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TELLING STORIES WITH PERSONAS

ABSTRACT

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Even though the persona method is a well-known tool in the Human-Technology Interaction field for knowing users and their goals, tasks and environments, there are varying opinions about how personas should be developed and used. Many agree that combining personas with scenarios and user stories is useful, but scenarios and user stories can also be defined and used in various ways.

The purpose of my master's thesis is to examine with a literature review different ways to develop and use personas together with scenarios and user stories. My thesis aims to gain a broad picture of the topic rather than confirm one, single perspective. I will search for sources in multiple places since quantitative research alone cannot provide complete enough answers to my research questions.

I have divided personas into four types based on my literature review. Manual, semi-automatic and automatic personas are based on mostly user research, but they vary on how many steps in their development are done manually. Expert personas are based on knowledge gathered from stakeholders, literature and other experts. Designers should decide the type of persona based on the purpose of the project and available data and resources. The most important elements in persona description are a photo, name, background information, goals, pain points and story. All personas in the project should be comparable by using the same elements in persona descriptions and same layout in persona documents.

Deciding what sources are included in a literature review and how extensively new sources are searched for are always subjective decisions. Another limitation of my thesis is that it does not cover visual design methods, such as storyboards or user journeys. There is some academic research about personas, scenarios and user stories, but knowledge about this topic could be broadened and deepened by conducting more research on the effectiveness, popularity and usage of these methods. Comparisons of practices between countries and companies would also be interesting.

Key words and terms: persona, scenario, user story, narrative, design methods, literature review

The originality of this thesis has been checked using the Turnitin OriginalityCheck service.

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1 INTRODUCTION

User-centered design (Stephanidis, 2014), service design (Stickdorn, Hormess, Lawrence, & Schneider, 2018) and user research (Parush, 2015, chapter 13) emphasize the importance of knowing real users and their goals, tasks and environments. The persona method is a well-known tool that helps designers know users and tell stories about them. Some designers use them regularly, but others scorn them and feel that personas are a silly distraction from real work. (Goltz, 2014b.) Designers want to achieve various and abstract goals with personas in diverse contexts, so they develop and use personas in multiple ways. Persona method lacks a unified identity and foundational methodology since it does not have a clear definition and instructions on how to use it. (McKeen, 2019.) Persona method has faced much criticism, but some of the criticism is based on false assumptions or misunderstandings about the method (Nielsen, 2014).

The most common ways to write stories for personas are scenarios and user stories (Minichiello, Hood, & Harkness, 2018). Personas, scenarios and user stories can be used alone, but they are most useful when combined (Pruitt & Adlin, 2006, chapter 1; Nielsen 2014; Minichiello et al., 2018; Khanh, Daengdej, & Arifin, 2017). As with persona method, people can mean completely different things when they talk about scenarios or user stories. None of these methods should be used with rigid rules, but with flexible guidelines that are modified to different situations.

Persona method is one of the most abstract methods in the field of user experience (UX), and this abstractness can easily lead to misunderstandings and misuse (Flaherty, 2018). Persona method may seem simple and easily learnable tool, but like any other tool, personas can be used effectively or incorrectly, for good or evil. It is easy to gain a simplified understanding of the method, but mastering the development and usage of personas can take many months. (Goltz, 2014b.) Many people have developed the persona method, but there is still much controversy about how persona method is applied, what is included in persona description and should the description be based on assumptions or data. (Nielsen, 2014.)

The purpose of my master's thesis is to examine with a literature review different ways to develop and use personas together with scenarios and user stories. I chose this topic because personas, scenarios and user stories are well-known but relatively under-

researched methods in the Human-Technology Interaction (HTI) field that raise diverse opinions. HTI field usually utilizes research methods such as experimental research, surveys, diaries, case studies, interviews, focus groups, ethnography and usability testing (Lazar, Feng, & Hochheiser, 2010). I chose to do a literature review since I wanted to gain a comprehensive understanding of the topic based on what has already been written. I felt that a shorter literature review done before interviewing UX professionals would not have given me a broad enough understanding of the topic to formulate the best interview questions.

My thesis covers basics about developing and using personas, scenarios and user stories, but also some more specific questions like how often personas should be updated. I will not present exact numbers about how many of my located sources used manual or automatic personas or conducted user research since I see that the popularity of the method's conducting details should be a side issue in deciding how to develop personas. Besides, since automatic personas have only been used in recent years, the number of included years in the search affects how many percent of the studies use it. In addition, there are many personas developed and used around the world that are not reported in research or web articles.

My research questions are:

1. How are personas developed and used?
2. How are scenarios developed and used together with personas?
3. How are user stories developed and used together with personas?

I do not have a hypothesis that can be supported or rejected since I aim to gain a broad picture rather than confirm a single perspective. I will search for sources in multiple places since quantitative research alone cannot provide complete enough answers to my research questions. I want to learn what is possible with the persona method when it is tailored to different situations and purposes. If readers are interested in detailed explanations about for example how to automatically segment users with cluster analysis, they need to examine my sources. I also only mention briefly how the persona method can be sold to stakeholders.

In my thesis, I often write about designing a product even when the target of design could as well be a service, software or something else. I use the word project when I mean the whole design process revolving around a certain product from beginning to end. For simplicity's sake, I use the word designer when I mean anyone in the design team even if that person has no official training in designing. I use the word stakeholder when I mean anyone who has any kind of connection and interest to the product, whether they are designers themselves or their superiors, employees from a different department, customers or other people.

In Chapter 2 I define a literature review and its general conducting process and tell how I conducted it. In Chapter 3 I define personas, tell about their usages and benefits and what kind of criticism and research there has been about them. In Chapter 4 I will tell about developing personas and in Chapter 5 about scenarios and user stories. In Chapter 6 I will discuss the limitations of my thesis and suggest further research topics. In Chapter 7 I will summarize my thoughts that have emerged while conducting literature review.

2 LITERATURE REVIEW

In this chapter, I will cover the general as well as my process of conducting a literature review. In Chapter 2.1 I will define what a literature review is and how it can be conducted. In Chapter 2.2 I will tell how I conducted my literature review in three rounds.

2.1 Definition and process of literature review

A literature review is a systematic inspection of academic literature about a specific, predefined topic. Its goal is to analyze and evaluate research findings, theories and practices so that it can compress extensive information into an unbiased summary. A literature review defines key concepts, sets up theoretical framework and identifies relationships between theories and their practical implications. It also identifies and critiques methodological assumptions and research techniques in previous studies and reveals gaps that have not yet been studied. (Efron & Ravid, 2018, 2 – 5.)

I have summarized the six steps of conducting a literature review according to Efron and Ravid (2018) in Figure 1. However, it should be noted that conducting a literature review is usually a dynamic and continuous process. For example, when selected sources are analyzed further, a need for a new search from a different perspective may become clear. (Efron & Ravid, 2018, 6 – 7.)

A literature review can be done as a systematic literature review or as traditional narrative literature review. A systematic literature review is a highly structured, protocol-driven and objective approach that aims to test a predetermined hypothesis using mostly quantitative research studies. Exclusion and inclusion criteria are explained in detail so that the literature review can be replicated. In a traditional narrative literature review research questions may evolve during the review process and both quantitative and qualitative research is included. Criteria for selecting the sources are not explicitly presented. Even though the search may be extensive, there is no attempt to find all relevant literature. (Efron & Ravid, 2018, 18 – 25.)

Literature reviews are usually utilized in natural sciences and medicine, but rarely in the field of HTI or Computer Sciences. Still, the general process of conducting a literature review is the same. No matter what the topic and scope of the literature review

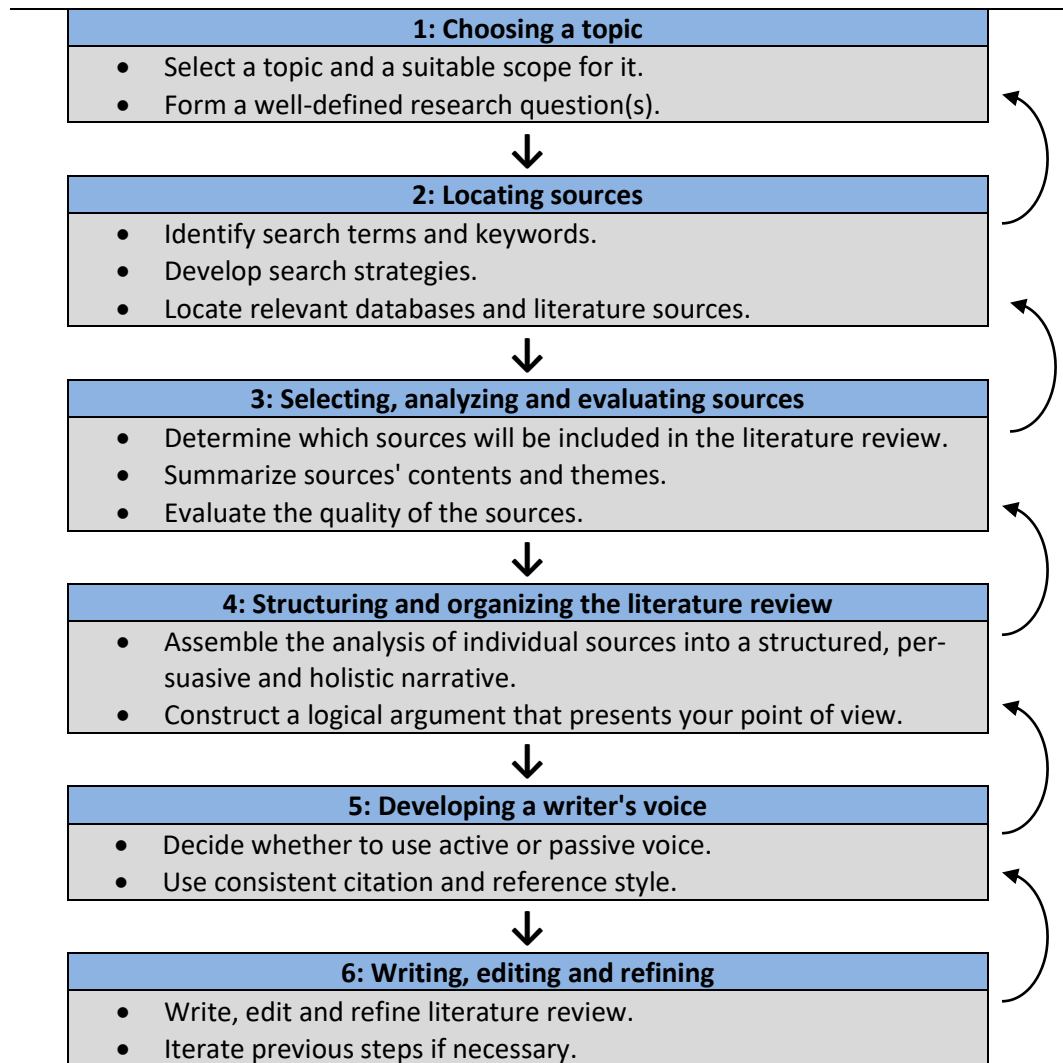


Figure 1. Six steps of conducting a literature review according to Efron and Ravid (2018).

are, it is important to locate multiple and varying sources, have suitable inclusion and exclusion criteria and synthesize data. (Hincapié-Ramos, 2012; Kofod-Petersen, 2014.) Some argue that systematic literature review might be too rigid for HTI at least in some cases (Hincapié-Ramos, 2012), but others think that a systematic literature review provides extensive data in Computer Sciences precisely because it is more organized (Kofod-Petersen, 2014).

In recent years there have been few other HTI Master's Theses in Tampere University (TUNI) that have been literature reviews. Pirinen (2019) examined addictive features in slot machines and Kuusikko (2017) examined using crowdsourcing in usability evaluations.

2.2 Conducting my literature review

My literature review resembles more a traditional narrative literature review than a systematic literature review. I used multiple types of sources and my topic focused more while conducting my literature review so I ended up excluding some sources that I had previously included. In addition, I did not try to find everything that has been written about personas or their scenarios and user stories since it would have been too broad for my thesis. Nevertheless, I will tell my inclusion and exclusion criteria and aim for objectivity and replicability.

