

Contextual Personas - A Method for Capturing the Digital Work Environment of Users

Marta Lárusdóttir¹[0000-0003-0256-5710], Ruochen Wang², Åsa Cajander²[0000-0001-7472-2215]

¹ Reykjavik University, Menntavegur 1, 101 Reykjavik, Iceland

² Uppsala University, P.O. Box 256, SE-751 05 Uppsala, Sweden
marta@ru.is

Abstract. It can be hard to understand the context in which a software system is used and how the whole work environment affects the usage of a particular system. In this project, we modified the Persona method to include aspects of the digital work environment and the context to extend the understanding of these aspects during software development.. The modified version of the Persona method is based on the traditional Persona method, on theories on healthy work and research on the digital work environment. The objective of proposing the modifications of the method is to give software developers more insights into the complexity of the digital work environment. University students tried the modified Contextual Persona method in a user-centred software development course. Students worked on designing a new system for 12 weeks using the Contextual Persona method during the fourth week of software development. The students gave feedback on what positive and negative aspects they experienced while using the modified Contextual Persona method and their thoughts on how the method could be improved. In the paper, we analyse reports from 30 students and summarise the feedback gathered. We conclude by summarising the possible improvements to the method based on our findings.

Keywords: Persona method, Context of use, Usability, User-centred design, HCI methodology.

1 Introduction

Software systems have become mobile, portable, wearable, and ubiquitous and thus are used in a more dynamic contextual setting than 20 or 30 years ago [1]. Hence, understanding the context of use while developing software systems has become more critical and has raised awareness in practice and research [1, 2, 3, 4]. Software systems are often used in multi-contextual settings where the usage is more dynamic, heterogeneous and unpredictable than the usage of systems used in a single context of use with stationary computing systems [1]. Hence many factors affect the analysis of the context of use for systems being developed, such as the dynamics of business environments, organizational culture, organizational strategy, project type, the background of team members and more [1].

The term digital work environment has been used to explain using software systems in the context of work situations. Digitalization in work situations has developed lately by automating working processes, assisting decision-making, and sharing knowledge within the organizations [5]. However, digitalizing work situations has also resulted in negative consequences such as productivity loss, health problems, and privacy breaches [6]. One approach to address health problems caused by poorly designed software systems is to improve the usability and the user experience of the software systems by considering the human factors and the contextual factors of the systems when developing those.

The Persona method is a user-centred design (UCD) method applied frequently and extensively in the development of software systems to gain empathy for users and to extend the understanding of the users, their tasks and their context of use. The Persona method is often used for enriching the communication between designers and developers with this purpose [7]. When constructing a persona, a name and a portrait are selected to depict the persona. Additionally, a narrative form to describe the persona is written to make the persona like a natural person and provide a clear and detailed story concerning the goals and needs of the target users in the context of the designed products [8]. The narrative usually starts with a description of the type of individual, occupations, hobbies and more. The specific needs and personal goals in the product context are also described [8]. The Persona method can help designers and developers to put themselves in users' way of improving the user experience of the developed system [9, 10].

Based on the idea of including health aspects related to the work environment into the Persona method, a new method called the Contextual Persona method was proposed in 2015 [11]. Although it looks like the traditional Persona method, the Contextual Persona method focuses on describing users' physical environment, social environment, and technological environment. The Contextual Persona method gained positive feedback from users and researchers in a case study [11]. Unlike the traditional Persona method, which mainly describes the end users' behaviour, goals and motivation, the Contextual Persona method also considers the context or environment-related factors when end-users use the system.

In this study, we build on previous work on the Persona method and the Contextual Persona method. We suggest modifications to the Contextual Persona method to include several digital work environment aspects and study how university students experience the modified Contextual Persona method.

In this paper, we state the following research questions:

1. What are the positive and negative aspects that students experience from using the modified Contextual Persona method?
2. What improvements do the students suggest for future usage of the modified Contextual Persona method?

2 Background

In this section we describe briefly the related work on the concept of context of use, the concept of digital work environment and the Persona method.

2.1 The Concept of Context of Use

The concept of context of use in HCI research has been defined and developed by several researchers. It includes defining a framework of the context of use [12], the taxonomy of context of use components [13], defining contextual dimensions [14], and defining a user experience context scale [15]. Maguire describes the main contextual factors to be considered in the context of user analysis [12]. According to his framework, the main contextual factors should be 1) users, 2) tasks, and 3) environments such as technical environment, the physical environment and social or organizational environment. Alonso-Rios et al. provided a context of use taxonomy for usability studies [13]. The first level of the taxonomy consists of users, tasks, and environments, similar to Maguire's main contextual factors [12]. The taxonomy provided a more precise definition of context of use components. To simplify the representation of context and structure the contextual factors, Bradley and Dunlop suggested the following contextual dimensions: 1) task context, 2) physical context, 3) social context, 4) temporal context, 5) application context, 6) cognitive context [14]. Additionally, Lallemand and Koenig recently developed a user experience context scale (UXCS), to incorporate contextual dimensions in the UX assessment questionnaire [15]. Their work strives to understand and assess the influence of context factors in user experience.

