Creating and Using Personas in Software Development Practice

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Abstract — **Personas has been suggested as a strong technique for providing software developers with a deep understanding of the prospective users of a software system. This paper reports from two separate but related empirical studies. The first study was a questionnaire survey about Personas usage in software development companies. The purpose was to uncover to what extent and in which ways Personas are used in software development companies located in a specific geographical area. This study demonstrated that less than half of the respondents had ever heard about Personas. We also identified key obstacles towards use of the technique: lack of knowledge of the technique, lack of resources, sparse descriptions and scarce integration in development. The second study was based on detailed interviews with four software developers about their usage of Personas in development processes in the software industry. We identified basic practices in Personas creation and usage, and found that the respondents understand Personas creation and use differently from the practice described in the literature. In fact, developers are evolving their own practices for creating and using Personas.**

Keywords—Personas; Personas creation and use; software development; questionnaire survey; interview.

I. INTRODUCTION

This paper is an extended version of the paper "Creating and Using Personas in Software Development Practice: Advantages, Obstacles and Experiences" [1].

Personas is being promoted as a technique that supports design and engineering of interactive software systems with an explicit focus on the prospective end-users.

The general definition of the technique is that a Persona is a description of a fictitious person based on data collected about the target user group of a system [2][3]. The common way to represent a Persona is as a text describing, and usually also a photo depicting, the fictitious person [2][4].

The main idea for introducing Personas is consistent with results from numerous reports that have documented that software developers lack knowledge and understanding of their users, their work, and their goals, e.g., [5][6]. A consequence is that when a system has been developed, it does not fulfil the needs of the users and is incompatible with their work processes. The Personas technique has been suggested as a strong tool to overcome these problems by providing software developers with a specific understanding of prospective end-users of their software [7].

It has been argued that the use of Personas provides software developers with empathy for, and engagement in, the end-users of the software solution [8]. There are also literature that concludes that the use of Personas has been a success [9][10].

The literature includes several conclusions about the benefits of the Personas technique, if it is used to its full potential. Matthews et al. [11] found that the designers who had a very positive attitude towards Personas were primarily those who had done extensive work with Personas, and had some training in the creation of Personas, and used them as prescribed by the literature. The Personas technique is not yet incorporated as an integrated and general part of the toolbox in the software development industry [11]. It has been documented that a main reason for this is that many developers in the industry have problems using Personas in practice [12]. Thus, there are still many unanswered questions about the actual advantages of using Personas in software development practice. The strength of using Personas compared to other techniques are also unexplored.

The purpose of this paper is to inquire into the way in which software companies use Personas and whether the technique is used as proposed in the literature. We report from a questionnaire survey and a case study of experiences with creation and use of Personas in software development practice. The questionnaire survey (Study A) was conducted in a delimited region in Denmark, where we inquired into the experiences software companies in this region had in using Personas and incorporating the technique as a part of their development toolbox. The case study (Study B) was based on interviews with four developers who were or had been working with Personas in practice. Our focus in this paper is on comparing the literature with the experiences and the perceived strengths and weaknesses of the Personas technique from the perspective of the software development industry, Our empirical basis includes using a mixed method approach involving both quantitative and qualitative data collection.

Section II presents a more detailed description of work related to this study. It describes how Personas are created and used, including the pitfalls to avoid. Section III describes the method used in the questionnaire survey (Study A). Section IV presents the results from this survey. Section V presents the method used in the case study (Study B). Section VI provides the findings derived from the interviews. Section VII compares the findings from the two studies and discusses the results compared to experiences about Personas

reported in the literature. Finally, Section VIII provides the conclusion.

II. Related Work

The literature offers four different perspectives regarding the basis for and role of Personas [13]: 1) Cooper's goal-directed perspective 2) Grudin, Pruitt and Adlin's role-based perspective 3) the engaging perspective, which emphasises how the story can engage the reader. These three perspectives agree that the Persona descriptions should be founded on real data. However, 4) the fiction-based perspective, does not include data as a basis for Persona description, but creates Personas from the designers' intuition and assumptions. Even though the Personas technique has been around for more than a decade, when comparing the four perspectives, it is still unclear what and how much background material is required to create Personas [14].

The common perceived benefits of Personas, when designing products are two-fold: 1) the technique facilitates that designers remember that they are different from the end-users, and 2) the technique enables designers to envision the end-users' needs and wants. Furthermore, in the design process Personas increase the focus on users' and their needs. The technique is an effective communication tool, which uses the Persona description to acquire direct design influence and lead to better design decisions and definition of the products' feature set [2][3][7][10][15][16][17].

The literature includes a rich variety of guidelines and experiences about the use of Personas.

1) Defining Personas. The literature originally defined a Persona as a text and a photo describing the character [2] [18]. Later developed into posters, websites and hand-outs [19]. Personas are considered to be most useful if they are developed as whole characters, described with enough detail for designers and developers to get a feeling of its personality [7][12][19]. The benefits of Personas are that they enable designers to envision the end-user's needs and wants, reminding designers that their own needs are not necessarily the end-users' needs, and provide an effective communication tool, which facilitates better design decisions [10][15] [16][17].

2) Creating Personas. Before creating Personas, a comprehensive study of the target user group is suggested. It has been recommended to acquire this information through interviews with the target user group [20] or observational studies of them [21]. Yet Chapman and Milham argue that it is not possible to verify that the created Personas actually reflect the target user group [22]. It has been suggested to create 3-5 Personas [23][24], but the amount of users one Persona can represent has been questioned [22].

