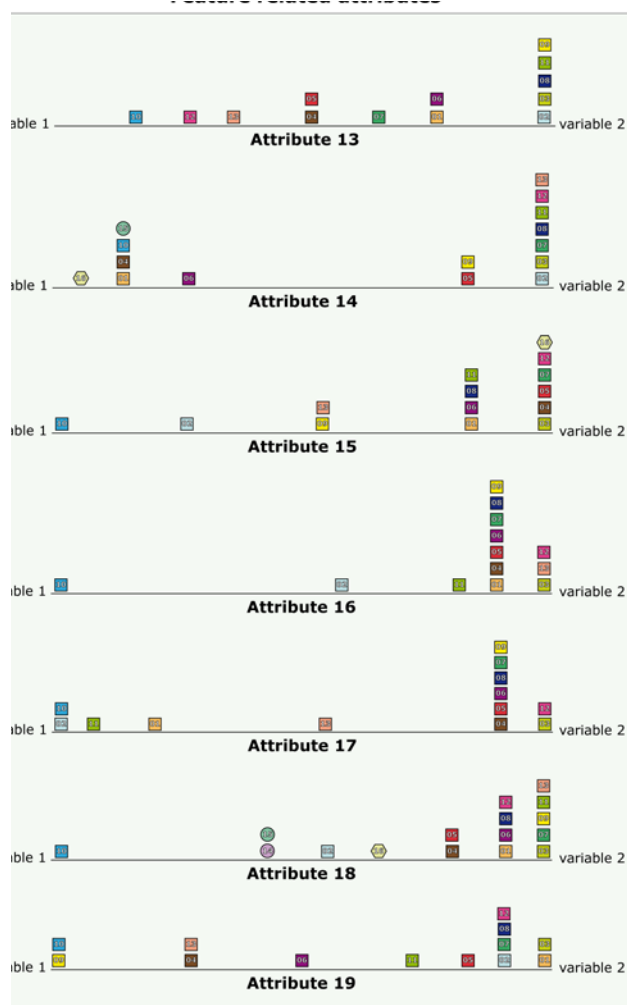


Figure 12: Feature related attributes

### Step 2: Identify clusters

Where interviewees seemed to match frequently they were circled and considered for a possible cluster. Goodwin suggests that if more than a third of the attributes are similar this cluster might represent a proto-persona. This was an iterative task and we looked back into the interviews and at the general picture we had of the candidates. Some clusters identified in the beginning turned out not to work, because the interviewees were completely different in important attributes, for example the interviewees. no.3 and no.11. In a first iteration they were matching in more than a third of the attributes. But in the use of the insulin pump no.3 used the complete functionality range while no.11 only used a limited functionality. This step of the persona creation is the most interpretative part of the persona creation. It is an individual process that might change from project to project and the standard procedure described in the literature should be reviewed carefully. For our needs not all steps fitted as described by Goodwin although in general it was a good and valuable guideline. Especially the recommendation to cluster interviewees when the matches exceed a third of the attributes was

too general in this project. Some attributes are such important that they serve as key attributes. If interviewees do not match in these attributes they should not be combined in one persona.