2.2 The Concept of Digital Work Environment

Work environment refers to “work conditions at the workplace, which may encourage or discourage employees to work” [16]. They also stated that the work environment includes the physical environment as well as the social relationships at the workplace. Additionally, Wright and Davis stated that the work environment consists of two components: job characteristics and work context [17]. Job characteristics refers to how a job affects the employee's critical psychological states, such as “the meaningfulness of the work” and “employee's spirit, growth and development”. The work context refers to the organizational settings such as organization's rewarding systems and organizational goals in their definition.

Digital work refers to employees' work using information and communications technology (ICT) [18]. Dittes and Smolnik conceptualized the digital work environment as “the online representation of the working conditions that the employees require to do their work” [19]. Williams and Schubert [20] argued that such work conditions should enable people to be productive and fulfil their requirements in data, information and knowledge. The term digital work environment is defined as “the working environment, with its problems and opportunities of physical, organizational,

social and cognitive nature, which is the result of digitalization of the work support systems and tools.” [21].

2.3 The Persona Method

The Persona method is a user-centred design (UCD) method applied frequently and extensively in the development of software systems. Cooper [22] was the first to introduce the concept of a persona and described that personas “are hypothetical archetypes of actual users”. Although Cooper argues that personas as hypothetical and imaginary, he emphasises that personas are defined with significant rigour and precision [22]. To illustrate this, Cooper et al. [23] stated that just like physicists use models to describe the behaviour of particles, HCI researchers should use the Persona method as a model to describe the behaviour of end-users and the context in which they work and life. In this paper, we refer to this method as the traditional Persona method. An example of describing one persona using the traditional Persona method is shown in Figure 1.

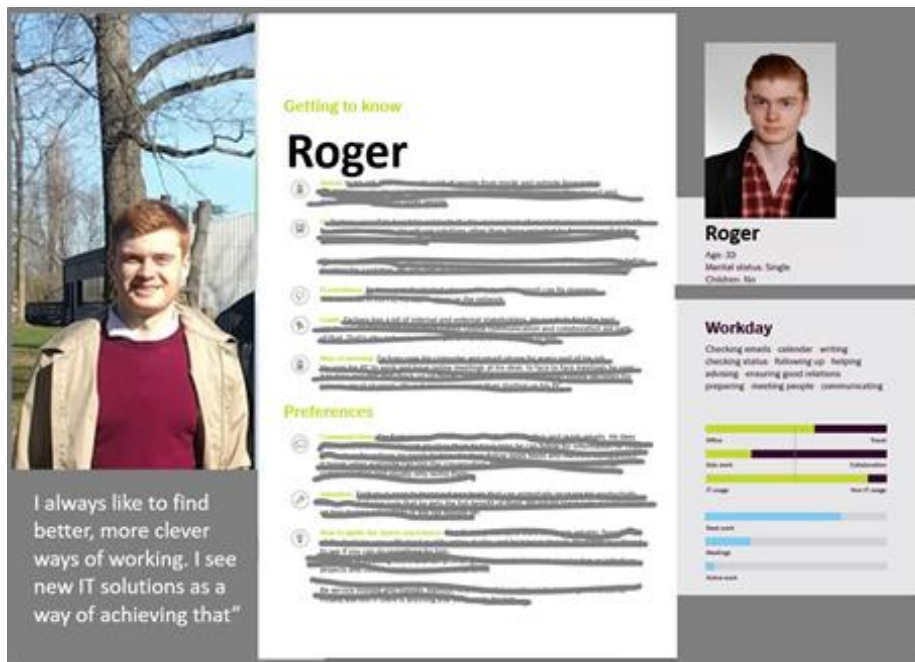


Fig. 1. An example of describe a persona by using the traditional Persona method

The personas are typically used to communicate between designers and developers to extend the empathy for users [7]. The traditional Persona method can help designers and developers put themselves in users’ shoes that are useful for improving user experience using the developed system [9, 10]. When constructing a persona, a name and a portrait are selected to depict the persona, and a narrative form will be adopted

to describe the persona [8]. The narrative usually starts with a description of the type of individual, occupations, hobbies, etc. The personas' specific needs and personal goals in the product context are described [8]. The narrative should be concise enough to express the design requirements accurately [24]. Typically, a persona is created through four steps [25, 26]: 1) collecting data from actual users, 2) grouping and segmenting the collected data, 3) analysing the grouped data, and 4) constructing a persona based on the information derived from the raw data. Qualitative data and quantitative data can be the source to create a persona [27].