3) Personas Critique. Personas has been characterized as unreliable and preventing designers from meeting actual users [5][12][13]. Problems have been reported regarding creation and distribution of the developed Personas [12] [19]. The descriptions have been perceived as unreliable and not well communicated. Also, developers lack understanding of how to use Personas [3][12][19]. The technique itself is criticised for being too founded on qualitative data and, as a consequence of that, being non-scientific, being difficult to implement. Also, for not being able to describe actual people as it only portrays some characteristics, and for preventing designers from meeting actual users [5]. Moreover, the unsolved question about how many users one Persona can represent is emphasized as problematic [22].

Some have tried to prevent poor use of the Personas technique, e.g., Faily and Flechais [25] describe regularly sending information about the Personas to the development team, to ensure that the designers and developers consider the Personas in the design process. They also suggest that the creators should hand over instructions and provide tools that support the developers' usage [25]. Problems in applying Personas are reported as also involving the mindset of the developers, which is documented by both Blomquist and Arvola [6], and Pruitt and Adlin [3].

Matthews et al. [11] focused mainly on designers and user experience professionals who had some training in Personas creation and had done extensive work with Personas using them as described by others [2][3]. These designers had a very positive attitude towards the technique. Those who had done minor use of Personas had a moderate or neutral opinion regarding Personas, and those who had not worked with Personas at all had a negative or indifferent opinion regarding the technique.

The use of the Personas technique in software development processes, e.g., by combining Personas and agile development like XP, has also been explored. In this case, the customer preferred a Persona without a picture, merely describing a job title and maybe a name, but Powell et al. do not support this as it will take away the developers' empathy for the users. Moreover, by using Personas integrated in XP, the developers felt confident to make decisions without involving the onsite customer every time [29].

4) Personas in Practice. An inquiry of design teams in 13 Danish multi national companies report that Personas help keep the focus on user needs instead of what the developers and designers like, and help in gaining an understanding of how the product can create value for end-users [26]. A different study describe how designers are using Personas contrary to the original intended usage; instead of creating Personas on research results, designers tend to base the Personas on their own experiences and thoughts [27]. This will make it even harder to ensure that the right Personas are created to represent the relevant user groups [8]. Problems in application of the Personas technique caused by the mindset of the developers have also been reported [3] [12]. It has been suggested to overcome this by regularly sending information about the Personas to the development team [19][25]. It seems difficult in practice to avoid making stereotypes when creating Personas, and using Personas does not seem to solve the problem that Cooper originally intended to solve [28].

III. Study A: Method

In order to inquire into the usage of Personas we conducted a questionnaire study in 60 software development companies. We chose to focus on a well-defined geographical area in order to allow us to do as complete a survey with as many companies as possible, and thereby achieve a more complete coverage of software companies in that area. The focus on one defined region is that it allows us to establish contact with all companies located in the region. This provides a more complete picture than randomly picking out

companies located in several regions or even countries. We made considerable efforts to identify and contact all companies in the area. The selection of companies would be more random if we had chosen a larger geographical area.

A. Participants

We focused on companies that were developing software, either for internal or external use. We ended up with software companies with the following characteristics:

The company;

- develops software with a graphical user interface (e.g., mobile phones, games, web applications, PC or PDA software).
- develops software for customers or for internal use and is geographically located within the defined geographical area.
- employs more than a single person and it is not a hobby company.

TABLE I. THE NUMBER OF RELEVANT COMPANIES.

	Companies		
Lists used to find companies	***Total number of companies on list***	***Out of scope or gone out of business***	***Relevant companies***
List 1	77	-35	42
List 2	139	-63	76
Linked In	16	0	16
Total			**134**

To obtain a list with as many software development companies as possible we acquired two lists containing software companies located in the chosen region. These lists were from a previous study of companies (List 1) and an industry network (List 2). This was followed by a search on LinkedIn to include companies that only had a smaller development department in the region and had their headquarters located either in another region or in another country. Table I shows the total number of software companies in the region, which were within the scope of this study.

B. Data Collection

We created an online questionnaire using the tool SurveyXact [30]. The first part of the questionnaire was made to gain information about the respondent and his or her place of employment (e.g., job function, business, number of employees in the company and line of business, within software development). The second part was designed to uncover if the respondents knew what a Persona was and what it was used for. The third part was about the use of Personas in the companies. This part was only filled out by the people who answered that they knew of, and worked with, Personas. The questionnaire consisted of 35 questions, but only respondents who knew of and was working with Personas in their current employment got to answer all 35 questions. The questionnaire consisted of both open and closed questions.

The distribution of the questionnaire was done in two ways. First, 43 companies in which we had a known contact person was contacted by phone. Then the remaining 91 of the 134 companies were contacted to acquire a contact person. Eight of these declined to participate and 14 we could not locate a viable phone number or email address. This resulted in 112 emails being sent out with a link to the questionnaire. The recipients were given three weeks to fill out the questionnaire survey. The data collection process resulted in 69 responses in total. Of the 69 respondents nine did not finish the questionnaire, leaving us with 60 complete responses. The nine who did not complete the questionnaire were mainly CEO's in small companies. These respondents mainly stopped filling out the quiestionnaire after entering their personal details.

