
Revisiting Personas: The Making-of for Special User Groups

Christiane Moser

ICT&S Center,
University of Salzburg
Sigmund-Haffner-Gasse 18
5020 Salzburg, Austria
christiane.moser2@sbg.ac.at

Verena Fuchsberger

ICT&S Center,
University of Salzburg
Sigmund-Haffner-Gasse 18
5020 Salzburg, Austria
verena.fuchsberger@sbg.ac.at

Katja Neureiter

ICT&S Center,
University of Salzburg
Sigmund-Haffner-Gasse 18
5020 Salzburg, Austria
katja.neureiter@sbg.ac.at

Wolfgang Sellner

ICT&S Center,
University of Salzburg
Sigmund-Haffner-Gasse 18
5020 Salzburg, Austria
wolfgang.sellner@sbg.ac.at

Manfred Tscheligi

ICT&S Center,
University of Salzburg
Sigmund-Haffner-Gasse 18
5020 Salzburg, Austria
manfred.tscheligi@sbg.ac.at

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

CHI '12, May 5–10, 2012, Austin, Texas, USA.

Copyright 2012 ACM 978-1-4503-1016-1/12/05...\$10.00.

Abstract

The diversity of special user groups, i.e. elderly from 50 to 90 years and children from 6 to 14 years, is huge. Assessing their requirements is challenging, as it requires sensitivity in terms of choosing an appropriate approach to collect data. Furthermore, the illustration of the data for the subsequent design process can be difficult, if different partners are involved in a project. In order to overcome these difficulties, we are exploring a decision diagram for the creation of personas. It aims at identifying the most appropriate approach (i.e. qualitative and/or quantitative data collection), taking into account the characteristics of the special user groups among other aspects. In this case study we present how we applied the decision diagram in three different projects to create personas for elderly and children.

Keywords

User-Centered Design, Personas, Special User Groups, Elderly, Children

ACM Classification Keywords

H5.2 [Information Interfaces and Presentation] (e.g., HCI): User Interfaces (Evaluation/methodology, User-centered approach)

General Terms

Design, Human Factors

Introduction

The goal of technology development is to design for a positive user experience and high acceptance. Two of the most critical success factors are the understanding of the user (e.g., needs, preferences) and the involvement of potential users into the development process, especially when developing for special user groups. Although developers and designers try to keep the end users in mind, they often do not belong to the same generation and thus the development might be driven by assumptions. *"It may seem obvious that adults, not youth, design and produce youth entertainment media"*, but these products do not necessarily reflect youth perspectives and needs [14].

By applying user-centered design (UCD), user characteristics are gathered in user studies and/or from literature review in the analysis phase. These characteristics may include needs, skills, behaviors, motivations, frustrations and demographic data. Within the recent HCI community, many different qualitative and quantitative approaches are available such as observations, workshops, interviews, surveys, ethnographic studies, etc. Nevertheless, the involvement of special user groups, like elderly and children, is often challenging due to a lack of participants or restricted access, among other reasons.

Additionally, age-related changes can influence the ease or difficulty when interacting with technologies. Elderly people might face multiple disabilities such as visual impairments, perception deficiencies, hearing loss or cognitive declines like dementia that are increasing and affecting each other [26]. Therefore, the physical capabilities and resulting needs have to be considered and more sensitive information-eliciting

techniques are required [29]. Other issues are important when working with children. Skill development as well as preferences for expressing themselves (e.g., verbally or through drawings) vary with children [2, 19]. Thus, traditional methodologies (like workshops or interviews) are often inappropriate and need to be adapted [20, 29, 34]. In order to overcome these issues, some authors [8, 29] suggest including experts as representatives of the user.

Generally, the data from as many users as possible should be collected in the analysis phase. This typically results in a long list of user characteristics (e.g., needs) that might be difficult to prioritize, easy to misinterpret or hard to understand for development team members or project partners. For example, if the results are presented as statistic figures and a project partner has little statistical knowledge, it can be difficult to gain a common understanding about the users.

The diversity of elderly (50 to 90 years of age) and children (6 to 14 years of age) is huge. The differences in terms of ability and skills make it difficult to categorize them [5]. The creation of personas has been motivated by the aim to better handle these issues through extracting the most important information from the assessed data. Personas help to make explicit assumptions about the target users [1, 19] and enable a focus on important characteristics across many users [28]. A *persona* is a type of user model or an archetypical representation of real and potential users, which illustrates the individuals' characteristics (e.g., needs, skills, behaviors, motivations, frustrations, and goals when interacting with a technology) [3, 7, 12]. However, it is not a description of a single or an average user.

Originally, Cooper [6] introduced personas to the HCI community. The knowledge about them is now widespread and, in recent years, mainly two topics were discussed: 1) *how to make them more memorable and tangible for those, who need to apply them* (e.g., [4, 15, 30, 33]) and 2) *how to develop and create personas* (e.g., [1, 10, 22, 24, 25, 28]).

As HCI researchers, who are involved in three different research and development projects, we were responsible for the user analyses and the creation of personas for special user groups (i.e. elderly and children). Therefore, we are especially interested in the second topic on the development and creation of personas. In our projects we emphasized the importance of tying personas to research results and careful analysis. The usage might fail when they are not seen as credible and not associated with methodological rigor or trustworthy data, which was pointed out by Freydenson [11], Goodwin [12], Pruitt and Adlin [32]. As different types of personas can be distinguished by the approach used to create them (i.e. based on quantitative or qualitative data or a combination), we developed a *decision diagram* which supported us in finding an appropriate approach.