Typically literature review list all sources that say the same thing since it confirms or rejects a hypothesis and makes research results more valid and reliable. I did not have a hypothesis and since so many sources say the same thing about for example personas evoking empathy or agile user stories using a certain format, I have given only examples of references in some cases. I did not include sources that covered my topic only briefly and did not bring anything new for my literature review.

I have summarized in Figure 2 how I conducted my literature review. At first I fo-

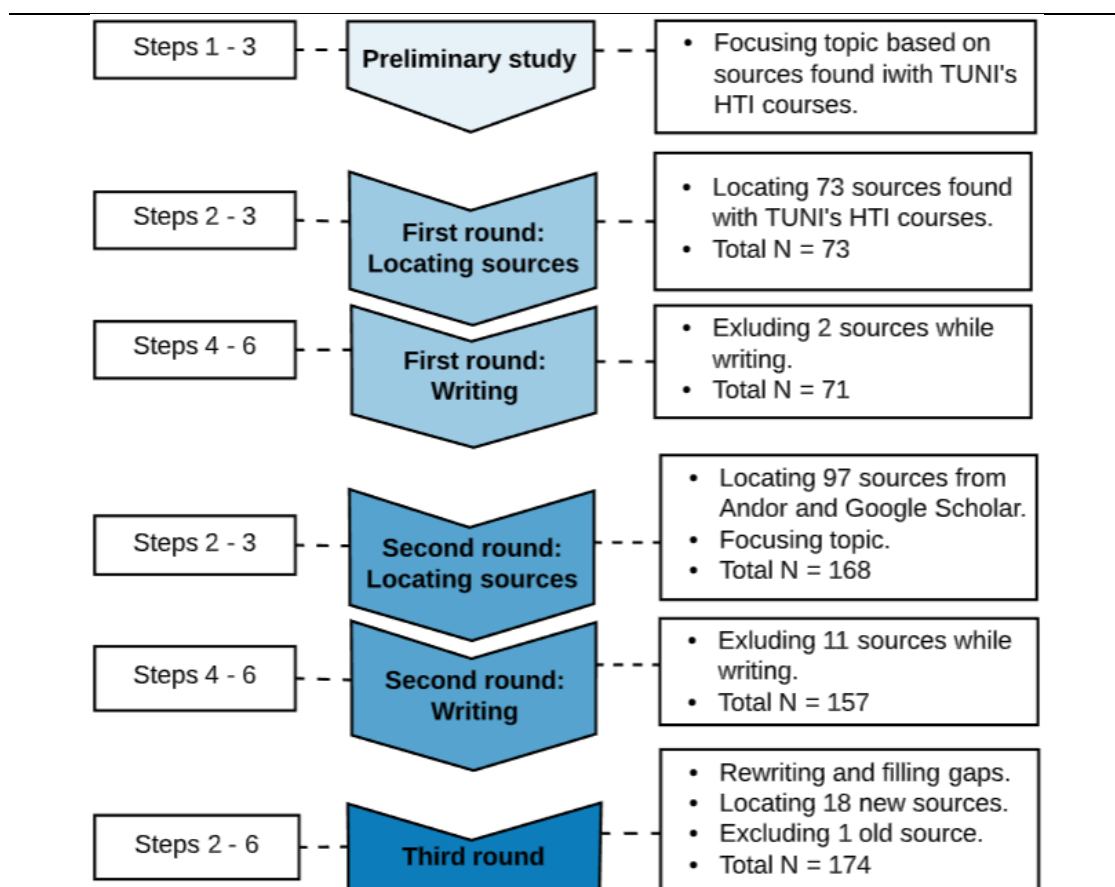


Figure 2. The summarized process of my literature review. It shows when I did which steps in Efron and Ravid's (2018) model and how many sources I had in different phases.

cused my topic in a preliminary study, where I did simultaneously steps 1, 2 and 3 from Efron and Ravid's (2018) model. After that I located sources and wrote the literature review in three rounds:

- First round: sources found from TUNI's HTI courses
- Second round: sources found from Andor and Google Scholar
- Third round: filling gaps in my literature review

In the first and second round I separately located sources (i.e. steps 2 and 3) and wrote or rewrote the literature review (i.e. steps 4, 5 and 6). I did steps 2 and 3 simultaneously because I wanted to evaluate and locate sources at the same time. While I located sources I wrote summaries of them to better perceive what kinds of sources I had gathered so far, but I did not write comparisons between sources or merge their contents. I also did not look at references or hyperlinks at this point. I did steps 4, 5 and 6 simultaneous because the structure of written out literature review and my writing style evolved. I did not want to post-pone writing to the very end because writing or rewriting a draft gave me a better understanding of the material I had gathered so far. In the third round I did all steps 2 – 6 simultaneously because I wanted to fill gaps in my literature review one by one and polish it a little bit at a time.

I have listed in Appendices A, B and C different kinds of sources. Appendix A lists my most important sources. I have evaluated sources' importance based on how often I referred to them and how much they gave content and new insights for my thesis. Appendix B lists sources where I did not have access to a full text version and hence I could not include in my literature review. Appendix C lists sources that I included while locating sources but excluded while writing or rewriting the literature review. I excluded sources that were not relevant for my more focused topic. When I was locating sources, I included uncertain sources just in case, which lead to including some unnecessary sources.

I used books, research articles, blog writings, theses and other types of material in my literature review. While I located sources I noticed that the phrases scenario and user story were sometimes used in different contexts that I mean in my literature review. I included only sources that considered scenarios and user stories as written out, refined textual narratives with a clear purpose that could be used together with the persona method (i.e. narrative where a certain user uses certain product). Regarding scenarios I excluded for example sources that considered scenarios as future scenarios, UML diagrams or conditional paths that players can choose in a game. Regarding user stories, I excluded for example sources that considered the story as a vague concept where the whole design process is seen as a story.

2.2.1 Preliminary study and first round

I did in January and February 2020 a preliminary study to focus my topic and gain a better understanding of the terms user group, persona, scenario and user story. I located relevant sources from websites and books mentioned so far in TUNI's HTI courses that I had taken. Courses referred typically to a single web article, but I searched for other sources on the same website. I used search functionality in websites and e-books and read books' tables of content. In the preliminary study, I found 25 websites and 5 books that had some information about user groups, personas, scenarios and/or user stories in them.

The preliminary study revealed that very few sources focus on clustering users into user groups. Those sources that I found considered the topic from the perspective of developing personas so I chose to exclude user groups from my topic and concentrate on personas, scenarios and user stories. The preliminary study also confirmed my aim to select diverse sources for my literature review since people's opinions about these methods varied greatly.

I included all the 5 books that I had found in the preliminary study. I only looked at the 7 websites that were mentioned more than one course since they gave many sources and I wanted to limit my workload. I found relevant sources from 5 websites. I searched for new sources on websites as long as I seemed to find new information and perspective to my thesis.

I have summarized in Table 1 how many sources I found and included on different websites. I used mostly search word function on the website to find sources, but if the website had tagged articles I used tags to locate sources. I searched separately with words "persona", "scenario" and "user story" and at least tested if plural search word gave more results than singular. If the search gave more than 100 results, I only looked through the first 100 of them. I read the title and abstract from all of the articles. Sometimes I also quickly looked at the contents before deciding whether I wanted to include the article or not. I excluded articles that focused on something other than personas, scenarios and user stories. I included only sources that had stated a publication time. Most included sources had also stated authors name and background information, but three articles in The Interaction Design Foundation had not specified the author. Still, I considered them to be reliable enough to be used as a source.

I evaluated sources based on how recent they were and where they had been published. Some blog writings had citations and references, but not all. It may well be that not everything written in blog articles without citations was author's original thoughts since they have learned about personas, scenarios or user stories somewhere instead of inventing those methods themselves. Still, I included those sources if they had relevant

Table 1. Search strategy for different websites and the number of sources found and included in them.

Website and search strategy	Sources found*	Sources included
Interaction Design Foundation: <ul style="list-style-type: none"> Sources tagged with "Personas", "User Scenarios" and "User stories". 	20	12
Nielsen Norman Group: <ul style="list-style-type: none"> Sources tagged with "Personas". The search function on the website. 	279	21
Smashing Magazine: <ul style="list-style-type: none"> The search function on the website. 	39	3
UXmatters: <ul style="list-style-type: none"> The search function on the website (partially broken). 	559**	26
UX Magazine: <ul style="list-style-type: none"> Sources tagged with "Personas" and "Storytelling" (partially broken). Advanced Google search. 	115**	6
Total	1012**	68

* Column numbers may contain duplicate sources since I did several searches with different search words.

** Number is not reliable since the search function on the website was broken.

content for my thesis since blog articles are typically written in a free format rather than with academic citations and references.

Websites that I used were:

- The Interaction Design Foundation (<https://www.interaction-design.org>): The Interaction Design Foundation was established in 2002 to create low-cost, high-quality online education about design. Its literature section has books and articles written by well-known authors in the design field. (Interaction Design Foundation [IDF], n.d.)
- Nielsen Norman Group (<https://www.nngroup.com/>): Nielsen Norman Group was founded in 1998 by Jakob Nielsen and Don Norman. It is a UX research and consulting firm that offers over 1000 free articles and paid reports and books. (Nielsen Norman Group, n.d.) I read only free articles. Plural search words gave the same results as singular. There was no way to order the results, but the most relevant seemed to be in the beginning.
- Smashing Magazine (<https://www.smashingmagazine.com/>): Smashing Magazine is an independent web magazine founded in 2006 by Vitaly Friedman and Sven Lennartz to publish reliable, useful and practical articles to web designers and developers. It offers free articles and paid reports and books. (Smashing Magazine, n.d.) I read only free articles. Plural search words gave the same results as singular.

- UXmatters (<https://www.uxmatters.com/>): UXmatters is a web magazine founded by Pabini Gabriel-Petit in 2005 to publish articles about UX to experienced professionals, newcomers and stakeholders (UXmatters, n.d.). Plural search words gave more results than singular ones, but I used singular ones because those also gave over 50 results. An exception is the search word "user story." For it singular search word somehow lost the results in the next result page, so I also looked through results from a plural search word. There seemed to be something wrong with the search since it sometimes gave a different amount of results when results were sorted by date instead of relevance. The amount of total results also varied depending on which result page I was on without any clear pattern. On different days the number of results sometimes varied to either up or down even when I used the same search parameters.
- UX Magazine (<https://uxmag.com/>): UX Magazine is a free web magazine that has articles about UX design combined with varying technology and customer experience strategies (UX Magazine, n.d.). It has articles tagged with topics "Personas" and "Storytelling" and amount of articles in brackets next to them, though the number of results on the tag page did not match the number in brackets. There is also search functionality, but it always gives the same results no matter what search word is used. I used the Advanced Google Search where I used a search word "scenario" and limited result to the UX Magazine website. I looked through only the first two pages of Google search results since they revealed only one relevant source.

In the end, I found 73 sources based on TUNI's HTI courses which was a lot more than I had anticipated. It was quickly obvious that I was conducting the first round of locating sources instead of just a preliminary study. While writing the literature review at the end of the first round I excluded two sources that concentrated in something else than personas, scenarios or user stories and did not bring any new ideas or perspectives to my thesis. After completing the first round of writing, I had altogether 71 sources, from which 66 were web articles and 5 books.

2.2.2 Second round

I conducted the second round of locating sources with searches from Andor and Google Scholar in April 2020. I included in total new 97 sources in the second round, from which 78 were found from Andor and 19 from Google Scholar. I will tell shortly in more detail about how I found those sources. Generally speaking in some sources I could determine straight from the title that it did not cover the topic from my perspective. In other sources, I also read abstract and subject or keywords. Sometimes I glanced

through the contents to determine whether or not I should include it. If Andor had marked some source as a book chapter, I also looked at other chapters in the same book and possibly made the whole book my source instead of just a single chapter.

At this point, I decided to focus my topic once more to consider scenarios and user stories only from the perspective of personas since there were so many results. I excluded sources that covered the topic only minimally and focused on other topics. I excluded for example research articles that studied something else than personas and only briefly mentioned that they had used personas in the research. While writing the literature review I excluded 11 first-round sources that did not give anything new to my literature review or were not relevant to my more focused topic. At the end of the second round I had a total of 157 sources.