The responding companies were asked to characterize their main line of business. The distribution is shown in Table II.

TABLE II. THE DISTRIBUTION OF THE COMPANIES AFTER LINE OF BUSINESS.

Characterization of Companies	**Number of Answers**
Software development	44
Design and development	4
Financial services	2
Marketing and advertisement	2
Game development and entertainment	1
Telecom	2
Web development	4
Other line of business	1
Total	**60**

Table II shows that the respondents prevailingly characterize their main line of business as software development.

C. Data Analysis

Data analysis was conducted continuously while the questionnaire was still open for submissions, as suggested by Urquhart [31]. When the questionnaire was closed, the data was updated with the results from the latest incoming questionnaires.

In the questionnaire, we used both open and closed questions. All responses to closed questions were analysed quantitatively. For the open questions, the grounded theory approach, as described by Corbin and Strauss [32], Urquhart [31] and Urquhart et al. [33], was used as analysis method. The aim of grounded theory is described as "building theory, not testing theory" [34]. This means that theory should emerge while the analysis takes place and should not be used to prove an already existing theory.

1) Open Questions: Coding was used to analyse the open questions. One question was: "How would you explain what a Persona is and how it is used?". For this question the fol-

lowing coding categories were assigned: technique (for creating Personas), finding target user group, when in the process the Personas are used and how they are used. Grounded theory coding was not used for other open questions since the respondents mainly answered in very short sentences and they were sent directly to the end of the questionnaire when answering "No", e.g., "Have you ever heard about Personas?" or "Have you ever worked with Personas?" meaning that the number of respondents dropped for every question. As it makes no sense to ask a respondent about their knowledge about the use of Personas if they have already indicated they have never heard about Personas.

2) *Closed Questions:* Statistics was produced directly from the closed questions.

IV. STUDY A: RESULTS

This section presents the results of the questionnaire survey. It is divided into two sub-sections. 'Knowledge about the Personas technique' is referring to the first part of the questionnaire. This subsection reports if the Personas technique has been adopted by the software developing companies in the defined region. The second subsection "The understanding of Personas and their use" is dividing the obstacles towards Personas usage into four main areas.

A. Knowledge about the Personas technique

The results of the questionnaire indicate that 27 out of 60 respondents, or 45%, have heard about Personas. Fourteen respondents out of 60 have worked with Personas. Seven respondents out of 60 are using Personas as a development tool in their current job. This can be seen in Table III.

TABLE III. DISTRIBUTION OF RESPONDENTS AND KNOWLEDGE ABOUT PERSONAS

Knowledge about Personas	**Number of respondents**
Heard about Personas	27 out of 60
Have Worked with Personas	15 out of the 27
Are using Personas in current job	7 out of the 15

Meaning that 11.5% of the responding companies are currently using Personas as a development tool and 55% of the respondents have never heard about the technique.

TABLE IV. DISTRIBUTION OF RESPONDENTS ON COMPANY SIZE.

	Number of Employees				
Number of companies	***1-10***	***11-50***	***51-200***	***200<***	***Total***
Using Personas	1	3	1	2	**7**
Not using Personas	23	16	8	6	**53**
Total	**24**	**19**	**9**	**8**	**60**

The distribution across different sizes of companies is shown in Table IV, showing the number of respondents familiar with Personas.

TABLE V. RESPONDENTS' KNOWLEDGE ABOUT PERSONAS IN COMPANIES THAT DO NOT USE THEM.

	Number of Employees				
Knowledge about Personas	***1-10***	***11-50***	***51-200***	***200<***	***Total***
Never heard about Personas	18	7	6	2	**33**
Heard about Personas, but never used them	4	5	2	2	**13**
Worked with Personas in other employment or while studying	1	2	0	1	**4**
Have used Personas, but stopped	2	1	0	0	**3**
Total	**25**	**15**	**8**	**5**	**53**

In Table V, the 53 responding companies that do not use Personas have been grouped. It shows that 33 respondents have never heard about Personas. Three of the organisations did use Personas at some point but stopped. One respondent stated his organisation used Personas in a project where they collaborated with a group of university students, but did not find the Personas technique useful for other projects. The other two respondents stated that their respective companies stopped using Personas, because they did not find the developed Personas applicable in their line of development. 13 respondents stated they had heard about the Personas technique but had never worked with creating Personas themselves and four respondents had worked with creating Personas in an earlier employment or while studying.

B. Understanding of Personas and their use

An open question in the questionnaire was analysed with coding to reveal all the participating companies' understanding of the term "Persona". "Personas being an imaginary user", were expressed by 22 respondents, e.g., "a fictitious user of the system you are developing". "Personas are used as a validation of the design", were expressed by 17 respondents, e.g., "making sure user needs are met by a given design".

A Persona "being a representation of a larger user segment" was expressed by 13 respondents, e.g., "description of a set of characteristics characterizing a certain group of users' behavioural patterns". Personas "being a tool for making sure to keep the users and their needs in mind all the way through the development process" were recognised by four respondents, e.g., "...the Personas are used as focus points for planning the entire product life cycle". This means that Personas by far are recognised as fictionalised users used as a tool for designing features requested by users and user segments. On the other hand, no more than four respondents expressed that Personas should be used through the entire development cycle. This means that the common idea seems to be that Personas are mainly a tool for identifying some as-

pects of the user group and not so much a tool to be used during the entire development process.