The application of the decision diagram is described in the Use Cases section and refers to the following three projects: CVN, FamConnector, and Games4School. Within the CVN project, a tele-presence system is developed aiming at socially connecting elderly with their family, caregivers, and peers. The FamConnector project aims at developing an online platform offering intergenerational online activities for geographically distant grandparents and grandchildren. In the Games4School project, mini-games are developed

together with 60 children of three classes of a secondary school, which should be fun, support co-experience, and fostering children's movement.

Approaches for Creating Personas

As "*personas are still in their infancy, and modifications may need to be made to the persona method*" [25], this paper aims to advance personas by structuring the decision process to choose a suitable persona creation approach. Miaskiewicz et al. [25] indicate that there is no advocated or universal method for persona identification and creation. Therefore, we distinguished three different approaches for the creation of personas regarding the data collection process:

- A qualitative approach (i.e. gathering only qualitative data), e.g., [1, 7, 10, 25]
- A quantitative and qualitative approach (i.e. assessing both qualitative and quantitative data), e.g., [27]
- A quantitative approach (i.e. gathering only quantitative data), e.g., [24]

In the following, we provide a brief overview of important approaches, which represent the foundation for our decision diagram. This section also aims at providing references for further reading, if more details are required.

Qualitative Approaches

Different qualitative approaches are available, whereof the original one was described by Cooper et al. [7]. The data collection is based on behavioral variables (which are used to identify behavior patterns) in order to gain all relevant information focusing on activities, attitudes, motivations and skills. Cooper et al. [7] do not describe

in detail how the data for the personas are collected and analyzed. For more profound descriptions see Calde et al. [3], Freydenson [11] and Goodwin [12].

Faily and Flechais [10] suggest a qualitative approach that is driven from a grounded theory model using data from interviews or ethnographic research. They created “Persona Cases”, i.e. personas, whose characteristics are grounded in and traceable to their originating source of empirical data.

Based on user interviews or narrative observations, Mulder and Yaar [28] build user categories, called segmentation. This is done either qualitatively (i.e. categories are built manually) or quantitatively (i.e. by performing a cluster analysis).

Miaskiewicz et al. [25] use Latent Semantic Analysis (LSA) in order to identify the personas directly from textual data. LSA uses the contexts in which words appear to determine similarity in meaning. For example, it calculates the similarity of the interviewees’ answers to specific questions in order to provide an objective representation. This is the basis for applying a cluster analysis.

Regarding personas for children, Antle [1] suggests including theoretical and empirical data as well. She proposes relying on literature regarding developmental psychology in order to define childhood needs and children’s developmental abilities. The context of the specific project is needed only for specifying the experiential goals. This helps to define how the product might support having an experience.

Combined Quantitative and Qualitative Approach
Moser et al. [27] conducted a probing study with children aged 10 to 14 years in order to gather quantitative and qualitative data to overcome the problem of subjectivity when creating personas. They conducted a cluster analysis on the quantitative data to segment the children and enriched it with the qualitative data.

Quantitative Approach

McGinn & Kotamraju [24] also address the problem of subjectivity and, therefore, introduce a pure quantitative approach for the persona creation. They distributed a survey in order to get first-hand data of end users. They were able to obtain statistically significant data, with which they conducted a factor analysis to define groups for personas.

In order to find out, which of the presented approaches is the most suitable one for our three projects, we developed a decision diagram for the creation of personas for special user groups.

Decision Diagram

Before working with the decision diagram, it is necessary to define the behavioral variables that should be investigated according to the project goals. The more they are focused on the project goal or the technology, the more the personas will illustrate the target end users. For the identification of the most suitable data collection approach(es), several aspects should be considered in advance, i.e. the pre-knowledge, existing skills, the sample size, or available resources (see Figure 1). Some of these aspects are more general and others address in particular the special user groups.