Andor

Andor is an online search service that can locate databases and both printed and online library materials that are available in Tampere University Library (Tampere University Library, 2020). At first I experimented by searching separately with words "persona", "scenario" and "user story." They gave an enormous amount of results which did not relate to my topic. For example, they covered climate change scenarios or celebrity personas. I chose to limit most of my searches only to results that have "design*" somewhere in the result and to results that have been published since 2010 in English.

I have explained how I located sources with Andor in Table 2. I ended up using slightly different search parameters for personas, scenarios and user stories since they resulted in a different amount of results and needed different kinds of limitations. I often chose to limit my search by a subject since I assume that sources concentrating on personas, scenarios or user stories would list them as a subject or keyword. This decision will exclude sources that cover those topics but have not listed them as a keyword. Still, I needed to limit my results somehow and the subject seemed like the best way to do it. I found only two relevant sources when I searched for scenarios, so I did another search for user scenarios.

I tried limiting results to only those that are available online as full text, but it did not affect the number of results. In most of my searches, I did not limit result by resource type because I wanted to have multiple types on sources. I limited most of my searches only those that were written in English. Still, few sources had only their abstract in English.

I sorted results by relevance but still looked at all of them. Andor listed some result twice if there were more than one version of them available. In some cases later searches gave duplicate results on sources that I had already included in previous searches, but

Table 2. Search parameters for Andor and the amount of sources found and included from different searches.

Search parameters	Sources found	Sources included
Persona: <ul style="list-style-type: none"> • Subject contains "persona*" • Subject is "Persona" or "Personas" • Any field contains "design*" • Publication date is between years 2010 – 2020 • Language is English 	138	57
Scenario: <ul style="list-style-type: none"> • Subject contains "scenario*" • Subject is "Scenario" or "scenarios" • Subject is not "Agriculture", "Climate Change", "Land use" or "Iran" • Resource type is "Books", "Book chapters" or "Articles" • Any field contains "design*" • Publication date is between years 2010 – 2020 • Language is English 	136	2
User scenario: <ul style="list-style-type: none"> • Subject contains "user scenario*" 	31	5
User story: <ul style="list-style-type: none"> • Subject contains "user stor*" • Any field contains "design*" • Language is English 	41	13
Sources in Finnish: <ul style="list-style-type: none"> • several different searches 	12	1
Total	358	78

I only counted them once for Table 2. Two sources that I found when I searched for scenarios or user stories focused more on personas than scenarios or user stories but had not come up when I had searched for personas.

Google Scholar

Google Scholar is an online search service that focuses on searching scholarly literature. It can be used on many disciplines to find varying types of sources, such as articles, theses, books and abstracts. (Google Scholar, n.d.). I used Google Scholar while logged in as a TUNI student on website <https://scholar-google-com.libproxy.tuni.fi/> because then Google Scholar could give me access to full texts that are available for TUNI students.

I used search words "design*" AND ("scenario" OR "persona" OR "user story") and limited results to sources published between the years 2010 – 2020. I did not include patents or citations. I tried many different search words, but I ended up having

many thousands of results no matter what search parameters I used. Even the advanced search in Google Scholar does not offer many options for making more detailed searches.

My chosen search parameters gave in total 1,910,000 results when I sorted results by relevance and 7,740 results when I sorted results by date, so there seems to be something wrong with sorting by date. In the end I used sorting by relevance and I looked through the first 15 pages, which had in total 150 results. There were 6 duplicate sources that I had already included in my search from Andor. I included a total of 19 new sources from Google Scholar. 15 of those could also be found on Andor, but I had not found them previously. 4 sources could only be found on Google Scholar.

2.2.3 Third round

The third round was incoherent since I searched for sources that could fill gaps in my literature review. For example, I searched for first-hand sources about the popularity of persona and scenario methods among designers and to define terms like the future scenario and behavior-driven development. I also checked if there are any more master's theses in TUNI that would be good to mention in my thesis. In addition, I looked at references and hyperlinks in some sources that seemed important and promising, even if I had excluded that source from my final sources. However, it should be emphasized that I did the third round rather quickly. If I had used more time for it, I could have broadened and deepened my thesis.

I found 18 new sources in the third round. I wrote them into my literature review immediately after locating them so there was no need to separate locating sources and rewriting literature review in this final round. While writing I excluded 1 second-round source. In the end, I had a total of 174 sources in my literature review.

3 PERSONAS

From the 1980s to the beginning of the 2000s software industry used mostly ethnographic user profiles to define requirements. At the end of the 1990s and beginning of the 2000s, Cooper and Goodwin formalized the persona method for defining requirements. (Edeker & Moorman, 2013.) Cooper published in 1999 the book *The Inmates are Running the Asylum*, which introduced the concept of personas for the first time (Nielsen, 2014). Following the year 2000 personas have been used for both UX and marketing design. Usage of personas has been widespread, but many have also criticized the method. (Edeker & Moorman, 2013.) According to Rosala and Krause (2019), 30 % of UX professionals create personas often and 84 % at least sometimes.

In this chapter, I will focus on describing different aspects of the persona method. In Chapter 3.1 I define personas and their different types and in Chapter 3.2 tell about different usages and benefits of them. In Chapter 3.3 I will talk about challenges and criticism concerning personas and in Chapter 3.4 how to ensure the success of personas. In Chapter 3.5 I report academic research about the effectiveness and usage of the persona method.

3.1 Definition and different types

Personas are fictitious and specific representations of users (E.g. Pruitt & Adlin, 2006, chapter 1; Nielsen, 2014; Goltz, 2014b; Flaherty, 2018; Dam & Teo, 2020). Personas have also been described as model characters or composite characters (Dam & Teo, 2020) or as snapshots of users (Flaherty, 2016). They are not the same as demographic segments, market segments, user profiles or user groups since they are more personal and memorable (E.g. Jahagirdar & Martin, 2010; Nielsen, 2014; Harley, 2015). Personas offer empathy evoking faces to users and give a human touch to cold facts to help designers focus on designing for target users instead of themselves (Pruitt & Adlin, 2006, chapter 1; Harley, 2015; Dam & Teo, 2020; Garrett, 2011, chapter 3).

Personas demonstrate the needs, attitudes, goals and other characteristics of different user groups in a relevant context concerning a specific product, service, website or brand. Persona description does not include everything about the user, only relevant

traits in the chosen context. (Brangier & Bornet, 2011; Harley, 2015; Flaherty, 2018; Dam & Teo, 2020.) Organizations usually have multiple personas for different purposes. Each product, service, feature set or content of a website can have one or two personas that are primary personas for that particular purpose. (Harley, 2015.)

Personas are typically presented as a persona document that has a name, photo and description of persona's identity, values and actions (Brangier & Bornet, 2011; Goltz, 2014b), such as in Figure 3. I will give more examples of different persona documents in Chapter 4.5.

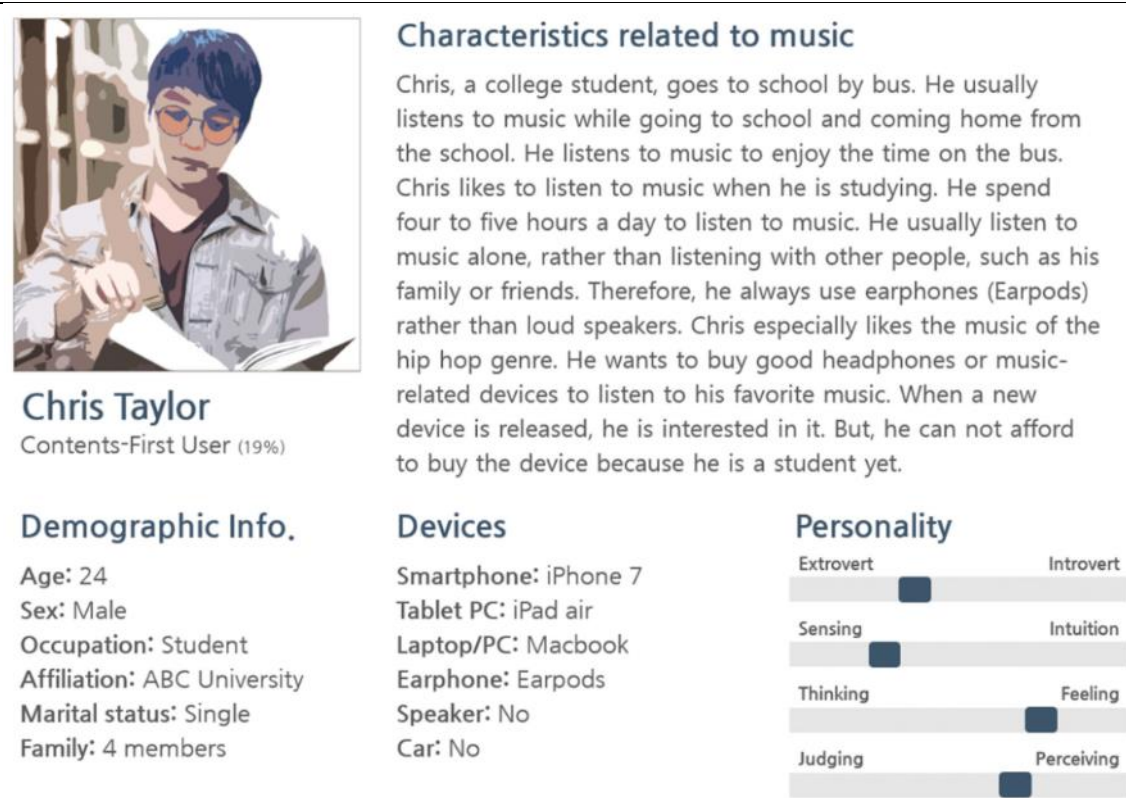


Figure 3. An example of a persona document. (source: Lee et al., 2020)

When designers develop personas, they identify patterns in the data about users' behavior, needs and goals and use these patterns to create representative, fictional personas (Minichiello et al, 2018; Garrett, 2011, chapter 3). Persona does not represent all members of a group, but rather an average member of group X trying to perform activity Y in context Z (St. Amant, 2018). Still, persona is not the same as a stereotype, even though poorly made personas may resemble stereotypes (Lepore, 2009; Stickdorn et al., 2018, 40). Some say that persona is an archetype of a real person (Baty, 2009; Harley, 2015; Holtzblatt & Beyer, 2016, chapter 8; Stickdorn et al., 2018, 40), but others say that persona is not entirely the same as an archetype or an actual living human since it focuses on aspects that are relevant in some specific context instead of the whole person

(Nielsen, 2014). Archetype has also been seen as an overly academic and lifeless term to describe a persona (Lepore, 2009).

Including scenarios and user stories in personas makes them more memorable and empathy evoking. Scenarios and user stories help all team members understand difficult, abstract concepts and remember personas' needs and pain points in the same way. (E.g. Khanh et al., 2017; Goltz, 2014b; Nielsen, 2014; Krause, 2019.) Both scenarios and user stories are stories about a certain user using a certain product, but scenarios are several sentences long (E.g. Pruitt & Adlin, 2006, chapter 6) and user stories are only a single sentence long (E.g. Lucassen, Dalpiaz, van Der Werf, & Brinkkemper, 2016). I will define them in more detail in Chapter 5.1.

The persona method is a flexible tool that can be tailored to various situations by changing their focus from users to something else. For example, a marketing persona describes a customer purchasing a product and factors influencing his or her purchase decision (Barlow-Busch, 2006). A manager persona describes manager's behavior within an organization (Straker, Mosely, & Wrigley, 2019). An attacker persona describes a person who commits cybercrimes (Tariq, Brynielsson, & Artman, 2012). Personas can also be used to represent a couple (Nielsen, 2014), a family (Dai & Xu, 2013) and even an organization (Ali, Stewart, Boks, & Bey, 2019) instead of a single user.

There have been several classifications for different persona types. Nielsen (2014) separates personas based on user research and data gathered from stakeholders. She separates user research based personas further into goal-directed, role-based and engaging personas based on the characteristics and emphasis of the persona descriptions. On the other hand Laporte, Slegers and De Grooff (2012) have separated qualitative and quantitative personas based on what kind of research techniques were used. Personas based on data gathered from stakeholders have been called assumption personas (Pruitt & Adlin, 2006, chapter 3), proto-personas (IDF, 2017), hypothetical personas (Ghosh, 2018), fictional personas (Dam & Teo, 2020) and provisional personas (Goltz, 2014a) since they are sometimes seen as collections of assumptions, stereotypes and expectations that are only suitable for acting as sketch or prototype persona before conducting user research.