The traditional Persona method offers several benefits in product design. One of the benefits is to facilitate communication among designers and stakeholders and to enable designers to put themselves in the users' shoes and extend empathy for the users [22, 28, 29, 30, 31]. Elaborating upon previous research, Miaskiewicz and Kozar [8] concluded that the five most significant benefits of personas are the ability to: 1) focus the product design teams on the actual goals of the target users; 2) prioritise the product requirements and help to determine whether the designers are solving the correct problems; 3) prioritise the most critical audience; 4) challenge the long-standing and often incorrect assumptions about the users, and 5) prevent the self-referential design.

However, the traditional Persona method has been criticised for being not scientific. Chapman and Milham [32] argue that it is impossible to reproduce a specific persona from given data, and thus the process is not subject to the scientific method of reproducible research. Some researchers also claim that verifying the accuracy of the persona remains challengeable [33, 34, 35]. Moreover, making personas during a design activity is costly and time-consuming [35]. For example, An and colleagues reported that the creation of personas could cost tens or even hundreds of thousands of U.S. dollars, and the persona creation also takes months to complete [33]. Other negative aspects of the traditional Persona method include being biased by creators [35], being overused [24] and neglecting disability groups [9].

3 The Contextual Persona Method

In this section, the development and a description of the template for the Contextual Persona method are given.

Cajander et al. [11], proposed the Contextual Persona method to extend the understanding of software developers on the context of use that the software system they are developing will be used in. They state that the primary motivation for suggesting the Contextual Persona method was to promote healthy work. The original Contextual Persona method was based on the Demand-Control-Support model developed by Theorell and Karasek [36]. The model is used to analyse psycho-social work conditions and their effect on health. According to this model, high job demand with little control at work and little support at work will lead to stress and cause very adverse effects on health. The original Contextual Persona method includes sections for demand at work, control at work and support at work. These sections were meant to help developers consider the factors that cause health issues in designing their software system. In Figure 2, an example of one Contextual Persona using the original version of the Contextual Persona method.

PERSONA #1
JOHANNA AXELSSON

ONE DAY AT WORK

The majority of her time, Johanna works with the financials in various research projects. She is proficient in Excel and creates her own templates to compute the economy. She does not believe that there are good listings in the accounting system which counts in the way she wants it, and that researchers at her institution are used to seeing it the way she does it. Over coffee, the usual questions about computer systems come up, and Johanna who

feel secure about computers says that she has spoken with the IT support about a printing problem and they said they will solve the problem within a few days. Johanna has good support when it comes to computer problems as her boyfriend is always available for questions through Skype or email. After the coffee break, she continues to compile the financial reports. She listens to the radio on low volume in the background. Johanna thinks that it is indeed quite comfortable with her relatively undemanding job, but she can occasionally find it more fun with more challenging tasks like budgeting and budget tracking. Johanna dedicates the last hour of the day to access to code invoices Raindance. She works gradually through the submitted invoices and emails the scientists from which she needs a basis for understanding on what it is that has been purchased. At four o'clock, Johanna uses her possibility of a flexible work schedule and goes to a spinning class at the local gym.

20 SYSTEMS

Goals

- ✓ a good job with the financials of the various research projects.
- ✓ to help the others in the administrative group with for example computers.
- ✓ an empty inbox in the travel expenses system when the day is over.

CONTROL Johanna has the competence needed for her work, and she is in complete control in most situations. Having an empty inbox adds to her a sense of control.

DEMAND Johanna has a demanding work, where accuracy is crucial. Sometimes it is much too demanding as when it comes to foreign invoices. Many task are too easy and tedious, and this is a stressor in her work.

SUPPORT Johanna is supported by the central business administration when her work tasks are too demanding. She has good support from her boyfriend when it comes to difficult questions about computers

Johanna has not lived in Uppsala that long, until recently she and her boyfriend rented a second hand apartment, but now they have just bought an apartment in the new area at the station. The apartment was expensive, but now they live in the city centre. Johanna has a Masters degree in business administration from Stockholm University, and is happy that she got an employment at Uppsala University. Her boyfriend had already started working on a game development company in Uppsala, so it was fitting to move here. She thinks it's fun at work, but feels she would like to take on more advanced tasks: Right now it feels as if she gets to do the things that nobody else wants to do, which tends to be quite tedious tasks.

Except for when it comes foreign invoices, then it is instead rather difficult for her and it is much too demanding. There is no clear information about what she should do with the tax codes, so then she just sends the to the central business administration and hope that someone else will solve the problem.