TABLE VI. DISTRIBUTION OF JOB TITLES OF RESPONDENTS.

Job Title of respondents	***Not working with Personas in current employment***	***Currently working with Personas***
CEO, CTO, Owner	12	4
System developer or consultant	11	1
Project, Product or Sales manager	16	0
Business architect, Communication and PR	8	0
UX or Web Designer or Manager	6	2
Total	**53**	**7**

1) Lack of Knowledge (of the technique): Lack of knowledge about the Personas technique seems to be a major obstacle regarding usage of Personas as shown in Table III. The analysis showed that 55% of the respondents had never heard about the concept or technique. Of the respondents who had never heard about Personas, 10 people were CEOs, owners or partners (primarily in micro- or small sized companies), five were managers in IT and three worked as sales managers (all three in medium sized companies). In Table VI, the respondents' job titles have been divided into groups based on whether the company is currently working with Personas, or not. This indicates that the chance of allocating resources to Personas development might be slim. One respondent indicated that the company did not recognise the importance for any communicative tools. "The company has downsized and has eliminated the communications position since it is primarily a production company and they do not really understand the importance of, e.g., Personas, ambassadors, first movers, e.g., or communication in general for that matter". This means that in these companies the knowledge about the Personas technique will not come from management, and even if employees bring the knowledge about Personas into the companies, funding will probably not be allocated. On the other hand, as seen in Table IV, in the seven companies currently working with Personas four respondents was CEO, CTO or owner.

2) Lack of Resources (time and funding): The analysis found that Personas are mainly created if a need has been identified for a specific project and "cutting a corner" when using Personas seems to be the general idea. Some only use Personas to the point that they think it creates value for the customer and thereby, profit for the company. Also, when asked in the survey how much resources were allocated to develop Personas, the general answer was zero.

3) Sparse descriptions: When a Persona is created too superficially the Persona will lack the depth that would normally be the strength of the technique, making the Personas untrustworthy and unusable. This contradicts with what helps making Personas useful tools that lead to better design decisions [2][3][15][16][17]. When a Persona is created with much detail and described as a whole character, and not a stereotype, it will support the design and innovation process. One respondent indicated difficulty in finding a suitable template for the descriptions and that they wanted to create short descriptions instead of detailed character descriptions. "It is hard to find good templates for constructing Personas. We ended up with a few lines in bullets describing each Persona, which could be used as a fast reference. Instead of a large scheme describing lots of details nobody wanted to read anyway". This corresponds with the descriptions of Personas by some respondents answering the questionnaire. These descriptions were quite superficial and did not describe individual Personas but mainly a job role and a use situation.

4) Not integrated in the development: This ties-in with the finding of lacking resources. The superficial Personas are created to be used in the design process. The descriptions are not meant to be used in any other stages of the design process. Furthermore, they are not used to keep reminding neither developers nor designers about the end-user's and their needs. This means that the potential of the Personas technique is not explored.

C. Advantages of using Personas

The respondents currently using Personas described why their companies are using Personas as follows: "*to support the development of a system that is easy to use for all types of users...It is very important for us that the system will be very easy to use, which is why a mapping of the various user groups is important*".

Another respondent stated: "*Internally in the company, Personas are used to communicate characteristics of the customer segments that we want to focus on especially"*. Yet another respondent stated that "*Personas are primarily used for optimizing the product*". These advantages correspond with the advantages identified in the related work section.

V. STUDY B: METHOD

We have conducted a case study about the use of Personas as a development technique in four software development organizations, including if, and how practitioners perveive Personas and how they actually use this technique in practice.

A. Respondents

From Study A software developers were identified, who had different types of experience using Personas as part of the software development process. Four kinds of software developers were identified, whom had different experiences and perceptions in regards to using Personas. One software developer from each category was identified and asked to participate in this study. The four different types are described as follows;

- Wants to start using Personas as a development technique. (R1)
- Has formerly used Personas as a development technique. (R2)

- Is currently using Personas as a development technique. (R3)
- Has knowledge about it but never used it as a development technique. (R4)

R1 – R4 shows which respondent falls under what category.

The respondents were working as software developers or project managers. None of them had any education in user experience. All respondents had worked in the industry for at least ten years and been in their current organization for at least two years. All four interviewees use an agile software development method in their current organisations. All are using SCRUM or an adjusted version of SCRUM.

B. Data Collection

The four interviews were conducted as semi-structured qualitative interviews [35]. The interviews were recorded and later transcribed. Each interview lasted between 22 and 55 minutes. All interviewees were asked about their educational background and their current and previous job functions. Through the interviews the interviewees' knowledge about and previous experiences with the Personas technique was explored.

C. Data Analysis.

All interviews were analysed using grounded theory [32] [33] and open coding with the Dedoose tool (http://www.dedoose.com/). This resulted in the following seven categories;

- Learning to Create Personas
- The Basis for Creating Personas
- Usefulness of Personas
- Strengths of Personas
- Redundancy of Personas
- Weaknesses and Limitations of Personas
- Personas and other techniques

These seven categories were used to categorise the findings.

VI. Study B: Findings

This section presents the findings based on the analysis of the interviews. The findings are divided into seven subsections in accordance with the coding categories.