I have distinguished four persona types:

- 1) *Manual personas*: Personas are created manually and based on mostly qualitative user research.
- 2) *Semi-automatic personas*: Personas are created semi-automatically and based on mostly user research. Users are clustered with algorithms, but other persona development activities are done manually.
- 3) *Automatic personas*: Personas are created completely automatically and based on mostly quantitative user data.

- 4) *Expert personas*: Personas are based on mostly data gathered from stakeholders, experts and literature.

I have distinguished user research based personas further based on how automated their development is. I felt that there is so big difference in developing and using manual, semi-automatic and automatic personas that they should be separated. I did not want to call them qualitative and quantitative personas since that would emphasize too much the chosen user research techniques. I have separated expert personas from research-based personas, but I did not want to call them assumption personas or proto-personas. I believe that if data is gathered from experts that work directly with users, expert personas can provide valuable insights rather than mere assumptions.

I have summarized in Table 3 the specific usages, advantages and disadvantages of different persona types. Designers should decide the type of persona based on what they want to learn and achieve with the personas and what kind of data and resources are available. It should be noted that my classification is only simplification and aims to demonstrate the versatility of the persona method. Even when manual personas are based mostly on qualitative user research, there can very well be some data from quantitative user research or from experts. Designers can also develop personas that are based equally on both user research and data from experts. It is also possible to first create personas automatically from quantitative data and later in another project modify them based on qualitative data.

I have classified studies that I found into different persona types. If a source did not specify how they clustered users from user research data, I have assumed that they did it manually since it is the traditional way of clustering users. If researchers would have used some algorithm for clustering, I presume they would have named it.

3.1.1 *Manual personas*

By manual personas, I mean personas that are created completely manually and are based on mostly qualitative user research. Everything from user research and clustering users to writing persona descriptions and making persona documents is done manually. In the sources that had prescribed exact information about its user research, manual personas had studied anything from 14 (Straker et al., 2019; Campos & Paiva, 2011) to 85 participants (LeRouge, Ma, Sneha, & Tolle, 2011).

In the health care field manual personas have helped in designing health care technology for elders to self-manage chronic diabetes (LeRouge et al., 2011) and peripheral arterial disease (Ariaeinejad et al., 2016). In the information technology field they have facilitated designing e-maintenance service (Idoughi, Seffah, & Kolski, 2012), next-generation industrial robots (Björndal, Rissanen, & Murphy, 2011) and personal and

Table 3. Comparison of different personas types and their specific usages, advantages and disadvantages.

Persona type	Specific usages	Advantages	Disadvantages
Manual personas	<ul style="list-style-type: none"> When there is mainly qualitative data. When there is too little data for statistical methods. 	<ul style="list-style-type: none"> Persona description has deeper psychological traits. Human eyes analyze data and notice relevant traits and patterns. 	<ul style="list-style-type: none"> Manual segmenting is subjective. Time-consuming. Need to be based on a limited amount of data.
Semi-automatic personas	<ul style="list-style-type: none"> When designers have so much research data that it cannot be analyzed manually. 	<ul style="list-style-type: none"> Can be based on a larger amount of data. Segmenting users is fast. 	<ul style="list-style-type: none"> Usage requires expertise in statistical methods. Writing persona descriptions manually takes time.
Automatic personas	<ul style="list-style-type: none"> When designers want to use aggregated data from a vast amount of users. 	<ul style="list-style-type: none"> Can be based on a vast amount of data. Fast to create and update. 	<ul style="list-style-type: none"> Usage requires expertise in statistical methods. Persona description lacks deeper psychological traits.
Expert personas	<ul style="list-style-type: none"> When conducting user research is too difficult or time-consuming. When designers want to develop personas fast in workshops. 	<ul style="list-style-type: none"> Allows developing personas for users that are difficult to research. Allows developing personas in participatory workshops. Can save resources. 	<ul style="list-style-type: none"> Poorly made expert personas only represent participants' assumptions.

friendly artificial companions (Campos & Paiva, 2011). Manual personas have also identified and communicated varying needs, values and activities among bus passengers' (Hildén & Väänänen, 2019) and people with disabilities navigating in the streets (Williams, Hurst, & Kane, 2013). In addition, they have helped in understanding how open company franchise owners are to selling innovative products in their stores

(Straker et al., 2019) and how undergraduate university students use library services (Zaugg & Rackham, 2016).

The advantage of manual personas is that it is the traditional way to develop personas so there are many sources about them. They require no special knowledge about algorithms or have no strict requirements for the amount of data to give reliable results. They also have deeper traits in the persona description, such as persona's pain points and goals that might not be present in automatic personas (Salminen et al., 2020).

The disadvantage of manual personas is that manual clustering requires expertise and is subjective, expensive and time-consuming. Since users are clustered without any algorithm, manual personas need to be based on a limited amount of data so that humans' cognitive abilities are sufficient for findings patterns in the data. (Brickey, Walczak, & Burgess, 2012; Salminen et al., 2020.) Manual segmenting is subjective so designers segment users differently and create different personas from the same data (Korsgaard et al., 2020). In addition, conducting user research to create personas costs resources and since updating personas is slow, they are not responsive to changes in user preferences. User research might also have been too narrow or conducted with a wrong target group or focus. (Jung et al., 2017; An, Kwak, & Jansen, 2016; Edeker & Moorman, 2013; Goltz, 2014b; Skand, 2019; Salminen et al., 2020.)

3.1.2 Semi-automatic personas

By semi-automatic personas, I mean personas that are created semi-automatically and are based on mostly user research data whether it is qualitative or quantitative. When designers create semi-automatic personas, algorithms cluster users automatically, but designers must manually conduct user research, input data into algorithms, add photos, invent names, write scenarios and make persona documents. Designers also need to possibly transform research data into suitable input form for the chosen algorithm since some of them can cluster only qualitative or quantitative data (Brickey et al., 2012). In the sources that had prescribed exact information about its user research, semi-automatic personas had studied anything from 59 (Tu, Zhang, He, Zhang, & Li, 2011) to 360 participants (Lee et al., 2020) and from 8 families (Dai & Xu, 2013) to 6,867 forum posts (Rahimi & Cleland-Huang, 2014).

Semi-automatic personas have helped in designing children's furniture (Dai & Xu, 2013) and an adaptive learning system for hearing and deaf children who have difficulties in reading comprehension (Laporte et al., 2012). They have also helped in understanding the use of media and media-related devices of millennials (Lee et al., 2020) and in designing a sports earphone (Tu et al., 2011) and a motion-sensing game (Zhang, 2019). They have facilitated coordinating, prioritizing and tracking feature requests in

forum posts (Rahimi & Cleland-Huang, 2014) and understanding why, how often and in what ways users give feedback (Almaliki, Ncube, & Ali, 2015). They have also helped in updating previously made personas with new data while studying portable and multi-device applications (Coorevits, Schuurman, Oelbrandt, & Logghe, 2016). There has also been a plan about creating a tool called UX Modeler that would offer designers a platform to create and continuously improve semi-automatic personas with the help of statistics about users and their correspondence to existing personas (Wolff & Seffah, 2013), but I did not find any information about implementing those plans.

The advantage of semi-automatic personas is that segmenting users with algorithms fastens the development of personas. They can also identify useful clusters that designers would have otherwise missed and lead to more rigorous and detailed personas. (Korsgaard, Bjørner, Sørensen, & Burelli, 2020.) Automated segmenting can give objective and data-driven clusters, identify latent factors and reduce the complexity of the data by compressing it (Brickey et al., 2012).

The disadvantage of semi-automatic personas is that as with manual personas, user research requires resources and it is possible to end up with biased data if user research was done with a wrong focus or scope. In addition designers might not be aware of the requirements for adequate sample size for analyzing data with statistical methods and end up conducting too small-scale user research. (Jung et al., 2017; An, Kwak et al., 2016; Edeker & Moorman, 2013; Goltz, 2014b; Skand, 2019.) Algorithms require lots of data to give valid results so user research needs to be extensive. Another disadvantage is that different algorithms segment users differently which ultimately leads to different personas. (Brickey et al., 2012.) Algorithms can identify useless clusters that are not relevant to the project. In addition, manually writing persona descriptions and making persona documents still takes time. (Korsgaard et al., 2020.)

3.1.3 Automatic personas

By automatic personas, I mean personas that created completely automatically with software and are based on mostly quantitative user data. Everything from gathering and analyzing data, clustering users, writing descriptions, adding photographs and making persona documents is done completely automatically. In the sources that had prescribed exact information about its user data, automatic personas had used over 30,000,000 social media interactions from different users. (An, Kwak, et al., 2016; An, Cho, Kwak, Hassen, & Jansen, 2016; Jung et al. 2017; An et al., 2018.)

Automatic personas have helped in getting accurate and fast updatable information about users in several major online social media platforms, such as YouTube, Twitter and Facebook (An, Cho et al., 2016; Jung et al. 2017; An et al., 2018) and different

kinds of players (Salminen et al., 2020). They can also help in planning an online marketing campaign if marketing is targeted for real-time optimized personas instead of single users (Jansen, Salminen, & Jung, 2020).

Shiga and Nishiuchi (2013) report making automatic personas to describe the everyday life of users, but they automated writing persona descriptions by filling blanks in previously made persona documents with the results of a Bayesian network analysis of survey answers. Due to this persona descriptions are simpler and poorer than in many other personas. Additionally, authors do not state how the picture was added, so I assume it was added manually.

The advantage of automatic personas is that they provide precise numbers describing an abundant number of users and still have a human face. They are accurate, easily manipulated and fast to create and update so they are responsive to changes in user preferences. Automatic personas can also tell how many percent of the entire user population is represented by a certain persona in real time. The number of resulting automatic personas is not decided beforehand so the software can create the optimal number of personas for each data set. Automatic personas are based on aggregated data and preserve the privacy of users. They also reflect the needs and behavior of a vast amount of users instead of just the few that have participated in user research. (Jansen et al., 2020; An, Kwak, et al., 2016; An, Cho, et al., 2016; Jung et al. 2017; An et al., 2018; Salminen et al., 2020.) Automatic personas are also more affordable to organizations and they can find latent factors in the research data that humans might miss (Salminen et al., 2020). Utilizing big data saves time and reduces the number of design iteration. It also shortens the product-development cycle because big data gives certainty about customer preferences. This ensures that products can be released on schedule and tested before release. (Siddiqui, 2020.)

The disadvantage of automatic personas is that their persona description typically lacks deeper traits such as interest, pain points and goals which can hinder feeling empathy (Salminen et al., 2020). As with other semi-automatic personas, automatic personas should not be used without expertise in statistical methods. Designers should be aware that the available data affects what kinds of personas are created so if available data is biased, so will be the personas created from it. (An, Kwak, et al., 2016; An, Cho, et al., 2016; Jung et al. 2017; An et al., 2018.) Designers also need to be aware of what is adequate sample size for analyzing data with statistical methods (Jung et al., 2017; An, Kwak et al., 2016; Edeker & Moorman, 2013; Goltz, 2014b; Skand, 2019). Algorithms can also identify useless clusters that are not relevant to the project (Korsgaard et al., 2020).

3.1.4 Expert personas

By expert personas, I mean personas that are based on mostly data gathered from experts, stakeholders, literature and previous research. Those sources that I found created expert personas manually, but I see no reason why they could not be created semi-automatically or automatically if there is suitable data available. Personas created in workshops based on mostly participants' own experiences are closest to assumption personas, but I still categorize them as expert personas. It is possible to recruit participants that are domain experts, have extensive knowledge about the users and come from diverse backgrounds.

Expert personas have been used when conducting user research is too difficult or not possible. Conducting user research with criminals in organized cybercrime (Tariq et al., 2012), non-professional cybercrime attackers (Atzeni, Cameroni, Faily, Lyle, & Flechais, 2011), users inside organizations with secrecy issues like Swedish Defence (Eriksson, Artman & Swartling, 2013) or children with autism spectrum condition (Zubair, Brown, Hughes-Roberts, & Bates, 2019) would be challenging and might not give reliable or usable data for creating personas. Authors have used mostly previous research findings, literature and experts' knowledge as a basis for personas in those studies.