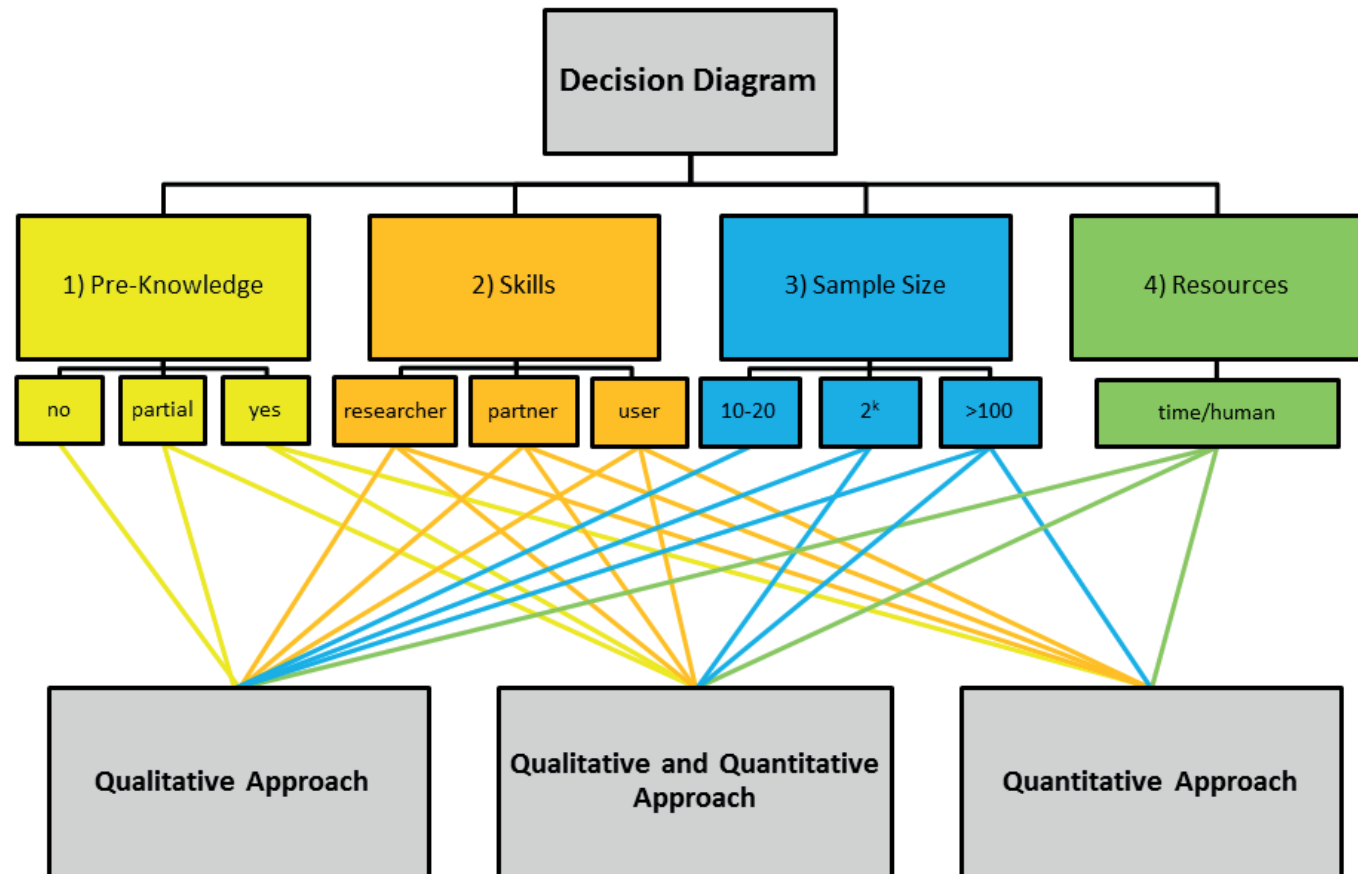


Figure 1. Decision Diagram for Persona Creation for Special User Groups

Regarding special user groups it is important to consider the users' characteristics, e.g., elderly's impairments, younger children's missing abilities to read or write. Equally important are the available sample size and the knowledge regarding the behavioral variables, which can be assessed beforehand

(e.g., from literature). The skills of the researchers and project partners about qualitative and quantitative data collection and/or analysis methods are also crucial. Moreover, the available time and human resources should be kept in mind.

Those aspects have been extracted from literature (e.g., Mulder and Yaar [28], Pruitt and Adlin [32]), and are representing our own experiences with UCD and special user groups. In the following it is described in detail how the four aspects of the decision diagram should be applied to find a suitable approach. Although some of them might influence each other, they should be considered separately in order to avoid for example judging the sample size regarding the resources needed.

1) Pre-Knowledge:

In a first step it is important to find out whether there is access to existing primary data sources, e.g., data from previous user studies, market research or secondary literature [28]. This data could provide insights on the defined behavioral variables, and could be used as a basis for gaining representative results.

Accordingly, if there is no pre-knowledge available, an exploratory qualitative approach would be appropriate, as quantitative approaches are mainly used to assess the quantitative distribution of known phenomena (i.e. knowledge) [16]. Therefore, a connection line should be made to the qualitative approach (see Figure 1). If there is partial pre-knowledge available, a qualitative or a combined qualitative and quantitative approach would be adequate and connection lines should be drawn (see Figure 1). This means for the combined approach that the existing knowledge could be used to phrase survey questions in order to get representative answers. Additionally, the missing knowledge can be explored qualitatively. Only if there is sufficient pre-knowledge available, a connection line should be made to the quantitative approach. The combined approach is also suitable in this case (see Figure 1).

2) Skills:

As special user groups are targeted in our projects, their specific characteristics (e.g., skills or impairments) also need to be considered carefully for an appropriate selection of the research approach (as explained in the introduction). For example, elderly people might have difficulties with hearing, attention and the ability to follow conversations, which might influence the flow of discussions (e.g., within focus groups) [17]. Younger children might lack skills that are integral to most interviewing techniques [1]. Therefore, it is necessary to define the target user group and their specific characteristics in order to identify the most suitable approach for involving them.

In the second step, it is necessary to identify whether the researchers (who will create the personas) are familiar with qualitative and/or quantitative approaches (do they have the skills to perform them or have the possibility to gain those skills?). It is also important to consider the skills of the partners involved in the project (e.g., other researchers, developers or end user organizations). Therefore, it is important to find out whether partners have skills regarding qualitative and/or quantitative approaches and are able to interpret the results (e.g., statistical calculations and figures).

Accordingly, connection lines should be made between the researcher, partner or user and the different approaches (see Figure 1).