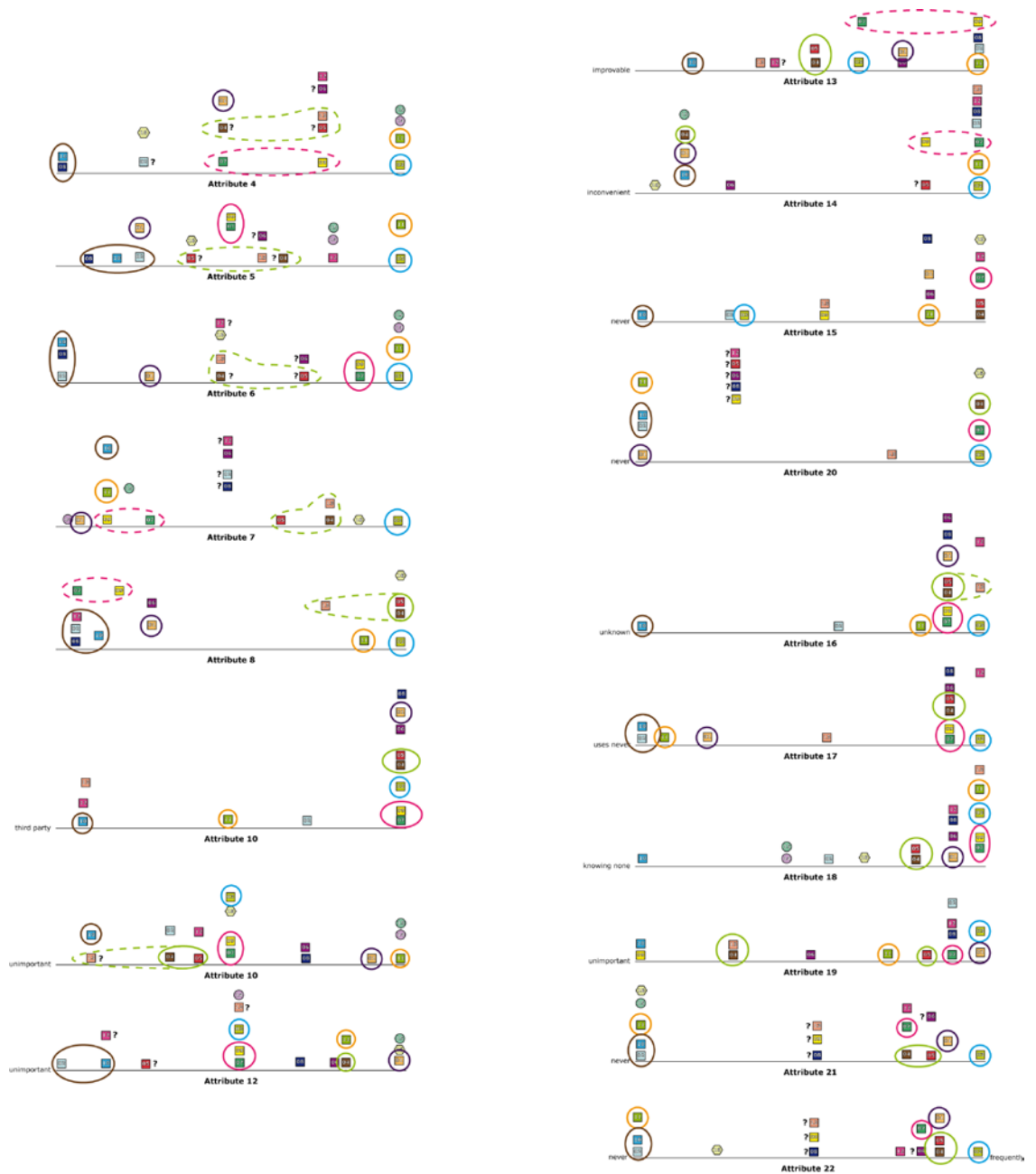


Figure 13: Persona modeling - Identifying attribute clusters among the interviewees

It must be emphasized that the clustering is not a statistical technique. As the graphic above shows, there are circles which mainly consist of one single candidate, for example the lighter blue one. The persona that results from this cluster is mainly based on candidate no.3. From a market segment point of view such users seem to be quite unique and might not be representative enough as a target group. But it would fudge the results if we would have mingled this candidate into another cluster.

### Step 3: Creating persona paths

From the clustering six proto-personas were identified. To visualize the proto-personas we connected the clusters by colored paths. This helped us to identify possible duplicate proto-personas. If paths would run parallel they would rather be similar characters and not resulting in different personas. The graphic shows that the paths have a good variability and none of them is parallel to another one. The persona paths were our basis for the concrete persona design.