A. Learning to Create Personas

The respondents learned about the Personas technique in different ways. Their first meeting with Personas seems to mainly have happened by chance. Two respondents describe it this way:

R2: The first time I heard about Personas was at a session at the universitys' humanities department four or five years ago. … Microsoft has created a number of Personas describing the users some years ago. They encourage us, as Microsoft consultants, to use these in our development process.

R1: I have a background as a software developer but in my former employment I worked very closely with user experience designers.

One respondent described coming from a smaller company where he learned about several usability techniques and why it is important to understand and represent the users' in the development process.

None of the respondents learned about Personas and other User-Centered Design or Usability techniques through education.

B. The Basis for Creating Personas

The respondents use different ways of collecting data for the creation of Personas. Yet all of them depend either on information they already have or information their customers have.

R1: If we do not have enough information ourselves to create the Personas we will ask our customers about their usage of the existing systems.

None of the respondents get money or time allocated specifically to gather information about the target user group, which is why they have to make use of the information they already have themselves or they can get from their customers.

Another respondent explained that due to not having a budget for data collecting, he was creating Personas a bit differently than suggested by the literature. He primarily thought about the existing users and the archetypes that were standing out.

R3: We know our users quite well. Our Personas are based on real users, like "can this user understand this?" We use them like Personas archetypes and we do not use Personas formalized. - Unformalized we use Personas quite a lot. Personas are based on the users who are critical towards our system; the people that make noise if they have a problem.

Another respondent described making Personas that were short and without much detail.

R2: To me a Persona does not have to be too detailed in the description of the person.

None of the respondents remembered reading specific literature about Personas. They had mainly learned the do's and don'ts about Personas from others, or from their own experiences.

C. Usefulness of Personas

Personas are considered particularly useful when the developers are missing information about the users and their needs. As all four respondents are employed in companies that use an agile development method, they usually work with an onsite costumer. Personas was found particularly useful if they did not have an onsite customer on a project. The greater the distance between the users, and the designers and developers the more useful Personas are considered to be. One respondent explained that he found Personas very useful as a substitute for onsite customers:

R1: If there is no onsite customer or employee that knows the field we are developing for very well, Personas seems to be very usable. The further the designers and de-

velopers are from the users, the more value Personas can bring to the development process.

Another respondent described Personas as a useful tool if there was a geographical distance between designers and developers. This was meant as Personas could help the developers remember the end-users during the development process. So instead of the design team present to make sure the developers focused on the end-users, Personas could do the same thing, if the Personas was made visible for the developers.

R3: I find Personas useful if the distance between designers and developers is substantial and they are not working side by side all day.

One respondents described that his company does considerable work for the health sector, and they used to have a former nurse employed to help them understand that domain. However, this was no longer an option, so they needed to find new techniques to bring an understanding of the user groups into the development process. He thought Personas could be useful for exactly that.

Another respondent described Personas as useful when developing software solutions for very specific user segments.

R2: We are creating ERP solutions. I feel that Personas are a relevant tool for us. Because we are developing very specific software solutions for our customers.

This respondent also outlined different opinions about the usefulness of Personas and other techniques in regards to User-Centered Design;

R2: One of my colleagues approached me one day and said the following "we live by creating solutions, not drawings." I understand his position but personally I feel that drawing up the organization first can help me understand their needs.

Other respondents described similar experiences of colleagues having different oppinions in regards to using User-Centered Design techniques or Usability theory in regards to software development.

D. Strengths of Personas

The respondents expressed different expectations about the benefits of using Personas in the development process. The respondents were asked to describe situations in which the Personas technique would have been beneficial.

R4: I believe using Personas would have helped us develop a more user-friendly system.

Personas are also perceived as a strong tool for ensuring the software developers keep the end-users in mind during the development process.

R1: Personas can help keeping the developer's focus on the users' needs. Personas will provide the software developer with the ability to understand the users' perspective.

R2: I think that Personas can provide the security for us not developing the wrong system for our user group.

One respondent added that he found Personas especially useful if using a development method like the waterfall method. His argument was that when using the waterfall method the developers have only one possibility to get everything right.

R3: If using the waterfall development method you have to get everything right the first time. When developing agile it is not as critical if we make a mistake, we can change that in the next iteration as a new iteration starts every two weeks.

The respondents find that a strenght of the Personas technique is that it can support the developers in developing software that live up to the users' requirements, and that Personas is especially useful in situations where it is eminent getting it right the first time.

E. Redundancy of Personas

Two respondents stated that Personas are unnecessary if user experience designers or expert users are part of the project team, meaning that the design decisions are not only left to the developers.

R4: Personas are unnecessary when design is not left to the developer but is in place long before the developers begin to create the software.

R3: If you have an employee who is an expert user and knows what the user group need, Personas are unnecessary.

The Personas technique is considered redundant if User Experience Designers or similar are involved in the development process.

F. Weaknesses and Limitations of Personas

The respondents agreed that using Personas incorrectly can have substantial negative impact on software or product development. They also agreed that Personas should not be used if there is insufficient data or if the creators are unfamiliar with Personas.

R2: If the choice you make when creating the Personas is wrong they will work against the design.

Another respondent raised the concern that he felt constrained by some formalized Personas. Every time he was in doubt he went to look at the Persona, but this meant that he felt boxed in, and it stopped him from looking outside of the box.

R3: When using Personas formalized you might be a bit constrained, always going to look at the posters with the Personas [...] To me it works better if I just keep them in my head. Of course our company is not that large anyway so I can just go talk to the developers if I need to change something.