34 YEARS OLD

PERSONAL LIFE

PORTRAIT BY: MARINA OSK JONSSOOTTIR

Fig. 2. An example of one contextual persona

The Contextual Persona method received positive feedback in a case study, and the respondents thought the contextual personas truly reflected their work situation [11].

The modified Contextual Persona method suggested in this paper considers the concept of the context of use in addition to the other aspects covered in the original Contextual Persona method. Based on the ISO 9241-210 [37] standard definition of the context of use and Maguire's components of context of use [12], sections were added to describe the digital work environment of the personas. The aspects are: 1) physical work environment aspects, 2) organisational work environment aspects, 3) social work environment aspects and 4) the cognitive load aspect. A template for describing a persona using the modified Contextual Persona method is shown in Figure 3.

INSERT PICTURE

NAME

Age: Some text
Job: Some text
Work Experience: Some text
Education: Some text
Family situation: Some text

PERSONAL CHARACTERISTICS

Write text here on the persona characteristics. Emphasize describing the characteristics that affect stress at work.

CONTROL AT WORK

Write text here on the control at work

DEMANDS AT WORK

Write text here on the demands at work

SUPPORT AT WORK

Write text here on the support at work

ONE DAY AT WORK

Write text here on one day at work. Describe the flow of the day and how the persona uses various software systems during one day.

GOALS AT WORK

- Write text here on the demands at work
- XXX
- XXX

WORK ENVIRONMENT

Physical work environment:

- ...
- ...
- ...

Organizational environment:

- ...
- ...
- ...

Social environment:

- ...
- ...
- ...

Cognitive load:

- ...
- ...
- ...

Fig. 3. A template for using the modified Contextual Persona method

In Figure 4, we show one example of using the template, describing the same persona as described and shown in Figure 2.

Johanna Axelsson

Age: 34 years old
Job: Accountant in various research projects
Work Experience: Has worked for 5 years at Uppsala University
Education: Master in business administration from Stockholm university
Family situation: Has a boyfriend and lives in central Uppsala in an apartment that they recently bought

PERSONA CHARACTERISTICS

Johanna is a person that likes details and wants everything to be according to the rules set. She is focused on her tasks and wants to meet deadlines well ahead of time. If she gets tasks to do with a short notice she gets stressed and also if she has to wait for somebody else to finish a task, before she is able to finish hers.

CONTROL AT WORK

Johanna has the competences needed for her work, and she is in complete control in most situations. Having an empty inbox adds to her a sense of control.

DEMANDS AT WORK

Johanna has a demanding work, where accuracy is crucial. Sometimes it is much too demanding as when it comes to foreign invoices. Many tasks are too easy and tedious, and this is a stressor in her work.

SUPPORT AT WORK

Johanna is supported by the central business administration whenever work tasks are too demanding. She has good support from her boyfriend when it comes to difficult questions about computers.

ONE DAY AT WORK

The majority of her time, Johanna works with financials in various research projects. She is proficient in Excel and creates her own templates to compute the economy. She does not believe that there are good listings in the accounting system which counts in the way she wants it, and that researchers at her institution are used to seeing it the way she does it. Over coffee, the usual questions about computer systems come up, and Johanna who feels secure about computers says that she has spoken with the IT support about a printing problem and they said they will solve the problem within a few days. After the coffee break she continues to compile the financial reports.

GOALS AT WORK

- ✓ A good job with the financials of the various research projects
- ✓ To help the others in the administrative group with for example computers
- ✓ And empty inbox in the travel expenses system when the day is over

WORK ENVIRONMENT

Physical work environment:

- Shares an office with Anna Lindgren
- Has two big screens and a PC
- The printer is at the end of the corridor
- Uses 20 computer systems at work

Organizational environment:

- Johanna's manager is enthusiastic and demanding

Social environment:

- The group of administrators help each other in stressful situations
- The IT tech department respond quickly to help requests

Cognitive load:

- The 20 systems that Johanna uses have various user interfaces, and uses various terms, sometimes for the same thing
- Johanna often does many things in parallel and is often interrupted by people asking for payments

Fig. 4. One example describing a persona with the modified Contextual Persona method.

4 Method

The findings presented in this paper derive from 30 student reports from a user-centred software development course given in Spring 2020 at Reykjavik University. In that course, students were asked to use the modified Contextual Persona method in their design work. They provided us insightful feedback on the following topics: the positive aspects of the Contextual Persona method, the negative aspects of the Contextual Persona method, and what can be improved about the method. At the end of the course, each wrote a report on using the Contextual Persona method. We analysed their reports with the thematic analysis method.