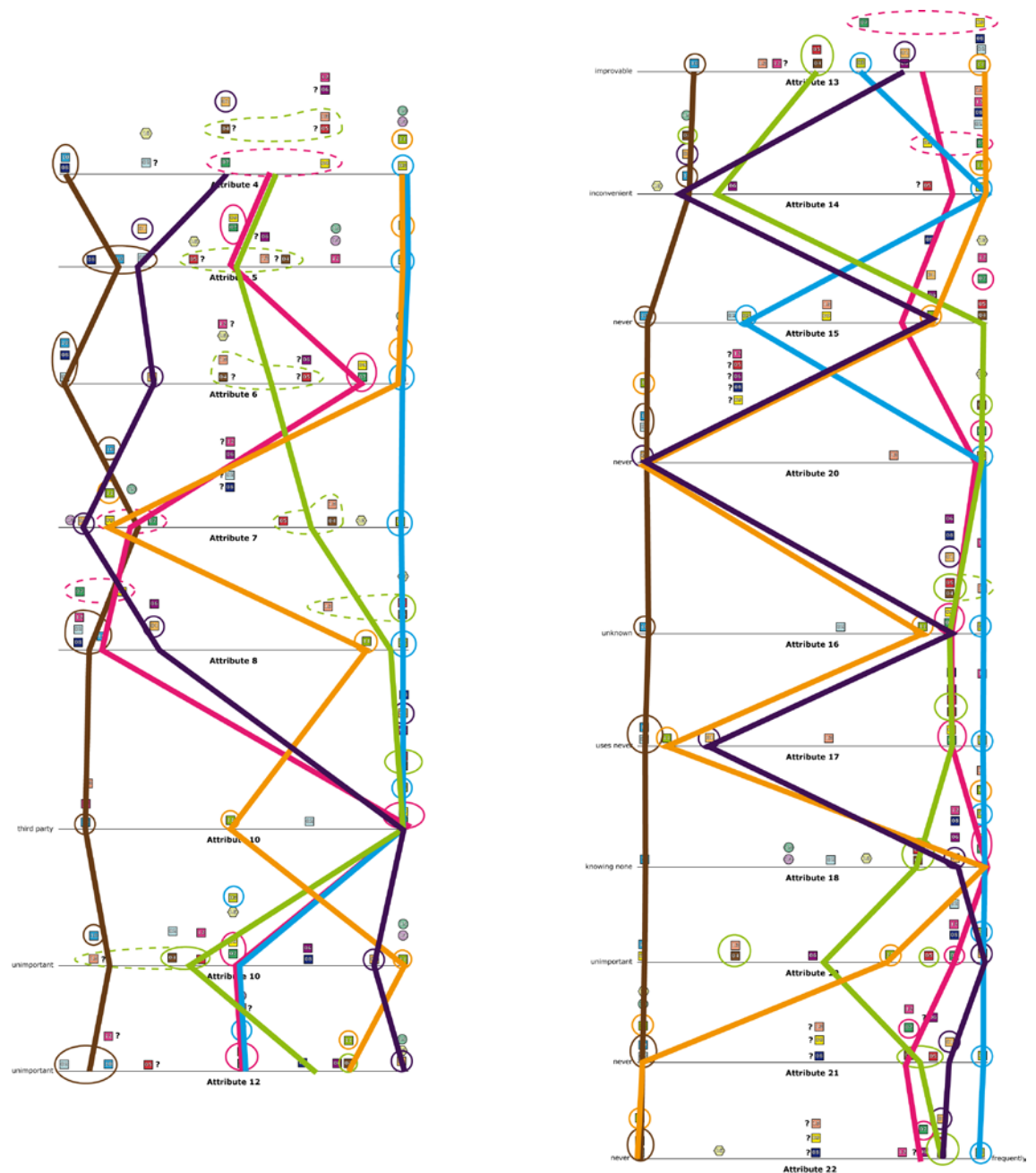


Figure 14: Persona paths based on the attribute clusters

### 3.10 Scenarios

Together with personas, scenarios are another important method in usability projects. Cooper mentions three different scenario types (2007, pp.112-113):

- Context scenarios are used in the pre-design phase and written from the persona's perspective, focused on human activities, perceptions and desires. Context scenarios describe the ideal user experience.
- Key path scenarios are revised context scenarios that are created when the product's functional and data elements have been designed. They describe user interaction and introduce specific vocabulary.
- Validation scenarios are used to evaluate the design solution in a variety of situations.

#### *Scenarios in this work*

The scenarios used in this work are context scenarios and are implemented in the persona descriptions. They focus on the personas activities, describe ideal user experiences and establish the primary touch points a persona has with the system (Cooper & Reimann 2007, p.119). Context scenarios should be broad and shallow in scope, not describing the concrete product interaction.

### 3.11 Lead Users and Case Studies

The recruiting process of the diabetics was sluggish especially in the beginning. There was the risk that the data base could be too weak for creating the personas. Although the first interviews were promising to unveil very interesting facts about the usability of the device we looked for alternative ways and methods. One alternative was to concentrate on these rare but interesting users and present the results as single case studies. The case study methodology originates before the 20th century in Europe and was established in the U.S. by the Chicago School in the field of sociology (Tellis 2007). The method underwent different ups and downs. We considered the case study method during the period when it was not clear if the data would be sufficient to create personas. During this period alternative concepts of qualitative user research were discussed. Based on the interesting interviews with the rare but engaged users we developed an idea of single, visionary users that act as the first UCD instance of a product and called them lead users. In the literature such a concept was already described by Eric von Hippel in the field of innovation research (1986). Surprisingly this method did not find its way into the usability field. Because the number of interviews increased we had sufficient data to concentrate on our initial goal in creating personas. The case study and lead user methods were dropped. Because they seem to be suitable methods also for the user centered design domain we decided to at least mention them here proposing further research if they are suitable for usability projects.

### 3.12 Design Strategy Analysis Grid

The medical device of our industry partner is in the early requirements phase and there are different options for the final product strategy. In this early stage several marketing issues influence the final decision about the pump type:

- Looking for cooperations with other companies
- Estimation of market potentials
- Pricing considerations
- Support and service considerations
- Innovation potential

These subjects were not part of this thesis but we wanted to bring our results into the above mentioned context because there was not always a sharp separation possible between marketing and design issues. Additionally we wanted to emphasize that it is necessary to classify the personas. Because the product strategy was not finalized during our thesis, we could not define one primary persona. To emphasize the need of defining primary personas we combined the potential design strategy for the medical device with the goals and motivations of the users and called it the design strategy analysis grid which is basically inspired by the Task Analysis Grid (Warfel 2006). It is desired to be used in earlier stages of the product development cycle when user relevant questions occur but the design strategy is in motion.