3) Sample size:

In a third step, the number of users (i.e. elderly or children) available for the data collection needs to be defined roughly. According to Mulder and Yaar [28], a

small sample size of 10 to 20 users is appropriate for qualitative approaches in order to explore and uncover previously unknown data about behavioral variables.

In order to perform a cluster analysis for the combined qualitative and quantitative approach we suggest a sample size of more than 2^k users (Formann; quoted in Dolnicar [9]), whereof k represents the number of behavioral variables to be investigated quantitatively.

For the factor analysis of the quantitative approach a sample size of more than 100 users would be appropriate [11], but there are also other calculations suggested in literature (for a detailed discussion see [23]). This sample size would also be suitable for the combined approach.

A sample size of more than 2^k or more than 100 users is also suitable for the qualitative approach. However, this should be considered carefully, as it might be very resource intensive, e.g., to interview a large number of users. This is considered separately in the next aspect.

4) Resources:

The research approach but not its content will be influenced by the available or needed resources regarding time and humans. Therefore, the resources do not belong to the design of the research approach but to the "environment" [21], which is also important to consider. All forms of data collection require a lot of time and many human resources. However, as soon as people can participate without a researcher being present (e.g., in a questionnaire or probing study), there are lower administrative costs than in face-to-face interviews [31]. Although a large sample in qualitative research will almost always improve the

certainty of inferences, too much information can also be disadvantageous due to its demand of human resources for the analysis [16]. According to Robson [31], the data collection period is the shortest for example in telephone interviews, while distributing a postal questionnaire will require more time (e.g., sending reminders). Therefore, Robson [31] suggests using group settings, within which the participants complete questionnaires, as this will not be time intensive. This is the only aspect that is related to another aspect, i.e. the sample size.

If few human and time resources are available, the following possibilities would be suitable: 1) a quantitative approach for a big sample size, 2) a qualitative approach for a small sample size or 3) the combined approach with a small sample size (which still needs to be appropriate for the cluster analysis on basis of the behavioral variables). All approaches are possible, when there are many human resources available and enough time for the data collection and the analysis. Accordingly, connection lines should be made between the time and human resources and the different approaches (see Figure 1).

The final decision about the most suitable research approach to create personas for special user groups should be based on the number of connection lines that were assigned between the aspects and the different approaches. The research approach, which has one or more connection lines from all aspects, should be selected. If this is true for more than one research approach, the one with the most connection lines should be selected. If none of these procedures is possible, connection lines can be prioritized according to the project goal for deciding on the most appropriate

approach. In the following, Use Cases for three different projects will be described.

Application of Decision Diagram and Persona Creation Approaches (Use Cases)

The two European research and development projects from the AAL joint program involve research institutes from various backgrounds (not only HCI), industrial partners (mostly SME) and end user organizations from different countries. In the CVN and FamConnector projects an effective communication and coordination is challenging for example due to language barriers, different knowledge levels and transfer as well as the physical distance. The third project, Games4School, is a research-education-cooperation funded by the Austrian National Government that involves a research organization and a secondary school.

CVN Project

The CVN project aims at developing a small scale “Connected Vitality Network” to fulfill meaningful social interactions (e.g., with family members, friends, caregivers) via a tele-presence system. It lasts for three years and involves three research and four end users organizations as well as two industrial partners from seven different countries.

At the beginning of the persona creation process, behavioral variables for elderly were identified, namely their family situation, social contacts, activities, means of communication and their ICT interest/experience. Additionally, hints in form of requirements, as well as primary usage reasons in form of required program formats were considered relevant. Regarding the decision diagram for the elderly personas, the following connection lines were made:

1) Partial pre-knowledge was available from literature, e.g., elderly’s social interactions. However, little knowledge was available about the social contacts the elderly have and activities they conduct.

2) All partners were familiar with the three research approaches. Elderly with minor age-related restrictions (e.g., limited mobility) were targeted in the project, which could e.g., make it hard for them to travel to the workshops. However, the end user organizations were very ambitious to compensate these restrictions (e.g., conducting workshops in senior homes or visit the elderly with limited mobility to fill in questionnaires together). Therefore, no research approach(es) needed to be excluded (see connection lines in Figure 2).

3) The available sample size for the elderly was estimated by the end user organization with more than 300. At least $2^7=256$ users were needed to investigate the seven behavioral variables with the combined approach. As more than 100 elderly were available, the qualitative and quantitative approaches were also possible. Therefore, connections lines could be made to all approaches as shown in Figure 2.

4) Enough human resources were available to perform a combined or pure quantitative research approach. For conducting a pure qualitative approach with more than 300 elderly not enough resources were available. Furthermore, the project partners were not willing to reduce the number of participants.

According to Figure 2, the combined qualitative and quantitative approach was finally selected, as it is the only approach that satisfies all four aspects. For the persona creation workshops, expert (i.e. caregivers)

interviews, end user interviews, and an offline and online survey were conducted to gather quantitative and qualitative data. Following the data analysis of Moser et al. [27], the quantitative data was segmented using a cluster analysis and enriched with qualitative data. We experienced that it is important to assess all behavioral variables both quantitatively and qualitatively, in order to appropriately assign the data to the clusters.