Expert personas have also been used when conducting user research would have been too time-consuming. They have helped in evaluating and improving a personalized learning program fast by allowing designers to interview stakeholders who have had worked with various and diverse students instead of interviewing students themselves (Sankupellay, Mealy, Niesel, & Medland, 2015).

Many expert personas are developed in workshops. They have given more tangibility for general predictions about how urban mobility and traveling might develop in the future (Vallet, Puchinger, Millonig, Lamé, & Nicolai, 2020), identified architecturally significant requirements in software (Cleland-Huang, Czauderna, & Keenan, 2013) and helped in designing an information security application (Bhattarai, Joyce, & Dutta, 2016). They have also facilitated co-designing a health service intervention program (Valaitis et al., 2014).

The advantage of expert personas is that they enable developing personas in situations where conducting direct user research would be difficult or it might not provide relevant data (E.g. Atzeni et al., 2011; Zubair et al., 2019). Expert personas suit agile or lean development well since they are fast to create if data is mainly gathered from stakeholders. This facilitates having an early buy-in for the persona method and inspiring the organization to be more user-centric. (Bhattarai et al., 2016; Gothelf & Seiden, 2013, chapter 3.) Expert personas save resources and produce correct enough descrip-

tions of users that can be iteratively refined and validated by conducting limited user research later on. Stakeholders can also be educated to be aware of potential bias and limitations in their experiences. (Gothelf & Seiden, 2013, chapter 3; Summers, 2014; Noetzel, 2018; Pruitt & Adlin, 2006, chapter 3.) Even the most critical authors admit that expert personas can serve as quick initial sketches for users' needs if designers acknowledge that they can be biased (Nielsen, 2014; Goltz, 2014a; Ghosh, 2018; Dam & Teo, 2020).

The disadvantage of expert personas is that poorly made expert personas represent only designers' stereotypes and assumptions instead of real users and do not lead to truly user-centered products (Nielsen, 2014; Goltz, 2014a; Ghosh, 2018; Dam & Teo, 2020; Edeker & Moorman, 2013; Goltz, 2014b; Skand, 2019). Still, it should be remembered that this disadvantage does not concern only expert personas. Conducting user research does not definitely and automatically mean that resulting personas are safe from biases and shortcomings. Conducted user research may be flawed, which can lead to flawed personas and results. (Goltz, 2014b.)

3.2 Usage and benefits

Originally personas were used in the software field to define requirements (Edeker & Moorman, 2013). Nowadays personas are used for many different purposes in diverse fields, such as library services (Zaugg & Rackham, 2016), furniture design (Dai & Xu, 2013) and learning programs (Sankupellay et al., 2015). Whatever the field is, persona documents should be posted somewhere clearly visible so that designers can use them as reminders of users' needs throughout the design process (Lior, 2013, chapter 5, chapter 8). However, it should be remembered that personas alone do not have all the necessary information for the design. Persona description might not include all specialties and details of real life. (Nielsen, 2014.) Also no matter how great ideas personas inspire, some decisions need to be made based on for example technological constraints or what is feasible with given resources instead of what users' would ideally receive (Pruitt & Adlin, 2006, chapter 6).

Personas should be shared and utilized across the entire organization within various departments, such as product development, marketing, customer support, and sales. Sharing the work for developing personas across different departments distributes initial research costs and makes the whole organization aware of the benefits and return on investment of personas. (O'Connor, 2011.)

Miaskiewicz and Kozar (2011) identified and ranked the benefits of the persona method with the help of product design experts who have used the persona method extensively. The most important benefits were:

- 1) Focusing product development on users and their goals.
- 2) Prioritizing product requirements and helping in identifying the right problem that needs to be solved.
- 3) Prioritizing users and focusing on the most important users.
- 4) Highlighting and challenging organizational assumptions about users.
- 5) Helping designers and stakeholders realize how users are different from themselves and preventing designing for themselves.

Other benefits that were mentioned were establishing a mutual understanding of the users' goals, facilitating teamwork in a multidisciplinary team with various backgrounds and helping in communication. Personas introduce research data to those who did not participate in the data gathering and organize research data into a more colorful and memorable form. They create empathy towards the users intuitively because personas have stories. They guide design decisions and help in evaluating made decisions resulting in innovative thinking, novel solutions and more usable products. Personas also help in evaluating competitors' products, defining product offerings and planning marketing. They can reuse older research data if data is relevant to a new project and data is not outdated or out of chosen focus. (Miaskiewicz & Kozar, 2011.)

Other authors (E.g. Brangier & Bornet, 2011; Guo, Shamdasani, & Randall, 2011; Parush, 2015, chapter 13, chapter 15; Pruitt & Adlin, 2006, chapter 1, chapter 6; Nielsen, 2014; Harley, 2014, 2015; Dam & Teo, 2020; Goltz, 2014b; Hodges-Schell & O'Brien, 2015, chapter 4) have also stated similar usages and benefits for personas than Miaskiewicz and Kozar (2011). On top of previously mentioned aspects personas give more detailed information than market research and highlight specific characteristics of certain users. Personas also help in designing for future users or less-known users. (Brangier & Bornet, 2011; Nielsen, 2014.) They can also help in designing content, information architecture, navigation, task flows (Guo et al., 2011), product support (Pruitt & Adlin, 2006, chapter 6), instructions, advertisements and button labels while choosing words that are most suitable for users (Lior, 2013, chapter 5, chapter 8). They help in developing and using other design tools such as storyboards or empathy maps (Pruitt & Adlin, 2006, chapter 1, chapter 6). They make statistical terms, broad profiles, abstractions and generalizations more alive, human and memorable. Personas can also be used to recruit users for usability tests and user research as well as a guide for expert reviews, such as heuristic usability evaluations. (E.g. Nielsen, 2014; Goltz, 2014b; Harley, 2015; Kneale, Mikles, Choi, Thompson, & Demiris, 2017.) They can help in the gamification of UX (Kumar & Herger, 2013, chapter 3). One organization even published personas on their websites to help users navigate on it (Hughes, 2010).

Personas have also been used as a teaching tool. Teaching about the persona method itself can help students understand how expectations and preferences in different

cultural and social groups vary when people use online texts (St. Amant, 2018). University teacher playing the role of a client persona for student interviewers can help HTI students prepare for projects, internships and future professional life (Kolski & Warin, 2018). Personas representing people with disabilities have taught students in massive open online courses about accessibility and how it affects designing (Kelle, Henka, & Zimmermann, 2015). Personas have also been used to improve learning systems. Personas and scenarios have facilitated conducting expert reviews evaluating usability and acceptance of an e-learning system (Stojmenova, Lugmayr, & Dinevski, 2013). Several different personas for staff members and students have helped in designing an online learning application (Anvari, Tran, Richards, Hitchens, 2019).

3.3 Criticism and challenges

The persona method is not a perfect, golden tool that can be used in every situation or without understanding its weaknesses. It should be used together with other design methods since personas are not suitable for everything. (Pruitt & Adlin, 2006, chapter 6.) I introduce in Appendix D concepts and methods that are related to personas and might work better in some situations.

I will present the general critique and challenges concerning the persona method in this chapter. I have presented critique and disadvantages concerning different persona types in Chapter 3.1. The critique and challenges might not be cited authors' own opinions but rather just a notion they have reported.

One common challenge is that people feel the persona method requires too much time and money when compared to the benefit of using it (Edeker & Moorman, 2013; Gothelf & Seiden, 2013, chapter 3). Some workshop participants have felt that creating personas even without any user research takes too much time compared to the benefits (Heck, Rittiner, Meboldt, & Steinert, 2018). Some think that the persona method is an outdated technique since there are newer methods to analyze and predict users' behavior, such as web analytics, A/B testing and multivariate testing. Some feel that personas do not work in agile development (Bryan, 2013) or generate too few new design ideas alone (Holtzblatt & Beyer, 2016, chapter 8).

It is difficult or impossible to verify that personas are accurate since they represent an undefined amount of users. Even if personas are validated by gathering feedback from stakeholders, there can be no definitive proof that personas are valid since personas are fictitious and their accuracy cannot be studied scientifically. When persona descriptions get more specific, they represent accurately even smaller user groups. In addition, there is no way to distinguish which characteristics of the persona are indicative of users and which are irrelevant. (Chapman & Milham, 2006.)

Writing useful and effective persona descriptions is a big challenge. Poor persona descriptions have irrelevant information and do not tell why users want to use the product. They can also have so general traits that designers do not feel empathy towards them (E.g. Lepore, 2009; Edeker & Moorman, 2013; Goltz, 2014b; Flaherty, 2018; Doody, 2013; Handa & Vashisht, 2016). Poor persona descriptions represent unconvincing ideal users that do not have the complexities of real users (Lepore, 2009; Nielsen, 2014; Skand, 2019). Personas may not represent actual users since their descriptions have fictitious elements that are not supported by quantitative user research (Nielsen, 2014). If personas are not updated, so their descriptions become outdated (E.g. Nielsen, 2014; Handa & Vashisht, 2016; Flaherty, 2018; Skand, 2019).

There can also be too many personas for a single project (Skand, 2019) or only personas created with a wrong scope or focus (E.g. Lepore, 2009; Edeker & Moorman, 2013; Goltz, 2014b; Flaherty, 2018). Personas can rarely represent people with disabilities with enough variety and detail, so designers do not fully understand disability or focus only on some disabilities (Stephanidis, 2014). Personas alone also might not be enough to represent users who have multiple roles. In large organizations, each role might map to a single persona, but in smaller organizations, a single persona might perform multiple roles. (Bleizeffer et al., 2011.)

Personas oversimplify real life and can lead to designers using simplistic thinking. Designers can place too much faith in personas and see them as full personalities that exist for real. Some designers do not realize that a real user may behave like several different personas instead of just one persona. (McKeen, 2019.) Designers think that they know the user when they in fact know only the persona (Handa & Vashisht, 2016). In poor design projects, designers cannot meet with actual users if they have to rely on only persona documents (Nielsen, 2014).

There are also many challenges concerning stakeholders. Personas might not consider organization's internal politics if designers create them on their own without stakeholders. Stakeholders might not know how to use personas or different stakeholders use them differently. Stakeholders might not want to use personas and do not believe that they give any new insights about users. (Nielsen, 2014; Flaherty, 2018). Personas might not be shared among stakeholders (Skand, 2019) or they are shared too late (O'Connor, 2011).

One big challenge with the persona method is that it has been developed and used mostly in westernized, educated, industrialized, rich and developed countries. When designers do not belong to the same cultural and ethnic group than users, it is important to let users participate in the design process. This minimizes the risk that an outsider misinterprets research data and creates biased personas. It is also important to pay attention to how the persona method is explained to participants. (Cabrerro, 2014, 2015;

Cabrero, Winschiers-Theophilus, Abdelnour-Nocera, & Kapuire, 2016; Itenge-Wheeler, Winschiers-Theophilus, Soro, & Brereton, 2018.) When participants from four Namibian ethnic groups were asked to create personas, some created generic and nameless personas, some created idealized personas and others more realistic personas. Participants understood the purpose of the persona method best if participants were asked to describe personas like they would describe characters in a reality-based TV show. (Cabrero et al., 2016.) Interpreting personas can be difficult for outsiders since they can have symbolic details that are important for participants' culture. Participants can also prefer to talk about personas rather than write about them if spoken communication is primary in their culture. (Cabrero, 2015.) Cabrero's (2015, 2016) two studies considered only developing personas and not using them, but there has been a participatory design project where 19 Namibian children successfully developed personas and designed a library space for children (Itenge-Wheeler et al., 2018).

3.4 Characteristics of successful personas

Well-made personas can guide user-centered design towards good UX, but poorly made personas give an inaccurate understanding of users (Goltz, 2014b). The Persona Perception Scale presented in Table 4 offers eleven factors to evaluate personas. The Persona Perception Scale was developed by identifying relevant factors with confirmatory factor analysis from data gathered from literature, experts' opinions and pilot study. (Salminen et al., 2018.)