Another respondent had drawn a similar conclusion:

R1: What tends to go wrong in software development is that developers tend to lock on some user requirements pretty early in the process, without documentation, and then describe the entire solution. If the user requirements or the solution change at some point, the developers tend to forget the user and their needs somewhere in the process.

The respondents described using a technique like Personas could be a limitation in regards to the software developers, as the respondents could have a problem changing focus if the requirements changed at some point.

Using Personas requires a certain level of maturity. Another respondent's current organization was not using Personas:

R1:"We are not using the Personas technique at the moment. I have worked with Personas in my last employment and found them very useful. I would like to introduce Personas in my current employment but the company needs to be

at a higher level of maturity before it would make sense. We simply have larger issues at the moment than this".

Using the Personas technique is described as a strenght, but only if the company has reached a certain level of maturity. Personas are perceived as usable if the organisation is unmature.

G. Personas with Other Techniques

The respondents stated that scenarios are very usable in combination with Personas.

R4: Scenarios are often used in combination with Personas.

Workshops and focus groups were also considered useful in combination with creating Personas.

R3: We have a community around our product and we host meetings with user groups, where we meet three times a year and discuss new releases and improvements.

Three respondents described that they are primarily using user stories to document the users' needs. The user stories are described by two respondents as being used instead of developing a specification of requirements.

R3: We use common sense and we are not afraid of making a mistake because it is okay if we do not get it right the first time.

Even though Personas are considered useful the respondents also discribed working agile meaning that correcting errors was not perceived a big deal.

VII. DISCUSSION

In this section, we discuss our results in relation to experiences about Personas reported in the literature, and we compare the findings across the two studies.

The discussion is structured with the following four issues: 1) software developers lack knowledge and understanding of their users, their work, and goals, 2) the Personas technique has been promoted as a strong tool for providing the software developers with a better understanding of the potential users, 3) the use of Personas has been a success, and 4) the Personas technique is not necessarily an incorporated part of the toolbox in the software development industry and the industry might experience problems using Personas.

A. Lack of knowledge and understanding of the users

Software developers lack knowledge and understanding of their users and their needs [5][6]. In many development situations, users do not know what they want, thus, it is the designer's job to find out. Pruitt and Grudin [19] argue that a good design does not come from users, but from designers. This is because users do not really know what they want until they get it. But for this approach to work, the designers need in-depth knowledge of the users and their needs. The aim of Personas is to provide that knowledge.

Among our findings was poor application of the Personas technique in practice. This relates precisely to the point about developers lacking knowledge and understanding of the users, since the Personas descriptions, if applied, are made sparse and only used in a very narrow time frame of the development process. Another finding was that the development of the Personas lacked resources, since none of our respondents had a budget allocated specifically for the Personas development. This is contrary to the related work emphasizing that Personas can lead to better design decisions [2][3][10][15][16][17].

B. Personas can help developers understand users

The Personas technique has been promoted as a strong tool for providing software developers with a better understanding of the potential users [7]. Thus, Personas is presented as a useful technique to keep the developers focused on the users and their needs and give them empathy towards the Personas and the end-users [7][8].

The results from our questionnaire indicate that the most useful aspect of using the Personas technique was that Personas helped the team share a specific and consistent understanding of several, different user groups; which can lead to another advantage of product optimization.

In our case study, we found that the respondents perceived Personas as a technique that supports designing and engineering interactive systems with a focus on the end-users. Matthews et al. [11] found that mainly developers who have been working with Personas are positive in regards to a technique like Personas. We got the same impression from our respondents. Unfortunately, the Personas technique is still suffering from developers considering it unnecessary; e.g., one respondent explained that his colleague told him that creating background material or drawings was a waste of time.

C. Personas used as a successful tool

Several papers conclude the use of Personas has been a success [9][10]. This corresponds with the experiences of our respondents who are using Personas. The tool is described as useful to help developers understand the users and their needs, especially if the system needs to be usable for several different types of end-users. Some respondents using Personas, identified some challenges for creating Personas, e.g., "it can be hard to find templates for creating Personas." another respondent stated that "it is a challenge to map all user groups without asking all customers". These obstacles have to be resolved before Personas can be applied as a useful tool.

In our case study, we found that the practitioners do not use Personas as suggested in the literature. Instead, data is collected before creating Personas and it is mainly collected within their own or the customers' organization, or Personas are created on the basis of real users.

Baird [36] argued that Personas could be developed in a workshop while discovering requirements. One of our respondents described how they used Personas, and hosted meetings with their user group regularly. These meetings were also used to get to know their users and to help get an understanding of the customers' needs.

Personas are primarily considered useful if designers and developers are not working closely together to ensure that the developers understand the intended users and use, or merely as a representation of a user if there is no onsite customer available.

Using Personas has also been described as being risky. If the Personas created are targeting a wrong user group, the

software solution could end up being developed for the wrong users.

Scenarios and user-stories are considered useful in combination with Personas. In particular, user stories have been used to describe user situations and as a requirements specification.

D. Personas are not incorporated in the industry

The Personas technique is not necessarily an incorporated part of the toolbox in the software development industry, and the industry might have problems using Personas [12]. Since only 44% of our respondents have ever heard about the Personas technique and less than 12% have worked with creating Personas, it is fair to say that Personas are not an integrated tool in the software development industry in this region. Also, we found that only four respondents indicated that Personas should be used through the entire development process, meaning that even if Personas are used, they are not necessarily used to their full potential. In companies using Personas, the technique is used mainly to identify types of users or use cases.