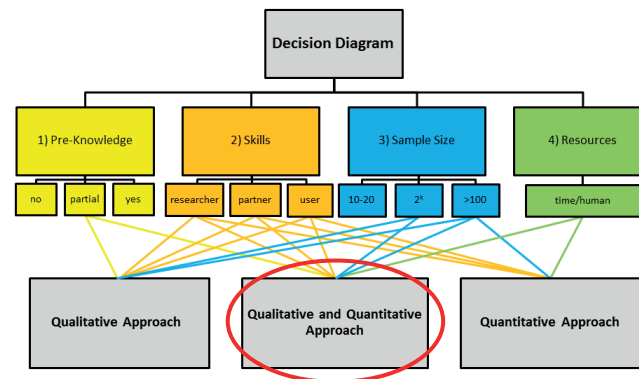


Figure 2. Decision Diagram for Elderly Persona

From the created personas, “Anna” was selected (see Figure 6), as it best represented the targeted user group with minor age-related impairments. It was then used to phrase the recruiting profiles for end user studies.

FamConnector Project

The objective of FamConnector is to establish a generic product in the field of meaningful online inter-generational interactions between geographically distant older adults (i.e. grandparents) and young children (i.e. their grandchildren aged 3 to 9 years). In

this project, the focus is on the elderly as primary users and children as secondary users. It lasts for two and a half years and involves two research and two end user organizations as well as one industrial partner from four different countries.

The first step of the persona creation process was to identify behavioral variables for the grandparents, namely their computer experience, their ICT usage, their family situation, and, in particular, the relationship with their grandchildren. The goals, frustrations and pain points, as well as the primary usage reasons were considered also relevant. For the children the following behavioral variables were identified: family and friends (especially the relationship to the grandparents), hobbies and talents, computer experience and ICT usage, goals, frustrations and pain points, as well as primary usage reasons. Regarding the decision diagram for the elderly and child personas, the following connection lines were made:

1) Partial pre-knowledge was available from literature, e.g., the ICT usage of elderly and children. However, there was little knowledge available about the characteristics of the relationship between grandparents and grandchildren.

2) The research partners were familiar with all three research approaches but not the end user organization or the industrial partner. The targeted grandparents should be active elderly with minor to no restrictions. Thus, there were no specific characteristics which would exclude one or more research approach(es) (see connection lines in Figure 3). Nevertheless, we had to consider the specific characteristics of the grandchildren (aged 3 to 9 years), like the missing ability to write.

Therefore, the combined and the quantitative approach were excluded (see connection lines in Figure 4).

3) The available sample size was, estimated by the end user organization, around 20 elderly and around 10 experts (e.g., teachers, psychologists) for the children. Accordingly, for both grandparents and grandchildren only the qualitative approach was appropriate (see connection lines in Figure 3 and Figure 4).

4) Enough human resources were available from the research and end user organizations to perform all three research approaches.

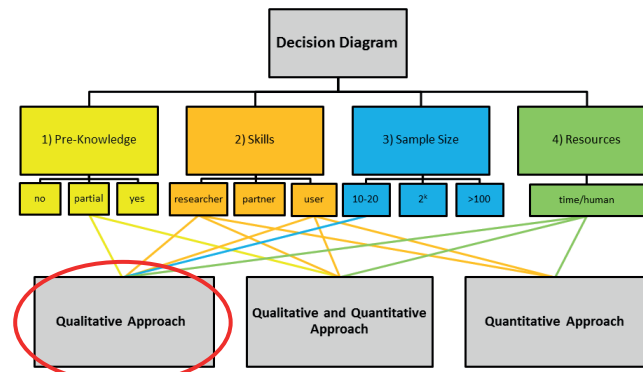


Figure 3. Decision Diagram for Elderly Persona

According to Figure 3 and Figure 4, a qualitative approach was selected for both persona creations, as being the most suitable one, which satisfies all four aspects. In order to collect data about the elderly's and children's characteristics (e.g., ICT usage, computer experience) workshops, expert and end user interviews were conducted. The personas for the elderly were created following Cooper et al. [7] and for the young

children following Antle [1]. Afterwards, offline and online questionnaires were distributed for validation purposes of the elderly personas.

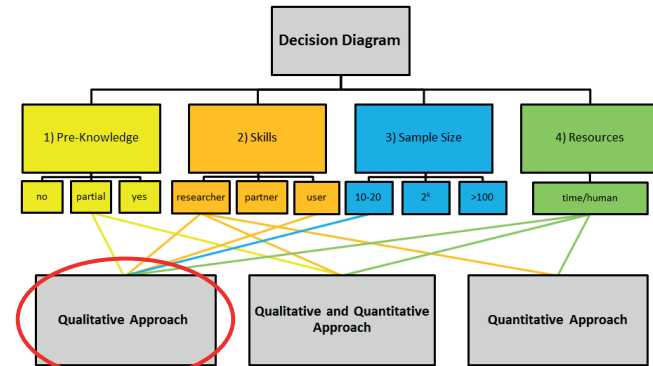


Figure 4. Decision Diagram for Child Persona

From the three developed personas for grandparents two were selected by the partners to further work with. An outline of one persona called "Albert" is exemplarily provided in Figure 6. The selected two personas proved to be useful to phrase the recruiting profiles for end users. These profiles were used for workshops and user studies in order to evaluate the online platform. The respective results were additionally described for each persona in order to communicate them to the project partners. Thus, the results were more tangible and memorable, especially as the personas were also used to present the requirements in the design process.

All three child personas were used for heuristic evaluations with HCI experts, in order to ensure that the children's requirements were considered appropriately. An outline of one persona called "Sarah" is exemplarily provided in Figure 7.