The grid contains different design strategies assigning each strategy to one primary persona. The design strategies were developed from the current and future developments of insulin pumps as well as from the persona's goals and motivations (see Chapter 5, page 82 for the artifact).

## 4 Persona Deliverables

*Not for public use*

*Pages 46 to 75 are not part of the public version of this document*



## 5 Further Deliverables

*Nor for public use*

*Pages 76 to 85 are not part of the public version of this document*

## 6 Critical Review and Reflexion

### 6.1 Approved and Disproved Hypotheses

*Not for public use*

### 6.2 Recruiting

*Not for public use*

### 6.3 Working Plan and Efforts

The thesis is focused on the initial phase of the user centered design process. The discussions often went into the direction of answering marketing or product innovation questions and it was not always possible to ignore such topics. We did not follow a standard user centered design procedure model but adopted elements of such models where appropriate.

#### *Project phase*

Our course of action is divided into the following phases:

- Preparation phase (May – June 2009)
  - Initial discussion with our industry partner
  - Project proposal and approval by course administration
  - Kick-off with Product Manager Head of Software Development, and Coach
- Analysis and research phase (June – September 2009)
  - Define initial hypotheses with the industry partner
  - Familiarization with the problem domain
  - Recruiting of candidates
- Interview phase (July – October 2009)
  - Create questionnaires
  - Field work
- Design phase (October – December 2009)
  - Persona modelling from interview data
  - Design mood boards
  - Develop design strategies from interviews and research
  - Align personas with design strategies
- Report phase (October -January 2009)
  - Define the main and sub-chapters of the report
  - Create templates and documents for writing within a locally separated team of authors
  - Design the persona posters
  - Create the content for the report

#### *General efforts for the project phase*

The general efforts for the particular phases and the individual working plans of the authors are compiled on the annexed CD-ROM.

## 6.4 The Cost of Personas

Among usability professionals there is consensus that personas should be created from real user data, e.g. from interviews and/or observations. Designing personas in this way is a significant cost factor and should not be neglected in usability budgets. It would be interesting to carry out research in the comparison of „cheap“ and „expensive“ personas because studies in this field seem not to exist. The six personas in this thesis were developed based on 18 interviews. The complete cost in terms of hours is listed below including the research on the best suitable method.

<i>Subject</i>	<i>Tasks</i>	<i>Effort in hours</i>
Recruiting	Letters, leaflet, phone calls, informal interviews	56
Data acquisition	Create questionnaires, field work (interviews), interview data processing, research forums	96
Data analysis	Concept and modeling, Description, photo, name, szenarios	170
Persona design	Review, layout, design, literature/ study review and reserach	27
Persona mood boards	Literatur/study review and reserach, photo search, design	25
Total		374

*Table 2: Total effort*

## 6.5 Applying Knowledge of the MAS HCID Course

This thesis is positioned in the initial product development phase. The applied methods focus on lesson contents taught in the first year, the requirement engineering course. Although lesson contents from the second year like interface design, prototyping and evaluation methods were not applied in our study we could profit from parts of the course programme especially the design part. These elements are reflected in the design of the persona posters where we developed a consistent identity in terms of visualization, colors and typography. Additionally the learned content was valuable for the layout and typography of the report.

Recruiting was not a subject-matter in the requirements engineering course. In our project it was quite important (see also the chapter Recruiting the Interviewees on page 25). Kuniavsky (2003, pp.84, 87) warns „Recruiting is a time-consuming process, especially for relatively rare groups“ and „Recruiting is almost a full time job in itself, and it always turns out to be more work than anticipated“.

We discovered methods that were not taught or mentioned in the course. Browsing internet forums as a qualitative research method was quite valuable. As well as mood boards to enrich personas and communicate visually.

Usability engineering for medical devices is regulated by international standards. This fact was new to us. Usability in the medical engineering field is mainly based on risk management. The medical device industry seems to be an interesting field for usability experts and we think it would be worth if the specialties of these industry would find their way into the course programme of the MAS HCID course.

Our industry partner uses a software development process that is strongly inspired by the V-model. For this thesis we got deeper into knowledge of the V-model and attended a partner internal training. In the Requirement Engineering course of the MAS HCID degree course we learned to know the V-model as inflexible and analogical to the waterfall model. This is not correct. In the V-model, and the updated version, the V-model XT, iterations are intended. Another important characteristic is tailoring, as it is with RUP (Rational Unified Process).

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## 8 Glossary

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