The Personas are kept to a minimum and not focused on describing whole characters. As in the related work, we found developers lacking understanding of how to use Personas to gain most from their usage [7][12][19]. The reasons for that could be a combination of several aspects. We found that resources are not allocated specifically for creating Personas, which corresponds with the area of usability in general [5][19][37].

The full potential of Persona usage does not seem to have caught on in the industry. Matthews, Judge and Whittaker [11] found a connection between, on one hand, the perception of Personas and, on the other hand, to what extent the technique was used and, the amount of training the developers had had using Personas.

VIII. Conclusion and Future Work

This paper has reported from a combined questionnaire survey and case study of experiences with creation and use of Personas in software development practice. There are still only few studies of the actual use of Personas in software development practice [1]. The purpose of these studies were to identify both on the overall level and in detail how practitioners in the industry create and use Personas in their development processes.

In the questionnaire study, we explored to what extent Personas were used by software development companies in a defined geographical area and whether they used Personas as proposed in the literature. To accomplish this, we conducted a questionnaire survey with complete responses from 60 software development companies. The study showed that only 7 out of the 60 software development companies used Personas. The results from the questionnaire also uncovered four issues. Lack of knowledge of the technique as such and lack of resources both related to companies not using the Personas technique. Sparse or badly designed descriptions or not being part of the development process both related to poor application, when using the technique.

Our findings are well linked to other studies described in the related work section. Yet our study contributes with a new angle by focusing on making a complete study within a limited geographical area we now have a pretty good idea about if the Personas technique is an integrated tool in software development in this geographical area. We have not been able to find related work that has done a similar study in another country. This means that this paper is the first paper assessing whether and how Personas are used for developing software in the industry.

The main limitation on our results is that we focussed on a defined geographical area. This was necessary to achieve a high level of coverage of all companies in that area. As future work it would be interesting to learn more about the advantages of using Personas. This area still needs further studies even though some advantages have been identified in this paper, also, it would be interesting to learn if companies that do not use Personas are using another tool instead. The number of respondents for the questionnaire survey can also bee seen as a limitation.

We have presented results that are qualitative and based on four developers who have been interviewed in depth. The number of respondents is obviously a limitation of this study; yet only few software companies are using the Personas technique in their development process, so it is very challenging to find even a few respondents with experiences from using the Personas technique. Conducting a qualitative study means that the perspective of the interviewees are in focus. Conducting a study like this obviously requires that the intereviewees are trustworthy and telling the truth from their perspective.

It would be interesting to conduct a more extensive series of interviews with practitioners about their use of Personas and study how that influence the quality of the systems they develop. Also, if there is a correlation between the type of company that uses Personas and the product being developed, and if the use of Personas differs by type of software development company or product being developed. And if the use of Personas differs by the size of the company.

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References

[1] J. Billestrup, J. Stage, L. Nielsen, and K. S. Nielsen, "Persona usage in software development; Advantages and Obstacles," Proc. of International Conference on Advances in Computer-Human Interactions (ACHI 2014), IARIA, 2014, pp. 359-364.

[2] A. Cooper, "The inmates are running the asylum: Why High-Tech Products Drive Us Crazy and How to Restore the Sanity," Sams Publishers, 1999.

[3] J. Pruitt and T. Adlin, "The Persona Lifecycle: Keeping People in Mind Throughout Product Design," Morgan Kaufman, 2006.

[4] L. Nielsen, "A model for Personas and scenarios creation," Roskilde, Denmark 27th November, 2003, 71.

[5] J. Bak, K. Nguyen, P. Riisgaard, and J. Stage, "Obstacles to usability evaluation in practice: a survey of software

development organizations," Proc. of Nordic Conference on Human-Computer Interaction: Building Bridges (NordiCHI 2008), ACM Press, 2008 pp. 23-32. doi: 10.1145/1463160.1463164

[6] A. Bruun and J. Stage, "Training software development practitioners in usability testing: an assessment acceptance and prioritization," Proceedings of the 24th Australian Computer-Human Interaction Conference (ozCHI 2012), pp. 52-60. doi: 10.1145/2414536.2414545

[7] A. Cooper and R. Reimann, "About face 2.0: The Essentials of Interaction Design," Wiley Publishing, 2003.

[8] L. Nielsen, "Engaging Personas and Narrative Scenarios," Vol 17, PhD Series. Copenhagen: Samfundslitteratur, 2004.

[9] A. Cooper, R. Reimann, and D. Cronin, "About Face 3.0: The Essentials of Interaction Design," Wiley 2007.

[10] A. Dotan, N. Maiden, V. Lichter, and L. Germanovich, "Designing with Only Four People in Mind? - A Case Study of Using Personas to Redesign a Work-Integrated Learning Support System," Procedings of Human-Computer Interaction – INTERACT (INTERACT 2009) pp. 497-509.