Games4School Project

The goal of the Games4School project was to develop mini-games, together with the children of three classes of a national secondary school following a UCD approach. The 11 to 13 year old children were embedded in different research activities and took over the role of a user, a tester, an informant, and a design partner in the context of the school. Every month each class participated in a four hours project day to conduct the UCD activities together with researchers (mostly in school, within one year).

The first step of the persona creation process was to identify behavioral variables for the targeted children (aged 10 to 14 years), namely preferred games, playing venues, playtimes and important game features. Regarding the decision diagram for the child personas, the following connection lines were made:

1) Partial pre-knowledge was available from literature for example about the children's gaming behavior or playtime, but not about playing venues or preferred game features.

2) We were familiar with all three research approaches, but not the involved children or their teachers. There were no specific characteristics (i.e. restrictions or missing abilities) regarding the children for the data collection, which would exclude one or more research approach(es) (see connection lines in Figure 5).

3) The available sample size of children, who were not involved in the project so far, was estimated by the partner school with 40-60, whereof $2^4=32$ users were at least needed to investigate the four behavioral

variables. Furthermore, a qualitative approach was also possible (see connection lines in Figure 5).

4) Within the project enough human resources were estimated and actually available to perform a combined or pure quantitative research approach.

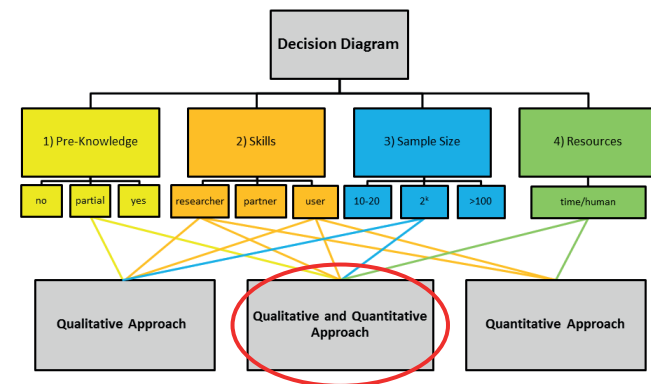


Figure 5. Decision Diagram for Child Persona

According to Figure 5, the combined qualitative and quantitative approach was selected, as it is the only approach that satisfies all four aspects. Within the analysis phase, a probing study was conducted to collect qualitative and quantitative data for the creation of the personas. A cluster analysis was applied on the quantitative data to group the children. The analysis revealed three clusters which were enriched with the respective qualitative data (for more information see [27]). Afterwards, the personas were presented to the classes. Two personas were selected for each class in order to guide the development of the mini-games. An outline of one persona called "Tobias" is exemplarily provided in Figure 7.



 <p>Name: Albert Age: 57 Location: Great Britain Occupation: Accountant in a large company</p> <p>ICT Usage: Albert uses new means of communication very often, he also likes Facebook. To communicate with his son and his granddaughter Elisabeth in the US, he uses the telephone (both landline and mobile), email, Facebook, and sometimes Skype.</p> <p>Relation to grandchild(ren): Albert and Elisabeth share one interest, they like to read stories and invent different endings or new stories. As they live far away, this does not happen regularly. When they meet, Albert pampers Elisabeth very much. Apart from the meetings, Albert often produces CDs with pictures or films he makes himself, containing family parties, landscapes or being on vacation. When they meet, they often go on excursions and show each other the country they are living in. Furthermore, Albert seeks for information about the US when he is at home. Then he shows and tells Elisabeth what he found out. Furthermore, they like painting and drawing together as well as playing or shopping, and Albert likes to explain to Elisabeth how to do things.</p> <p>On birthdays and Christmas, Albert sends presents to his granddaughter, which make her happy. He sends her books, chocolate from Great Britain or games, sometimes also pictures, to give her the feeling that he is with her.</p> <p>Goals: 1) being up to date (concerning ICTs and his granddaughter's life) and 2) meeting Elisabeth more often</p> <p>Frustrations and pain points: 1) being treated as an „old man“ and 2) not having the possibility for physical contact</p> <p>Primary usage reasons: 1) staying in contact, 2) seeing Elisabeth more often, 3) making the relationship more tangible over distance and 4) being interested in new forms of remote interaction</p>	 <p>Name: Anna Age: 72 Location: Sweden Occupation: Retired</p> <p>Social contacts: Until a few months ago, Anna was in regular contact with her 3 best friends Susan, Anika and Leonie, who she has known for a couple of years from the cycling club. They often met each other, if only just to go for a walk. But due to her restrictions in mobility, she doesn't see them as often as she would like to. Until recently, Anna regularly took care of her two grandchildren Simon and Mark (aged 3 and 5 years), as their mother had just started a new job. Anna likes to take care of the two boys, because she enjoys the feeling of being useful. Since her rheumatism has gotten worse, she only takes care of them occasionally, because she quickly feels overstrained. She regularly meets her son and daughter-in-law who support her in terms of daily activities. Her son is especially concerned about her physical condition and would wish to have more time to take care of his mother.</p> <p>Interest and experience in new communication technologies: Anna is interested in new communication technologies and is familiar with her mobile phone, e.g. she knows how to write a text message. Furthermore, she sometimes uses Facebook to stay in contact with her friends. Although her available budget per month is more than 1000 Euros, she is not willing to spend money on new communication technologies.</p> <p>Requirements: 1) include formats that support her staying as physically fit as possible, 2) provide possibilities to encourage the social contact with her family/friends, 3) provide a possibility that enables Anna to contact her caregiver/family, to ensure constant care conditions, 4) provide a possibility to involve Anna's family, in terms of care and 5) support Anna regarding her chronic disease and other issues regarding her daily activities</p>
---	--