Pruitt and Adlin (2006, chapter 1), Brangier and Bornet (2011), Guo et al. (2011) and Nielsen (2014) have listed the most common pitfalls and challenges of personas. I have combined and rephrased them into a positive list of practices that enhance the success of personas:

- Ensure that personas are accepted and supported at the organization and among executives. Make certain that the persona method and created personas are properly introduced to the organization.
- Ensure that all stakeholders know how to use personas alone and together with other methods and that they keep using them. Make sure that designers see personas as descriptions of fictitious users, not as real people.
- Ensure that personas are developed with valid research methods and data whether they are based on data from users or experts. Validate personas by gathering feedback.
- Ensure that personas are developed for a particular purpose and that chosen research methods, gathered data and made persona documents reflect that purpose.

Table 4. Persona Perception Scale developed by Salminen et al. (2018).

Factor	Definition
1. Credibility	Personas match reality and seem like a real person
2. Clarity	Information is clearly presented in the persona document (e.g. font size and resolution are adequate).
3. Completeness	Personas have plenty of information about the persona and nothing crucial is missing.
4. Consistency	Personas are coherent and every piece of information in them is matching.
5. Empathy	Designers feel sympathy towards the personas.
6. Familiarity	Designers can think of real persons that are similar to personas.
7. Friendliness	Designers see personas as friendly.
8. Interpersonal attraction	Designers see personas as attractive.
9. Liking	Designers like personas.
10. Similarity	Designers feel that personas are like him or her.
11. Usefulness and willingness to use	Personas help in understanding the user base and designers want to use personas.

- Ensure that personas have relevant, precise and accurate information in them. Personas need to describe both attitudinal traits (e.g. needs, values and motivation) and behavioral traits (e.g. performed tasks and used tools).
- Ensure that personas are not just market segments that identify demographic user groups, but describe key user groups' psychological dimensions.

It has also been recommended that personas are developed like a screenwriter creates a character to ensure that persona has culture, context and challenges (Doody, 2013). Persona description should represent empathetic, deep and developed character that has flaws and quirks like real users (Lepore, 2009). Some research participants can be marked as representatives for a particular persona so that persona description can use them as a primary data source (Holtzblatt, Wendell, & Wood, 2005, 185). Still, designers should realize the limits of personas. Personas only reveal mental states and behavioral patterns of users and are not full-scale real users. (McKeen, 2019.) Designers should use also personas together with other methods, such as usability testing or focus groups (Handa & Vashisht, 2016). The used method and the details of conducting it should be chosen based on what works best with a particular project (Bryan, 2013).

3.5 Academic research about the effectiveness and usage of the persona method

I will focus in this chapter to studies concerning the effectiveness and usage of the persona method. I will report studies about the different segmenting algorithms and details of the persona document in Chapter 4.

3.5.1 Research conducted with statistical significance testing

There has been some academic research about the use or effectiveness of personas that have tested the differences between groups statistically. Some studies have compared using personas to designing with the persona description only as a list (Bornet & Brangier, 2016) or as design brief and image boards (Long, 2009) or designing for a general, undefined employee (So & Joo, 2017). In them, personas have helped individual participants to invent more original and novel ideas, but there was no difference in the amount of generated ideas. Control variables, such as participant's age, gender, personality traits or empathy level, did not predict originality or amount of ideas. (So & Joo, 2017.) Personas helped student groups to produce designs with better usability (Long, 2009), but there were no differences in the amount of ideas generated per participant, the number of themes addressed per group or the originality of the ideas (Bornet & Brangier, 2016). Teams using personas identified and solved design issues faster and earlier in the development process and achieved a design consensus within the group (Long, 2009). They discussed in a more solution-focused and justified way and generated more appropriate and relevant ideas. They also spent less time defining the problem and more time on argumentation and justifying decisions. (Bornet & Brangier, 2016.)

There have also been studies where all or several participants or teams have used personas. If participants were given clear instructions that they would be later on be asked to brainstorm ideas for the persona, they looked longer at the persona document measured by eye tracking. They also presented ideas that were more suited for the persona than themselves. Control group was asked to just read the persona document and imagine a new feature for the persona before giving the brainstorming task. (Pröbster, Haque, Haag, & Marsden, 2016.)

Students were able to design a weight loss program that was tailored to each persona's personality traits. For example, students emphasized confidence-building and socializing for introverted and emotionally unstable personas. Students were able to correctly identify the personality traits of personas, but Australian and Danish students saw the extreme personalities differently even though personas only differed in their nationality and not in their personality traits. (Anvari, Richards, Hitchens, & Babar, 2015; Anvari et al., 2017.) In another study, Australian university students could also see the differences between themselves and both Australian and Vietnamese personas and to design for someone who is from a different culture. Students' deep or surface approach to learning did not affect how well students designed for the personas instead of themselves. (Anvari, Richards, Hitchens, & Tran, 2019.)

Workshop participants evaluated that personas were more useful if they had been developed and refined iteratively. The more persona was iterated, the more likely that

persona was to be used still at the end of the workshop and that participants were satisfied with the workshop performance. There was no significant correlation between workshop performance and persona's survival rate to the end of the workshop or the time spent on developing personas. There was also no significant correlation between the diversity of participants' background and the creation process of personas or the workshop performance, but the authors think that this might be due to the shortness of workshops. (Heck et al., 2018.)

3.5.2 Other research

Minichiello et al. (2018) did a literature review about how UX design principles are taught in technology, engineering and mathematics. They identified 20 studies that they used as primary sources. 18 of those studies reported using user research based personas. One study reported using both user research based personas and personas based on information gained from stakeholders. 12 studies reported using manual user segmentation and 3 studies using algorithms, such as cluster analysis, factor analysis, principal component analysis and latent semantic analysis.

Nielsen and Hansen (2014) interviewed 28 company workers who have experience in creating and using personas and studied 47 persona descriptions. Contrary to the existing literature the persona method was well integrated into existing design practices. Personas were created in the beginning of the design process and used for design. Most companies were satisfied or very satisfied with the method, but many companies have had several failures in using persona method before succeeding in it. Designers were aware of the differences between data and own assumptions. Matthews, Judge and Whittaker (2012) on the other hand interviewed 14 user-centered design practitioners who have used personas. They found that most practitioners used personas almost exclusively for communication instead of designing. Personas were seen as abstract, impersonal, misleading and distracting so practitioners preferred to study original research data on top or instead of personas. They also saw that persona descriptions should concentrate on avoiding misleading or distracting attributes instead of being as engaging as possible. Practitioners with special training concerning personas had more positive experiences and opinions about the method.

There has been some previous master's thesis from TUNI about personas. Sidorko (2018) developed personas to help design university websites that perform well for multicultural users. Ye (2016) developed personas by combining a collaborative filtering algorithm and persona-scenario approach, which improved efficiency and accuracy in persona identification and requirements elicitation. Koponen (2017) on the other hand developed with machine learning marketing personas that were based on data, more

detailed and more efficient in communicating the needs of the target groups. Marketing personas that were made by enriching a template were more usable than generic personas made from labeled clusters. In a bachelor's thesis from TUNI Anttila (2017) created job seeker personas to improve company's recruitment process and understand how job seekers see the brand of the company and what kind of job seekers are attracted to the company.

4 DEVELOPING PERSONAS

I have divided the process of developing personas into six phases that I will present in the following six subchapters. These phases are mostly inspired by, but not identical to the five phases presented in the persona lifecycle by Pruitt and Adlin (2006). I have modified their model since my thesis focuses more on creating personas than using them and selling them to stakeholders. Nielsen (2014) has also formed a model for developing personas. Even though I mention ideas presented in Nielsen's model in this chapter, I felt the ten detailed and strict steps of Nielsen's model do not fit into my thesis as such. Ten steps make the instructions for developing personas very long, and I wanted to summarize the process by having larger phases that can be divided into smaller parts if necessary. I also wanted the phases to talk about segmenting users, writing persona descriptions and making persona documents rather than forming and accepting a hypothesis, describing personas and preparing situations. The words I chose gave a clearer idea about the development process at least for me.

The six phases in persona development are:

- 1) *Planning the development process*: Planning the purpose, focus, scope and schedule for the project and its personas.
- 2) *Gathering data*: Conducting user research or gathering data from experts and literature.
- 3) *Segmenting users*: Identifying user groups manually or with algorithms.
- 4) *Writing persona descriptions*: Writing background information, scenarios and user stories for the personas and finding appropriate pictures for them.
- 5) *Making persona documents*: Making persona documents that are suitable for the personas and the project.
- 6) *Designing with personas*: Introducing personas to the organization, using them in design activities, updating personas based on feedback and new information, assessing personas' successfulness and finally either retiring personas or reusing them in other projects after modification.

In the persona development process every phase builds on top of the previous phase, but the development process should be customized to the objectives of the pro-

ject and available resources. If necessary, some steps can be carried out fast or passed completely. (Pruitt & Adlin, 2006; Nielsen, 2014.)

Personas can be developed vary fast or elaborately. They have been developed in a single workshop session (Bhattarai et al., 2016; Valaitis et al., 2014), but designers have also spent an entire year gathering data before clustering users (Dai & Xu, 2013). Some say that user research itself takes 3 – 6 months (Summers, 2014) or that creating research-based personas takes over a week (Noetzel, 2018). According to Flaherty's (2015) study, larger companies and companies that use research-based personas need more time. In her study a small company could create expert personas in 23 hours and a large company could make research-based personas in 103 hours. Regardless of the size of the company or type of persona, approximately 43 % of the time went to gathering the data, 30 % to analyzing the data and 27 % to writing persona descriptions.

In agile projects, persona development process is typically tailored to be faster and iterative (Caballero, Moreno, & Seffah, 2014) and it often utilizes stakeholders' expertise rather than user research (Sedano, Ralph, & Péraire, 2019). Still, it should be remembered that even in agile development fast production is not always the same as good UX (Bryan, 2013). Even when personas are not developed in agile development, creating them iteratively improves them and ensures that they are the most suited personas for a chosen purpose. For example, there may arise a need to conduct more thorough research for a new user segment after the initial data is analyzed. New data can be used to update, remove or create completely new personas and scenarios. (Parush, 2015, chapter 14; Caballero et al., 2014.)

When personas are developed in workshops, they are usually done quickly and in a tailored way. Workshops can utilize participatory design to make sure products reflect users' actual needs (E.g. Mahamuni et al., 2018; Valaitis et al., 2014; Cabrero et al., 2016; Itenge-Wheeler et al., 2018) or refine and validate personas by conducting quick user research with convenience sampling (Mahamuni et al., 2018). Expert personas have been developed in a single workshop session (Bhattarai et al., 2016; Valaitis et al., 2014; Summers, 2014) or in three separate sessions (Mahamuni et al., 2018). Workshops can start by gathering participants' tacit knowledge about users or go straight to forming initial personas individually or in pairs. Then all the sketches are presented to the group and similar personas are merged. Some personas may be removed if there are too many personas. Refined persona descriptions and documents can be made with mutual brainstorming. If possible personas are later validated and refined with user research. (Gothelf & Seiden, 2013, chapter 3; Summers, 2014; Noetzel, 2018; Mahamuni et al., 2018; Bhattarai et al., 2016; Valaitis et al., 2014.)

4.1 Planning the development process

At the beginning of a persona development process, it is useful to analyze the situation before starting to gather data and create personas. Even if designers have created many personas before, discussing the planned scope, goals and focus of personas and schedule, milestones and deliverables of the project will help everyone in the team have a mutual understanding of the project's objectives and resources. Plans can change when the project progresses, but even so initial plans give tangibility to vague thoughts and facilitate developing successful personas. (Pruitt & Adlin, 2006, chapter 3; Goltz, 2014a.)

Ideally, stakeholders are involved in the entire development process, but they should be involved at least in the planning of the project and personas. Involving stakeholders ensures that necessary business needs are taken into account. It helps everyone have a mutual understanding of the goal and usage of personas and get stakeholders to be more supportive towards personas. (E.g. Jahagirdar & Martin, 2010; Harley, 2015; Salazar, 2020.) Developing personas by co-design with stakeholders from different departments and by participatory design with users offers new and diverse insights into the project (Nielsen, 2014). Team members with varying backgrounds and expertise promote creativity and innovativity in the team and facilitate designing products that work from multiple perspectives (Pruitt & Adlin, 2006, chapter 3).