4.1 Data Collection

Computer science students at Reykjavik University used the modified Contextual Persona method during a 12-week user-centred software development course. Students worked on designing a new system of their choice during the whole course. The new system was to be used in some work environment of the students' choice. The students attended the course on-site at the university one morning each week. The schedule combined lectures, hands-on training on site, and projects between the course occasions. During the course, one of the first activities was to conduct contextual interviews in a work environment to gather ideas for improving the digital work environment for potential users.

Students used the Contextual Persona method during the fourth week of the course. The students got a 40 minutes introduction lecture on personas in general and contextual personas particularly. They were shown some examples of contextual personas and got hands-on training in defining 3 - 5 contextual personas for 80 minutes. The contextual personas were based on the data gathered during the contextual interviews. The students got the template shown in Figure 1 to fill in.

The students gave feedback on what positive and negative aspects they experienced while using the modified Contextual Persona method in the design project and their thoughts on how the method could be improved. To gain a deeper understanding of the usage of the Contextual Persona method, we analysed 30 student reports from Reykjavik University. Students answered a series of reflective questions in their reports: 1) What are the positive aspects of the Contextual Persona method? 2) What are the negative aspects of the Contextual Persona method? and 3) Is there anything that you think could be improved in the Contextual Persona method?

All the reports were thoroughly constructed, except that one student handed in an unfinished report. The contents of students' answers were heterogeneous, which enabled us to gain diverse perspectives from their reflections. Some students provided long and detailed reflection, while some students' answers were short. The aim of the research is not to focus on identifying the unique and idiosyncratic meanings and experiences. In the analysis, we strive to find common themes in their answers and we therefore, adopted the thematic analysis method to analyse the reports [38].

4.2 Data Analysis

The data were analysed following [38]. Reports were first read to familiarise with the data, and answers were extracted question by question. The answers to one specific question were analysed together. The initial codes were gathered by finding short segments that could answer the question clearly and explicitly.

After the initial coding, patterns and potential themes were identified. In most cases, several relevant codes were combined to form an overarching theme. In some cases, codes could become themes in their own right. Some codes, however, were discarded because they were too vague or not relevant enough to the specified question. Moreover, some codes that did not belong anywhere were grouped under a theme called “miscellaneous”. These codes were revisited in the next stage to decide whether they should be combined, refined, or discarded.

Based on the potential themes, a thematic map was constructed. All the candidate themes were revisited to make sure that the themes were accurate representations of the data. The first step was to read all the extracted codes for each theme and consider whether those codes appeared to form a coherent pattern that is that all relevant codes under a theme fitted the theme. If codes did not fit the existing theme, that code was redefined to a suitable theme. If the codes were irrelevant or too vague, these were discarded from the analysis. The relationship between the candidate themes and the data set was validated by comparing the data set with candidate themes to confirm that the candidate themes were accurate representations of the data set. The categorisation into themes was finished when there was no missing information or nothing substantial that could be added to the candidate themes. After all candidate themes were validated, a thematic map was developed for each question by grouping relevant themes together.

The thematic maps are a hierarchical structure that consists of main overarching themes and sub-themes for each of the three questions analysed. Each central overarching theme has one or several related sub-themes. The thematic maps depict the relationship of all the themes.

5 Results

This section presents our findings by listing or narrating the themes identified from the 30 reports. Most respondents think that the Contextual Persona method will be valuable in the future and should be used at the beginning of the development. Moreover, six respondents particularly mentioned that the method should also be used throughout the whole design process. The presentation of the findings starts with showing the positive aspects and negative aspects of the Contextual Persona method. Additionally, we describe the possible improvement that the students suggested to the method.

5.1 Positive Aspects of the Modified Contextual Persona Method

The positive aspects of the Contextual Persona method extracted from the student reports include three themes described below.

Help to understand the users and their work environment. Almost all students described that the Contextual Persona method helps deepen their understanding of the users' needs and the users' work environment. Compared to the traditional Persona method, they reflect that the Contextual Persona method gives more relevant information about the context. For example, one of the students made such reflections: "It allows the team to get in sync with not only the Personas but also the work environment and the task that the design needs to be able to handle."

An excellent tool to facilitate the design/development work. Another important positive aspect is the efficiency that the Contextual Persona method brings to the design work. The Contextual Persona method is regarded as an efficient tool for collecting data, assisting communication and collaboration among the design group members, helping the design team make important decisions, and saving time for the design projects. Some respondents also reported that the Contextual Persona method is easy to use, and the layout of the Contextual Persona is easy to navigate.

Help with the scope and the focus of the design work. The respondents experience that Contextual Persona enables them to see the scope of the design work and help them focus on the critical tasks and features which matter most to the users. Just as one of the respondents said in her report: "By getting a more detailed context we get a better idea of what should be included in the implementation and how it should be handled."