Figure 6. Outline of FamConnector "Albert" and CVN "Anna" Elderly Persona translated from German



 <p>Name: Sarah Age: 8 Location: Australia Occupation: Third grade student in elementary school</p> <p>Computer Experience: Sarah has initially learned how to handle computers through a computer for kids. Additionally, she uses the computer at school for didactic games and information seeking. She likes downloading music, which she learned from her older brother. She does not have her own Facebook account, but her mother does and sometimes they are on Facebook together. She would like to have her own account, but her mother does not want her to as she thinks Sarah is too young. Sarah has an email account for exchanging photos, but she does not use it to write or read text.</p> <p>Goals: Love, security and independence. Therefore, Sarah needs to cope with leaving the security and safety of home and parents to enter the riskier but more exciting world of peers. To develop successfully, she must have the opportunity to safely explore beyond the world of her family, be exposed to a range of new experiences and be welcomed back when ready to return [1]. For Sarah, even her grandparents expand her world as they do not have a close relationship right now.</p> <p>Frustrations and pain points: Needing frequent or a lot of help when using the system</p> <p>Primary usage reasons: 1) establishing a steady relationship with her grandparents, getting to know them better and 2) communication supported by video (to see her grandparents, which is not possible on the phone)</p>	 <p>Name: Tobias Age: 12 Location: Austria Occupation: Second grade student in secondary school</p> <p>Games: Tobias prefers playing games of skill or action on the computer or on the console. However, he dislikes games, which primarily aim at killing and violence. On the computer, he also likes role plays, like Sims or "Die Stämme", as long as the fellow players do not cheat or think that they are better than him. In his spare time, he is also fond of tile-based games, e.g., doing jigsaws with his parents or playing card games with his friends.</p> <p>Playing Venues: In school, Tobias prefers playing ball games in the gym or on the sports ground, as well as playing tag in the schoolyard. He perceives the entrance area and the corridor as being too loud, thus he rather plays in the classroom if the teacher allows to. In breaks, Tobias rarely plays, as he is too distracted.</p> <p>Game Features: Tobias thinks that games need to be fun and exciting. Furthermore, he wishes for good and realistic graphics. Players should not only be able to choose their tokens, but also configure them by themselves. Tobias prefers games, in which it is possible to collect as many points as possible or in which the winner is the one, who reaches the goal first and the last loses. As soon as a game is too difficult and he cannot go further or if the end cannot be foreseen, Tobias quickly loses interest in the game. In order to avoid this, he requests game instructions not to be too long and complex, but short and appropriate for children by using understandable pictures. He also prefers having the rules of the game explained within a trial. Preferably, Tobias controls computer games with mouse and keyboard, as long as the configuration of the buttons is described accurately at the beginning of the game.</p>
--	--

Figure 7. Outline of FamConnector "Sara" and Games4School "Tobias" Child Persona translated from German

Conclusion

The decision for using personas needs to be done early in the UCD process, as the whole data collection within the requirements analysis phase will be influenced by the defined behavioral variables. In complex projects it is especially advisable to make the decision process for a certain persona method explicit for the project partners. Our decision diagram aims at supporting this transparency in a structured and reasoned way.

Inexperienced researchers or those, who only worked with certain approaches like Cooper [6], are enabled by the decision diagram to select a suitable approach for special user groups (e.g., elderly or children). However, researchers familiar with creating personas might not see the benefit of the decision diagram as they might already consider similar aspect to choose a suitable persona creation approach.

The decision diagram aims to take into account the pre-knowledge, the skills of the involved people, the sample size and the available resources. The list of aspects might be extended according to different project goals or specific products. We are still exploring aspects, but those four proved to be valuable for the decision on three different projects which deal with special user groups. We are convinced that our approach will also support other researchers when working with personas.

In the future we plan to apply the decision diagram in our currently started third AAL project ENTRANCE and extend or adapt it if necessary. Furthermore, we want to investigate whether the decision diagram is also suitable for other user groups than elderly and children.

Acknowledgements

This research was enabled by the FamConnector and CVN projects (funded by AAL JP) as well as the Games4School project (funded by the Austrian National Government). Special thanks go to end user organizations and partners, which supported us in conducting the studies for our research.

References

1. Antle, A.N. Child-based personas: Need, ability and experience. *Cognition, Technology & Work* 10, 2 (2008), 155-166.
2. Bekker, M., Beusmans, J., Keyson, D., and Lloyd, P. KidReporter: a user requirements gathering technique for designing with children. *Interacting with Computers* 15, (2003), 187-202.
3. Calde, S., Goodwin, K., and Reimann, R. SHS Orcas: the first integrated information system for long-term healthcare facility management. *Case studies of the CHI2002 AIGA Experience Design FORUM (CHI '02)*, ACM Press (2002), 2-16.
4. Chang, Y., Lim, Y. and Stolterman, E. Personas: from theory to practices. *Proc. of the 5th Nordic conference on Human-computer interaction: building bridges (NordiCHI '08)*, ACM Press (2008), 439-442.
5. Chisnell, D., Redish, J. C. and Lee, A. New Heuristics for Understanding Older Adults as Web Users. *Technical Communication* 5, 1 (2006), 39-59.
6. Cooper, A. *The Inmates are Running the Asylum: Why High Tech Products Drive Us Crazy and how to Restore the Sanity* (2nd Edition). Pearson Higher Education (2004).
7. Cooper A., and Reimann, R., and Cronin, D. *About face 3: the essentials of interaction design*. Wiley-India (2007).
8. Colonius, I., Budde, S. and Annicchiaro, R. Participatory design for challenging user groups – a case study. *Proc. of the 28th Annual European*