Locating potential internal and external data sources and planning how to gather data before doing it saves time. Designers should decide what they want to know and what data sources and research methods are going to be used. One important thing to decide is the type of personas since it affects the data gathering and used data types. (Pruitt & Adlin, 2006, chapter 3.) Creating a research plan and forming research questions around common user tasks and goals helps in focusing research. It also ensures that designers will gather data that help in solving the right problem. (Lior, 2013, chapter 3 – 4.) Research questions need to be clearly defined so data sources and collection methods can be suitably selected (Parush, 2015, chapter 13). For example, if designers are going to use an algorithm to segment users, they need to ensure that their research methods give data that can, if necessary, be transformed into the required data type of the algorithm (Brickey et al., 2012).

It is also important to decide the focus of the personas. For example, both Tariq et al. (2012) and Atzeni et al. (2011) studied cybercrime attackers, but Tariq et al. focused on attackers in organized cybercrime and Atzeni et al. focused on attackers that are not involved in government attacks or organized cybercrime. Different focus means that they used different data sources and resulting personas were used for different purposes. On the other hand, Cleland-Huang et al. (2013) decided to focus on user needs that im-

pacted major architectural decisions, such as quality, usability or security requirements, instead of more general user needs.

The scope of the persona can also vary. If personas have a broad scope, they are used when designing for multiple business areas with dozens of products. If personas have a narrow scope, they are used when designing for only one specific business area. Broad scope personas have shallow and general data that helps make high-level decisions, such as choosing the tone of marketing messages. On the other hand, narrow scope personas have detailed data that helps make targeted design decisions, such as which features are most relevant to a certain user group. The chosen scope affects the data gathering, so it should be decided at the beginning of the project. (Salazar, 2020.)

If designers decide to use automatic personas they need to ensure that the application or steps they use for developing automatic personas are competent and that there is enough valid data for it to provide valid and relevant personas.

4.2 Gathering data

Data gathering will provide the raw material for the personas. It is important to track and manage data sources while gathering data so that the origin of the data can be checked. Personas should be based on real data either directly from users or indirectly from for example stakeholders and domain experts. Having multiple data sources and types of data gives a more versatile picture of users. (Pruitt & Adlin, 2006, chapter 3; Brangier & Bornet, 2011.) Combining data from multiple sources and research methods reduces the risk of making decisions based on biased data (Baty, 2009).

Even when all data is gathered from users, it is beneficial to involve all designers and stakeholders so that wider business aspects, such as partners, branding and future plans, can also be considered (Parush, 2015, chapter 13). Data gathering should include all the important, planned elements in the persona description, such as users' social and cultural backgrounds, psychological traits, frustrations and goals (Esser, 2020).

Data gathering can use previously made personas as a reference when deciding research questions (Coorevits et al., 2016). If a project wants to use previous personas or research results as such, they should ascertain the current validity of suitability (Pruitt & Adlin, 2006, chapter 7).

4.2.1 User research

User research means collecting and analyzing data. Data can be qualitative (i.e. verbal data and narratives) or quantitative (i.e. counts, frequencies, rating scales and durations). (Parush, 2015, chapter 13.) Qualitative data gives a deeper understanding of the users

and is typically emphasized when developing personas, but quantitative data also can give important insights (E.g. Nielsen, 2014; Dam & Teo, 2020; Skand, 2019). Data can be gathered directly from users with for example surveys, interviews, observations, focus groups or field studies. Indirect sources, such as web analytics, call center logs or stories told by customer service employees, can provide interesting information, but usually, they alone cannot offer deep enough insights into users' goals and needs. Stakeholders may also provide data through business documents and competition analysis. (E.g. Lior, 2013, chapter 4; Goltz, 2014a; Jahagirdar & Martin, 2010; Baty, 2009; Parush, 2015, chapter 13.)

User research conducted in a relevant context, such as the user's home or workplace, provides insight into participants' behaviors, motivations and attitudes that may not surface in interviews done outside context (O'Connor, 2011; IDF, 2017). Contextual inquiries give rich and deep information about the participant's needs, goals and values even when the participant might not be completely aware of them (Holtzblatt et al., 2005, 181 – 182; Holtzblatt & Beyer, 2016, chapter 8).

If data is gathered with multiple methods, it becomes more diverse and reliable. Tu et al. (2011) received 59 valid questionnaires, interviewed 3 hikers and observed and talked to 3 hiking groups. Hildén and Väänänen (2019) used both diaries and interviews to collect data. However, it is possible to develop personas with just questionnaires (Zhang, 2019) or with phone interviews (Williams et al., 2013).

It is important to consider who the targets of the user research are. Previously done market or user research may imply what kind of user groups exist. (Goltz, 2014a.) Still, there might arise a need to alter the original research plan when designers see what kind of data emerges. For example, Shiga and Nishiuchi (2013) noticed that they need to refine survey questions to make sure every participant understood them in the same way and that they covered all the elements of the final persona document.

When developing manual personas authors have studied for example 5 patients, 1 caregiver and an undefined number of health care professional (Ariaeinejad et al., 2016), 55 patients and 30 health care professionals (LeRouge et al., 2011), 14 franchisee owners (Straker et al., 2019), 14 students (Campos & Paiva, 2011), 20 bus passengers (Hildén & Väänänen, 2019), 30 people with disabilities (Williams et al., 2013) and 21 potential end-users for next-generation industrial robots on top of 5 field trips (Björndal et al., 2011). The number of participants varies, but it is usually less than a fifty to make sure that humans can analyze and cluster data without the help of algorithms. A lot depends on how much data is gathered from a single participant.

When developing semi-automatic personas authors have studied for example 8 families (Dai & Xu, 2013), 59 hikers (Tu et al., 2011), 71 teenagers (Zhang, 2019), 114 children (Laporte et al., 2012), 360 millennials (Lee et al., 2020), and 6,867 posts from

2,459 unique online forum users (Rahimi & Cleland-Huang, 2014). The number of participants varies even more than in manual personas, but semi-automatic personas require a great amount of data for the algorithms to give valid results. 8 families in Dai and Xu's (2013) study might sound little, but since data was gathered in year-lasting ethnography observing, interviewing and photographing family members and asking family members themselves to photograph and write about their experiences, the authors ended up with plenty of data.

When developing automatic personas, authors have studied over 15,000 players (Salminen et al., 2020) or over 30,000,000 interactions by viewers from 181 countries. Even though automatic personas are based mostly on quantitative user data, they can have some qualitative data as well, such as comments made by users. (An, Cho et al., 2016; Jung et al. 2017; An et al., 2018). Automatic personas should be based on a very large amount of data since the main advantage of them is to condense information. Also, there will be no human looking through the raw data noticing any anomalies, so data should be rich enough to make significant anomalies rise as factors with algorithms.

4.2.2 Gathering data from experts

When data is gathered from experts, it can mean many other things on top of talking to other team members and stakeholders. Tariq et al. (2012) interviewed IT security experts and did a literature review about criminal actors in organized cybercrime. Even when authors did not interview users themselves, IT security literature had documented several accounts of convicted attackers. Eriksson et al. (2013) formed initial personas based on previous research findings in the same organization. Personas were refined based on feedback gathered with interviews and surveys, but because Swedish Defence is a widespread organization with secrecy issues, user research was very limited. Authors could only interview few participants, and even then participants could tell very little about their work and nothing at all about their personal lives. Zubair et al. (2019) gathered data from experts, studied previously made relevant personas and observed children with autism spectrum condition. Data gathered from experts gave new knowledge about users, clarified observational data and validated personas.

Another intriguing way to gather data for personas was done by Kanno, Ooyabu and Furuta (2011). They created persona sketches based on reports and journal papers about residents' behavior in the Tokaimura nuclear accident in 1999 in Japan. Then they complemented data about how different personas would react in an accident situation by using human modeling and simulation.

When developing expert personas authors have gathered data from for example 6 (Tariq et al., 2012), 7 (Zubair et al., 2019) or 17 experts (Sankupellay et al., 2015).

Some have just sent them surveys (Tariq et al., 2012). Others have combined interviews and focus groups (Sankupellay et al., 2015) or even added surveys and questionnaires on top of them (Zubair et al., 2019). Some have conducted a literature review first and then two separate workshops with experts to develop and refine personas and scenarios (Vallet et al., 2020). Some authors have conducted limited user research to complement the data gathered from experts (E.g. Mahamuni et al., 2018; Eriksson et al., 2013).

4.3 Segmenting users

Segmenting users means making clusters or groups of similar users based on gathered data. Segmentation is a critical step in developing personas since user segments are later polished into personas. If clusters are not accurate and valid, personas will not be representative and design decisions based on them can lead to a product that is not suited for the intended users. (Laporte et al., 2012.)

At this phase, it is also necessary to decide how many personas are created. Making bulleted persona sketches help in prioritizing them even when they do not have all the information about the persona. (Pruitt & Adlin, 2006, chapter 4.) Some authors recommend creating 3 – 5 personas for a single project (Skand, 2019), some 3 – 7 personas (Harley, 2014) and others 4 – 8 (Holtzblatt & Beyer, 2016, chapter 8). The exact number of personas should not be decided beforehand, but only after analyzing the data (Baty, 2009).

Designers also need to prioritize personas because they cannot please everyone with a single product. *Primary personas* are the main users of the product who use the whole product or a large part of its functionalities. *Secondary personas* are important users who use the product often and might have more specific additional needs not covered by primary personas. (E.g. Lior, 2013, chapter 3; Brangier & Bornet, 2011; Holtzblatt et al., 2005, 184; Jahagirdar & Martin, 2010; Skand, 2019; Dam & Teo, 2020.) Though the product cannot meet the needs of every persona perfectly, it should at least meet the essential needs of all personas so that all desirable users can use the product (Sherwin, 2015). If designers want to clarify users for whom they are not designing, it is possible to define *negative personas* or anti-personas for insignificant users who use the product only occasionally or in unintended ways (Lior, 2013, chapter 3; Brangier & Bornet, 2011; Pruitt & Adlin, 2006, chapter 4).

When semi-automatic personas are used, designers can notice more easily if clusters created by algorithm do not make sense since designers have to turn clusters into personas manually. With automatic personas, designers might accept more easily personas that do not make sense since personas are created completely automatically.

4.3.1 *Manual clustering*

Manual clustering is a qualitative technique that requires human judgment to identify users with similar characteristics. It is subjective and time-consuming, but it can provide rich data. Humans can be overloaded by a large amount of data so its proper use requires expertise. (Brickey et al., 2012.) Designers can build an initial hypothesis about personas and their qualities and differences. Gathered data and stakeholders' feedback can support or reject the initial hypothesis, which may lead to refining it. (Nielsen, 2014; Dam & Teo, 2020.) Additional tools, such as affinity diagrams or sequence models, can be used to communicate and analyze data (Pruitt & Adlin, 2006, chapter 3; Atzeni et al., 2011; Nielsen 2014). Visualizing data with charts can help in noticing if some things need further research (Lior, 2013, chapter 4).

Segmenting users manually is complicated because designers must compare multiple variables among many research participants and find patterns in the data. Gathered data can be processed by prioritizing, filtering and organizing it. Designers also need to combine data with their expertise about what will and will not work in the current project. User roles, user goals or demographic segments can be used as an initial basis for analyzing data and forming segments, but resulting personas need to be more than just them. Two or more personas might be required to represent the range of behavior within a single role. Designers can give each research participant scores from 1 to 4 for the most relevant behavior and attitude traits that can be presented as a spectrum. Some traits can be better assessed by selecting the most appropriate choice from multiple choices. (Goltz, 2014a; Pruitt & Adlin, 2006, chapter 4; Zubair et al., 2019; Harley, 2014, 2015; Jahagirdar & Martin, 2010.)

When all participants have been scored, participants with the same role should be compared to each other. For example, comparing doctors to nurses would confuse the results even when both roles have some similarities. Those participants that have a similar pattern and resemble each other the most on relevant traits can be used as a basis for the persona. Since personas are meant to describe a combination of users instead of being a single real user, it is alright if patterns are imperfect. (Goltz, 2014a; Pruitt & Adlin, 2006, chapter 4; Zubair et al., 2019; Harley, 2014, 2015; Jahagirdar & Martin, 2010.) After initial segments have been identified, designers should look at them as preliminary personas and identify each persona's goals and behavioral models. If necessary, personas can be combined, separated or eliminated. (Brangier & Bornet, 2011; Lior, 2013, chapter 5; Harley, 2014, 2015.)