5.2 Negative Aspects

The negative aspects of the Contextual Persona method extracted from the student reports were mainly focused on two themes: 1) The limitations in revealing users' needs and their working environment and 2) the inconvenience of using the Contextual Personas in the design activity.

Limitations in revealing users' needs and their working environment. First, Contextual Persona might encourage us in using stereotypes, and makes us focused on one type of user but ignores other types of users. For example, some respondents reflect that Contextual Persona might provide us with a stereotypical representation of elderly and non-tech savvy people. Second, although some respondents made multiple Contextual Personas, they reflected that their Personas were too similar and thus, lacked diversity. However, they did not explain in the report how they made those Personas and thus we cannot infer why they end up having Contextual Personas that look very much alike. Third, Contextual Personas are fictional and influenced by designers' Personal bias, affecting the system design and development work. Regard-

ing this point, one respondent made such reflections: “Because the Persona is technically made up and fictional, when creating the Persona, we can become biased on how the Persona should be like which can greatly affect the outcome of the system if we were to base it on the Persona.”

Fourth, the Contextual Persona method can lower the need to have frequent face-to-face conversations with real users. One respondent described this phenomenon as “the bigotry” of the designers. Another respondent pointed out that “this method could endanger the Persona by reinscribing existing stereotypes and following more of an I-methodological than a user-centred approach.

Inconvenience in the design work activity. First, some respondents describe that once the Persona is made, it is difficult to change it. Thus, the wrongly made Persona would finally affect the whole process and the final product. Second, most respondents reported that making Persona is time-consuming, which will consequently slow the progress. Third, respondents also mentioned a phenomenon that developers might not keep the Contextual Persona that they made in mind, and thus the Contextual Persona turned out to be useless. One respondent described this phenomenon as follows: “A team could put time into making these Personas, and then not utilize them when designing the software, resulting in wasted time.” Fourth, developers might have a different interpretation of the Persona details, which might lead to a different understanding or even misunderstanding of the Persona.

5.3 Possible Improvements of the Contextual Persona Method

Students also provided insightful ideas on how the Contextual Persona method could be improved. In total, seven themes were analysed.

Layout and content. The first central theme identified from the reports is the improvements regarding the layouts and contents of the Contextual Persona. The first suggestion is that the Contextual Persona should be accurate and reliable. To achieve that, possible actions could be using analytic methods to get reliable information, building Persona based on actual users, and picking up the right end-users for an interview.

Reducing background details. The second suggestion is reducing the irrelevant background details in the Contextual Persona. They think such details do not help the team make decisions. “I also think that the Persona does not need a backstory, it does not improve the system to know if the Persona has three kids and loves tennis.”

Add subsections on work-related information. The third suggestion is to add more subsections that care about work-related information. For example, the respondents suggest adding a subsection regarding the overall technical skills of the Persona. Besides, a respondent suggests adding a subsection describing the Persona’s current anger points at work and a subsection describing what the Persona are not capable of at work.

Multiple and diverse personas. The fourth suggestion is to make multiple but diverse contextual personas. The respondents believe the diverse Personas could help them gain a broader picture of the end-users and their needs. One informant stated: “I also think that making multiple personas for each user group would be beneficial as each user group could have users with different needs and one persona per user group might not catch all those needs.”

Stakeholders involved in making personas. Students suggested that the stakeholders should be involved in reviewing the contextual personas. They argued that the perspectives from outside stakeholders could avoid bias and thus help them get a more accurate understanding of users.

Use Contextual Personas more frequently during the design process. The respondents commented that they think Contextual Persona could be used in a variety of ways, not just keeping it in mind. “Another thing that could be improved is to use the contextual personas for something else, other than simply keeping them in mind. For example, they could be used in user stories.”

Simplifying the Contextual Persona description. . One respondent suggested that the method description should be simplified. Here is his reflection: “[I]n the beginning, when I didn’t have any previous knowledge of using the Contextual Persona method, I found it fairly difficult to implement as I needed help from my teachers on how to implement it correctly, so I solely think that method description should be simplified with the goal of receiving larger groups of people, that want to implement the method.”

6 Possible Improvements to the Method

Based on our results, we have made a list of possible improvements to the Contextual Persona method and the guidance that will be given out for using the method.

The credibility of the Contextual Persona could be extended. When introducing the Contextual Persona, the conductors of the method could be encouraged to involve actual users in contextual interviews. In doing so, they could make sure that the source of the Contextual Personas is more credible, and the Personas that they make represent the end-users well.

The Contextual Persona should be straight to the point. Conductors of the Contextual Persona method should be advised to write concise description and pertinent. They should avoid using lengthy paragraphs but instead, use shorter paragraphs or bullet points.