- Conference on Cognitive Ergonomics*. New York, USA. (2010), 339-340.
9. Dolnicar, S. A review of unquestioned standards in using cluster analysis for data-driven market segmentation. *Faculty of Commerce-Papers* (2002), 273-279.
 10. Faily, S. and Flechais, I. Persona Cases: A Technique for Grounding Personas. *Proc. CHI 2011*, ACM Press (2011), 2267-2270.
 11. Freydenson, E. Bringing your personas to life in real life (2002).
http://www.boxesandarrows.com/view/bringing_your_personas_to_life_in_real_life
 12. Goodwin, K. Perfecting your personas (2001).
http://www.cooper.com/newsletters/2001_07/perfecting_your_personas.htm
 13. Gorsuch, R.L. *Factor analysis*. Erlbaum, Hillsdale (1983).
 14. Herring, S.C. Questioning the generational divide: Technological exoticism and adult constructions of online youth identity. *The John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning*. MIT Press (2007), 71-92.
 15. Hisham, S. Experimenting with the use of persona in a focus group discussion with older adults in Malaysia. *Proc. of the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group: Design (OZCHI)*. ACM Press (2009), 333-336.
 16. Jakob, A. On the Triangulation of Quantitative and Qualitative Data in Typological Social Research: Reflections on a Typology of Conceptualizing "Uncertainty" in the Context of Employment Biographies (2001). <http://www.qualitative-research.net/index.php/fqs/article/view/981>
 17. King, G., Keohane, R. O., and Verba, S. Designing Social Inquiry: Scientific Inference in Qualitative Research (1994).
<http://press.princeton.edu/chapters/s5458.html>
 18. Inglis, E.A., Szymkowiak, A., Gregor, P., Newell, A.F., Hine, N. Shah, P., Wilson, B.A. and Evans, J. Issues surrounding the user-centred development of a new interactive memory aid. *Universal Access in the Information Society 2,3*, Springer, Berlin and Heidelberg (2003), 226-234.
 19. Jones, C., McIver, L., Gibson, L. and Gregor, P. Experiences obtained from designing with children. *Proceedings of the 2003 conference on Interaction design and children (IDC '03)*, ACM (2003), 69-74.
 20. Lines, L. and Hone, K.S. Research methods for older adults. Brewster, S. and Zajicek, M. (Eds). *A new research agenda for older adults* (2002).
 21. Maxwell, J.A. *Qualitative research design: An interactive approach*. Sage Publications, Inc (2005).
 22. Matthews, T., Whittaker, S., Moran, T. and Yuen, S. Collaboration Personas. A new approach to designing workspace collaboration tools. *Proc. CHI 2011*, ACM (2011), 2247-2256.
 23. MacCallum, R.C., Widaman, K.F., Zhang, S. and Hong, S. *Sample size in factor analysis*. In *Psychological methods* 4, 1 (1999), 84-99.
 24. McGinn, J. and Kotamraju, N. Data-Driven Persona Development. *Proc. CHI 2008*, ACM Press (2008), 1521-1524.
 25. Miaskiewicz, T., Sumner, T. and Kozar, A.K. A Latent Semantic Analysis Methodology for the Identification and Creation of Personas. *Proc. CHI 2008*, ACM (2008), 1501-1510.
 26. Milne, S. et al. Are guidelines enough? An introduction to designing Web sites accessible to older people. *IBM Systems Journal* 44, 3 (2005). 557-571.
 27. Moser, C., Fuchsberger, V. and Tscheligi, M. 2011. Using Probes to create Child Personas for Games. *Proc. of the 8th International Conference on*

- Advances in Computer Entertainment Technology*, ACM (2011), 39.
28. Mulder, S. and Yaar, Z. *The User is Always Right: A Practical Guide to Creating and Using Personas for the Web*. Berkley, CA: New Riders (2007).
29. Newell, A.F. and Gregor, P. Design for older and disabled people – where do we go from here? *Universal Access in the Information Society* 2, 1 (2002), 3-7.
30. Nieters, J.E., Ivaturi, S. and Ahmed, I. Making Personas Memorable. *Proc. CHI 2007*, ACM (2007), 1817-1823.
31. Robson, C. *Real world research: A resource for social scientists and practitioner-researchers*. Wiley-Blackwell (2002).
32. Pruitt, J. and Adlin, T. *The Persona Lifecycle*. San Francisco: Morgan Kaufmann (2010).
33. Saez, A.V. and Garreta-Domingo, M. Scenario-based Persona: Introducing Personas through their main contexts. *Proc. CHI 2011*, ACM (2011), 505.
34. Yao, D. Qui, Y., Du, Z., Ma, J. and Huang, H. A Survey of Technology Accessibility Problems Faced by Older Users in China. *Proc. of the 2009 International Cross-Disciplinary Conference on Web Accessibility (W4A)*, New York, USA (2009), 16-25.