[11] T. Matthews, T. Judge, and S. Whittaker, "How Do Designers and User Experience Professionals Actually Perceive and Use Personas?," Proceedings of SIGCHI Conference on Human Factors in Computing Systems (CHI 2012), ACM Press, pp. 1219-1228. doi: 10.1145/2207676.2208573

[12] Å. Blomquist and M. Arvola, "Personas in action: Ethnography in an Interaction Design Team," Proceedings of Nordic Conference Human-Computer Interaction (NordiCHI 2002), pp. 197-200. doi: 10.1145/572020.572044

[13] L. Nielsen, "Personas – User Focused Design," Human-Computer Interaction. Springer, 2012.

[14] L. Nielsen, "Personas. In The Encyclopedia of Human-Computer Interaction," 2nd Ed., Aarhus, Denmark: The Interaction Design Foundation, http://www.interactiondesign.org/encyclopedia/Personas.html, 2013. 2015.05.30

[15] F. Long, "Real or Imaginary - the Effect of Using Personas in Product Design," IES Conference, Dublin: Irish Ergonomics Review, 2009, pp. 1-10.

[16] J. Ma and C. LeRouge, "Introducing User Profiles and Personas into Information Systems Development," AMCIS. Paper 237, 2007. http://aisel.aisnet.org/amcis2007/237 2015.05.30

[17] T. Miaskiewicza and K. A. Kozarb, "Personas and User-Centered Design: How Can Personas Benefit Product Design Processes?," Design Studies 32, 5. 2011, pp. 417–430. doi:10.1016/j.destud.2011.03.003

[18] A. Cooper, R. Reimann, and D. Cronin, "About Face 3.0: The Essentials of Interaction Design," Wiley 2007.

[19] J. Pruitt and J. Grudin, "Personas: Practice and Theory," Proceedings of the 2003 conference on Designing for user experiences (DUX 2003), pp. 1-15. doi: 10.1145/997078.997089

[20] D. Levin, (2004). "Which Personas are you targeting?," 5 Minute Whitepaper.

[21] W. Quesenbery, "Using Personas: Bringing Users Alive," STC Usability SIG Newsletter-Usability Interface, 2004.

[22] C. N. Chapman and R. Milham, "The Personas' new Clothes: Methodological and Practical Arguments Against a Popular Method," Proceedings of the Human Factors and Ergonomics Society Annual Meeting, October 2006 vol. 50 no. 5 634-636 (HFES 2006), pp. 634-636,. doi: 10.1177/154193120605000503

[23] T. Adlin and J. Pruitt, "The essential Persona lifecycle: Your guide to building and using Personas," Morgan Kaufmann, Burlington, MA, 2010.

[24] E. Friess, "Personas and decision making in the design process: an ethnographic case study," Proceedings of SIGCHI Conference on Human Factors in Computing Systems (CHI 2012), ACM Press pp. 1209-1218, 2012. doi: 10.1145/2207676.2208572

[25] S. Faily and I. Flechais, "Persona Cases: A Technique for Grounding Personas," Proceedings of SIGCHI Conference on Human Factors in Computing Systems (CHI 2011), ACM Press, pp. 2267-2270, 2011. doi: 10.1145/1978942.1979274

[26] L. Nielsen, K. S. Nielsen, J. Stage, and J. Billestrup, "Going global with Personas," Procedings of Human-Computer Interaction – INTERACT (INTERACT 20013), pp. 350-357. Springer Berlin Heidelberg. 2013. doi: 10.1007/978-3-642-40498-6_27

[27] Y. Chang, Y. Lim, and E. Stolterman, "Personas: From Theory to Practices," Proceeding of Proc. of Nordic Conference on Human-Computer Interaction: Building Bridges (NordiCHI 2008), pp. 439-442. doi 10.1145/1463160.1463214

[28] P. Turner and S. Turner, "Is stereotyping inevitable when designing with Personas?," Design Studies, 32, 1, 30-44, (2011) doi:10.1016/j.destud.2010.06.002

[29] S. Powell, F. Keenan, and K. McDaid, "Enhancing Agile Requirements Elicitation With Personas," IADIS International Journal on Computer Science and Information Systems, 2(1), 82-95, 2007.

[30] www.survey-xact.com 2015.05.30

[31] C. Urquhart, "Grounded Theory for Qualitative Research: A Practical Guide," Thousand Oaks, California: Sage, 2013.

[32] J. Corbin and A. Strauss, "Basics of Qualitative Research, Techniques and Procedures for Developing Grounded Theory," 3rd edition, Sage Publications, 2008.

[33] C. Urquhart, H. Lehmann, and M. D. Myers, "Putting the Theory Back Into Grounded Theory," Guidelines for grounded theory studies in Information Systems". Info Systems J 20, 2010, pp. 357-381. doi: 10.1111/j.1365-2575.2009.00328.x

[34] S. Pace, "A Grounded Theory of the Flow Experiences of Web Users," Proceedings of International Journal of Human-Computer Studies (IJHES, 2003), pp. 327-363. 2003. doi: doi:10.1016/j.ijhcs.2003.08.005

[35] Kvale, S.: "Interview," København: Hans Reitzel (1997) NordiCHI, 2008, pp. 353-362.

[36] S. Baird, "Using Personas To Discover Requirements," http://philarnold.co.uk/wp-content/uploads/2009/10/User-Personas.pdf (2002) 2015.05.30

[37] D. Svanæs and J. Gulliksen, "Understanding the Context of Design – Towards Tactical User Centered Design," Proceedings of Nordic Conference oon Human-Computer Interaction: Building Bridges (NordiCHI, 2008), pp. 353-362. doi: 10.1145/1463160.1463199