The focus in the background information should be work-related. Conductors of the Contextual Persona method should be advised to focus on the background infor-

mation on work-related topics and not focus as much on information regarding more personal details. Questions like: What do your users want to achieve at work? What hinders them? What are the stressors? How much control do they have? What kind of support can they get at work? should be answered. That will extend the understanding of users through the Contextual Persona. Additionally, conductors of the method should be advised to describe the users' work environment that **affect** usability and user experience. For example, they might want to describe the noise, lightning, and temperature of the work environment in their Persona. Before doing that, they need to think about whether such details affect the usage of the system. If not, they should leave such details out.

The Contextual Persona should be reviewed by stakeholders. Conductors of the Contextual Persona method should be advised to ask end-users and other stakeholders to review their Contextual Personas with stakeholders. Their feedback could make the Contextual Persona more credible and accurate.

7 Discussion

The Contextual Persona method is a relatively new HCI method, so it is still unclear how software developers perceive it. In this study, we have gathered feedback from students using the modified Contextual Persona method to gain insights into how they perceive the new method. Some improvements suggested by the students are in line with previous literature. For example, the proposed improvement concerning making multiple contextual personas, prioritising them and focusing on the primary persona share the same idea as Alan Cooper and colleagues describe in their book [23].

Several factors defining the digital work environment are incorporated the modified Contextual Persona method to support software developers during their design process. Previous research regarding the context of use, such as the framework from Maguire [12] of the context of use, Alonso-Rios et al. [13] description of the taxonomy of context of use components, Bradley and Dunlop [14] description of contextual dimensions and Lallemand and Koenig [15] description of user experience context scale (UXCS), does not discuss how the context of use or contextual factors can be reflected in design processes. The previous studies focus on discussing the context of use from its definition, components and dimensions. However, such discussions separate the context of use concept from the design processes. The Contextual Personas method provides software developers with a tool to consider the context of use during their design process.

One limitation of this study is that the data is collected from students' reports rather than feedback from designers or developers using the Contextual Persona method in real-life situations. We need to be aware of the differences between gathering feedback from students in a university course and collecting data in real-life situations. Designing or developing IT systems is a complex social activity that happens in a dynamic and inter-organizational context [1], which is quite different from doing the

same things in a university course. Hence, further research can be conducted to investigate the usage of the Contextual Persona method in real-life situations.

The Contextual Persona method was described as a valuable tool to help students consider the digital work environment using the software system being designed. From the students' feedback on their own experience using the Contextual Persona method, we report the positive and negative aspects and what can be improved.

Acknowledgments

We would like to thank AFA Insurance in Sweden for the financial support to conduct this research project under the name STRIA - Software Development for a Better Work Environment (grant number 180250). Also, we would like to thank all informants in the study that took their time to participate in the study.

References

1. Eshet, E., Bouwman, H.: Context of use: the final frontier in the practice of user-centered design? *Interacting with Computers* 29, 3: 368–390 (2017).
2. Groot, B. D., van Welie, M.: Leveraging the context of use in mobile service design. In *International Conference on Mobile Human-Computer Interaction*, 334–338 (2002).
3. Kim, J., Chang, Y., Chong, A. Y., L., Park, M-C.: Do perceived use contexts influence usage behavior? An instrument development of perceived use context. *Information & Management* 56, 7: 103155 (2019).
4. Yang, S., Lu, Y., Gupta, S., Cao, Y.: Does context matter? The impact of use context on mobile internet adoption. *International Journal of Human-Computer Interaction* 28, 8: 530–541, 2012.
5. Brahma, M., Tripathi, S. S., Sahay, A.: Developing curriculum for industry 4.0: digital workplaces. *Higher Education, Skills and Work-Based Learning* (2020).
6. Hicks, M.: Why the urgency of digital transformation is hurting the digital workplace. *Strategic HR Review*, (2019).
7. Matthews, T., Whittaker, S., Moran, T., Yuen, S.: Collaboration personas: A new approach to designing workplace collaboration tools. In *Proceedings of the SIGCHI conference on human factors in computing systems*, 2247–2256 (2011).
8. Miaskiewicz, T., & Kozar, K. A.: Personas and user-centered design: How can personas benefit product design processes?. *Design studies*, 32(5), 417-430, (2011).
9. Goodman-Deane, J., Langdon, P., Clarkson, J.: Key influences on the user-centred design process. *Journal of Engineering Design* 21, 2–3: 345–373 (2010).
10. Haag, M., Marsden, N.: Exploring personas as a method to foster empathy in student IT design teams. *International Journal of Technology and Design Education* 29, 3: 565–582, (2019).
11. Cajander, Å., Larusdottir, M., Eriksson, E., Nauwerck, G.: Contextual personas as a method for understanding digital work environments. In *IFIP Working Conference on Human Work Interaction Design*, 141–152, (2015).
12. Maguire, M.: Context of use within usability activities. *International journal of human-computer studies* 55, 4: 453–483 (2001).

13. Alonso-Ríos, D., Vázquez-García, A., Mosqueira-Rey, E., Moret-Bonillo, V.: A context-of-use taxonomy for usability studies. *International Journal of Human-Computer Interaction* 26, 10: 941–970 (2010).
14. Bradley, A. N., Dunlop, M. D.: Toward a multidisciplinary model of context to support context-aware computing. *Human-Computer Interaction* 20, 4: 403–446 (2005).
15. Lallemand, C., Koenig, V.: Measuring the Contextual Dimension of User Experience: Development of the User Experience Context Scale (UXCS). In *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society*, 1–13 (2020).
16. Shrivasthi, R., Bhola, S. S.: Study on working environment and job satisfaction of employees in respect to service sector: An analysis. *Review of Research* 4 (2015).
17. Wright, B. E., Davis, B. S.: Job satisfaction in the public sector: The role of the work environment. *The American review of public administration* 33, 1: 70–90, (2003).
18. Davison, R., Ou, C.: Digital work in a pre-digital organizational culture (2014).
19. Dittes, S., Smolnik, S.: Towards a digital work environment: the influence of collaboration and networking on employee performance within an enterprise social media platform. *Journal of Business Economics* 89, 8: 1215–1243 (2019).
20. Williams, S. P., Schubert, P.: Designs for the digital workplace. *Procedia computer science* 138: 478–485 (2018).
21. Sandblad, B., Gulliksen, J., Lantz, A., Walldius, Å., Åborg, C.: *Digitaliseringen och arbetsmiljön*. Studentlitteratur, Lund (2018).
22. Cooper, A.: *The inmates are running the asylum: Why high-tech products drive us crazy and how to restore the sanity*. Sams Indianapolis, (2004).
23. Cooper, A., Reimann, R., Cronin, D.: *About face 3: the essentials of interaction design*. John Wiley & Sons (2007).
24. Pruitt, J., Grudin, J.: *Personas: practice and theory*. In *Proceedings of the 2003 conference on Designing for user experiences*, 1–15 (2003).
25. Wöckl, B., Yildizoglu, U., Buber, I., Diaz, B. A., Kruijff, E., Tscheligi, M.: Basic senior personas: a representative design tool covering the spectrum of European older adults. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*, 25–32, (2012).
26. Zhu, H., Wang, H., Carroll, J. M.: *Creating Persona Skeletons from Imbalanced Datasets-A Case Study using US Older Adults' Health Data*. In *Proceedings of the 2019 on Designing Interactive Systems Conference*, 61–70, (2019).
27. Mulder, S., Yaar, Z.: *The user is always right: A practical guide to creating and using personas for the web*. New Riders (2006).
28. Cooper, A., Reimann, R., Dubberly, H.: *About face 2.0: The essentials of interaction design*. John Wiley & Sons, Inc (2003).
29. Grudin, J., Pruitt, J.: *Personas, participatory design and product development: An infrastructure for engagement*. In *Proc. PDC* (2002).
30. Long, F.: *Real or imaginary: The effectiveness of using personas in product design*. In *Proceedings of the Irish Ergonomics Society annual conference* (Vol. 14, pp. 1-10) (2009).
31. Ma, J., LeRouge, C.: *Introducing user profiles and personas into information systems development*. *AMCIS 2007 Proceedings*: 237, (2007).
32. Chapman, C. N., Milham, R. P.: *The personas' new clothes: methodological and practical arguments against a popular method*. In *Proceedings of the human factors and ergonomics society annual meeting*, 634–636, (2006).

33. An, J., Kwak, H., Jung, S., Salminen, J., Admad, M., Jansen, B.: Imaginary people representing real numbers: Generating personas from online social media data. *ACM Transactions on the Web (TWEB)* 12, 4: 1–26 (2018).
34. Pruitt, J., Adlin, T.: *The persona lifecycle: keeping people in mind throughout product design*. Elsevier (2010).
35. Spiliotopoulos, D., Margaris, D., Vassilakis, C.: Data-Assisted Persona Construction Using Social Media Data. *Big Data and Cognitive Computing* 4, 3: 21 (2020).
36. Theorell, T., Karasek, R. A.: Current issues relating to psychosocial job strain and cardiovascular disease research. *Journal of occupational health psychology* 1, no. 1:9 (1996).
37. International Standard Organization: *Ergonomics of human-system interaction* - 9241-210 (2019).
38. Braun, V., & Clarke, V.: Using thematic analysis in psychology. *Qualitative research in psychology* 3, 2: 77–101 (2006).