Korsgaard et al. (2020) compared user segments that two designers had created manually from the same data and noticed differences in the segmentation strategy, number of segments and in the traits of the following personas. Designers transformed

interview data into numeric values differently. In addition, one designer looked studied data chronologically and the other concentrated on finding extremes in the data which lead to emphasizing different things in the personas. One designer formed similarly sized clusters and the other one let size vary.

4.3.2 Automated clustering

Designers using algorithms to segment users must have sufficient understanding of the chosen statistical method and take care not to violate its constraints, such as adequate sample size, variable independence and correlation requirements. The outcome depends on the quality of the input data, and input data needs to be transformed into a suitable form. If input data has poor quality, statistical software can give results that do not adequately explain similarities or differences between user groups. Also selecting the number of clusters and therefore personas can be problematic. A large number of clusters will fit the data more precisely, but it will also make resulting clusters more complicated and less generalizable to larger populations. Still, automated clustering can offer objective and data-driven clusters, identify latent factors and reduce the complexity of the data. (Brickey et al., 2012.)

Several algorithms can segment users. Qualitative clustering methods (e.g. latent semantic analysis) utilize verbal or textual data for input. Quantitative clustering techniques (e.g. factor analysis and cluster analysis) utilize numeric data as input. In one study factor analysis defined more similar clusters than human designers in comparison to latent semantic analysis and cluster analysis when exactly three clusters were formed from the same data. (Brickey et al., 2012.)

Semi-automatic personas have segmented users with the help of for example cluster analysis (Korsgaard et al., 2020; Lee et al., 2020; Dai & Xu, 2013; Zhang, 2019; Tu et al., 2011; Almaliki et al., 2015), correspondence analysis (Laporte et al., 2012) or principal component analysis (Coorevits et al., 2016). It is also possible to use several algorithms. Rahimi and Cleland-Huang (2014) for example used incremental diffusive clustering, association rule mining and a classifier to turn forum posts into topics and then related topics, feature requests and quality concerns to personas. It is also possible for designers to developed their own variables and calculation formulas for segmenting users (Wu, Yang, Lu, & Liu, 2010).

Cluster analysis can find optimal clusters, but it should be noted that it treats every variable as equal and does not emphasize any of them. Segments defined by cluster analysis were partially the same as manually defined segments, but the algorithm identified both useful and useless new clusters. Semi-automatically created personas were more rigorous and detailed than manual personas. (Korsgaard et al., 2020.) Correspond-

ence analysis on the other hand explores data without preformed hypotheses. It replaces the raw data in a complex data matrix with a more simple data matrix without losing any essential information to reveal structure and patterns. Designers can iteratively try out different solutions with a different number of dimensions or different variables to find out the most meaningful user segments. (Laporte et al., 2012.)

When developing automatic personas software has for example inserted a large amount of quantitative user data into an interaction matrix and used algorithms to identify user segments from it (E.g. Jansen et al., 2020; An et al., 2018). Salminen et al. (2020) made an interaction matrix from the research data and then grouped some variables and used non-negative matrix factorization for identifying latent factors that form the basis of the personas. On the other hand, Shiga and Nishiuchi (2013) used Bayesian network analysis to automatically determine the factors and relations between factors in the data.

4.4 Writing persona descriptions

Designers can write so many descriptions, scenarios and user stories for a persona that all the information cannot be fitted into a single persona document. It is advisable to collect all the gathered data, narratives and other information regarding persona into a foundation document. The foundation document can be used as a reference when designers need more information about a certain persona. It can also help in writing new scenarios and user stories and making persona documents and other deliverables. The foundation document is meant for storing information, so its length does not need to be limited and it does not have to focus on communicating its content clearly. (Pruitt & Adlin, 2006, chapter 4.) In this chapter, I will concentrate on writing persona descriptions in a general manner and in Chapter 5 I will tell more about scenarios and user stories.

Persona description can be written only for the primary personas or for all of the personas depending on the resources and objectives of the project (Lior, 2013, chapter 5). Elements chosen for the persona descriptions vary since personas can be developed for various purposes. Typical elements are:

- Name and a tagline describing the primary role or user group (e.g. "Abe the Active Administrator").
- Photograph (or other illustration).
- General background information, such as age, occupation and marital status.
- Product-related background information, such as frequency of use, experience in using the product, preferred device and motivation for using the product.
- Typical tasks, key goals and needs related to the product.

- Challenges, obstacles and concerns related to the product.
- Quotes demonstrating persona's attitude toward the product. (E.g. Pruitt & Adlin, 2006, chapter 4; Brangier & Bornet, 2011; Lior, 2013, chapter 5; Harley, 2015; Esser, 2020; Holtzblatt & Beyer, 2016, chapter 8; Nielsen, 2014.)

At this point, designers do not necessarily need to worry about how they are going to present the persona description in a persona document. Still, it is good to remember that even lengthy documents have limited space on them and keep the persona descriptions relatively short. In addition, shorter descriptions are faster to read and easier to remember. (Pruitt & Adlin, 2006, chapter 4.) Persona documents need to be readable, so using short and simple sentences is advisable (Brangier & Bornet, 2011). Simple, direct and informal language is best since it sounds like users themselves. If something does not sound like what a user could say, then it might be written in too formal or technical language. (Holtzblatt et al., 2005, 188.) Plain English is good because it requires no special literary gifts or linguistic talents to read or write (IDF, 2020b) and has simple, concise words that everyone can understand instead of technical or insider jargon (Stickdorn et al., 2018, 131; Quesenbery, 2006).

Persona descriptions need to be well-made, easily understandable and realistic so that they engage stakeholders and designers (Nielsen, 2014). Background information, photo and other personal details promote empathy towards the user and make personas more memorable (Laubheimer, 2017; Harley, 2015). Core characteristics of the persona should be written precisely even when it means lessening its accuracy. For example, giving the persona a specific job title will lessens its accuracy for users with different job titles, but specific details make personas more precise and memorable. However, details that can evoke strong emotional responses, such as political or religious opinions, should be avoided or at least used with care. If there is a suitable stereotype for some detail, it may be used, but designers should not turn the whole persona into a stereotype. (Pruitt & Adlin, 2006, chapter 4.) Personas should not confirm stereotypes (Nielsen, 2014).

Personas should be described as if they were real and authentic people. The description should have all the human attributes one would expect to find in users, including socially less acceptable emotions and behavior. (Harley, 2015; Jahagirdar & Martin, 2010.) However, participants felt more empathy towards personas that had a positive image and concentrated on advantages instead of problems. This might mean that if designers need to design for negative and unwelcoming personas, they might have trouble designing for them. (Bornet & Brangier, 2016.)

When personas are named, it is useful to create a combination of name and tag line starting with the same letter, such as Abe the Active Administrator (Pruitt & Adlin, 2006, chapter 4). Persona description should be extensive enough to cover all relevant

information about persona, but it should also be compact. Too few details make personas feel shallow and inhuman, but too many details make it harder to understand and remember the persona as a coherent character. Designers must prioritize according to the focus of the project and decide what information is included and what excluded on the final persona document. For example, description may mention that persona likes to eat candies, but there is usually no need to tell what the user's favorite candy is. An exception is that if the designed product has something to do with candies, mentioning favorite candy can be relevant for the design. (Holtzblatt et al., 2005, 189; Esser, 2020; Harley, 2015; Pruitt & Adlin, 2006, chapter 4; Brangier & Bornet, 2011.)

Personas can be illustrated with one or more photos or drawings (Pruitt & Adlin, 2006, chapter 4). Images about items that personas always have with them in their pocket, purse or bag enrich the text and illustrate personas' behavior (Stickdorn et al., 2018, 40 – 41). In Long's (2009) study photographs worked better than illustrations in persona documents, but the study did not state whether that difference was statistically significant or not. Nevertheless, student felt less empathy towards the illustrated persona since it did not feel like a real user and considered only part of the persona's traits while designing. However, it should be noted that the student had not been participating in conducting user research or creating personas, which can have affected their feelings of empathy towards illustrated personas.

Contextual photos showing the same person at work and in leisure situations provided more persona information to designers. On the other hand using multiple photos of different people with the same gender and age created confusion and lowered informativeness. In addition, designers' experiences and assumptions affected how they interpreted the photos and it took more cognitive focus to view multiple photos. All the differences were statistically significant (Salminen et al., 2019.) When persona document had a face photo instead of silhouette photos of the persona doing his or her daily activities participants paid more attention to the details of the picture and said more biased opinions about them, such as assuming persona to be rich based on her looks. However authors do not state whether the difference was statistically significant or not (Valls, Garreta-Domingo and López, 2011).

Persona description should be based on real data that has been colored with creativity and a narrative style. Designers need to combine fact and fiction to convey essential information about target users. They need to decide how much fiction and storytelling is needed to make personas feel real and engaging, but still as close to the gathered data as possible. (Pruitt & Adlin, 2006, chapter 4; Brangier & Bornet, 2011.) If persona descriptions have only cold facts, personas feel distant and it is hard to feel empathy for them. On the other hand, if descriptions have only fabricated elements, personas reflect its writer's assumptions and imagination. Finding the right balance between research

data and fabricated elements is crucial in writing persona descriptions that are accurate as well as relatable. (Esser, 2020.) Persona descriptions should be traceable back to the gathered data. Descriptions should also be validated and if necessary refined by getting expert opinion and feedback. (Pruitt & Adlin, 2006, chapter 4; Zubair et al., 2019.) Faily and Flechais (2011) combined personas with concepts from Grounded Theory to make sure that persona descriptions are based on summarized research data and are traceable back to the original empirical data.

Understanding and feeling empathy towards persona and writing believable persona descriptions can be seen similar to the way actors must develop an understanding of their characters. Character-building and storytelling skills benefit both designers and actors to imagine believable personalities. (Lepore, 2009.) Writing persona description together with other team members is a good idea since designers' writing skills affect the quality of persona descriptions. (Pruitt & Adlin, 2006, chapter 4; Brangier & Bornet, 2011.)

Role-playing can help in discussing who the users are and deciding how to write believable and multidimensional persona descriptions. Designers can read descriptions aloud and imagine how persona would feel, think and behave in certain situations. In groups, one designer can role-play and improvise the part of persona while others ask questions. If direct research can be shared, artifacts, photos, audio or video from real users in real context can give inspiration and tell what kind of words users themselves use. (Lepore, 2009; Edeker & Moorman, 2013.)

Descriptions of manual, semi-automatic and expert personas do not differ much on a general level, but details of the description depend on the purpose and focus of the project. Zaugg and Rackham (2016) for example did not name their personas, but gave them a general description, such as "Explorer" or "Socializer" along with only minimal background information. They felt that writing additional unsubstantiated information could decrease the validity of the personas and shift focus to irrelevant details instead of how the personas use university library services. Eriksson et al. (2013) made persona descriptions that had very little personal information and drawings instead of photos due to secrecy issues. Resulting personas could not even be made public. Workshop participants felt that limiting personal information also made personas more believable in the context of Swedish Defense.

In automatic personas persona descriptions are made automatically by taking names from a dictionary, photos from a photo stock with tagged photos and personal attributes from posts in social media platforms (Jansen et al., 2020; An, Cho et al., 2016; Jung et al. 2017; An et al., 2018). However, their persona description typically lacks deeper traits such as interest, pain points and goals which can hinder feeling empathy for them (Salminen et al., 2020). Shiga and Nishiuchi (2013) automated writing persona descrip-

tion by filling blanks in previously made persona document with the results of the Bayesian network analysis regarding survey answers. Due to this persona description is not as comprehensive and profound as in other personas. Additionally, authors do not state how the picture was added, so I assume it was added manually.

4.5 Making persona documents

Details of visual design, such as graphics, colors, density of elements, usage of white space, visual balance and types of images, can improve legibility of a document and directs reader's attention to certain elements (Fessenden, 2019). Still designers should remember that the persona is not the same as the persona document. Persona document is just a single, isolated document created to communicate and summarize research results. Persona itself is much more than just a paper pinned to a wall and it has characteristics that have not fitted into a single document. Persona documents are important deliverables, but designers should spend more time on user research and writing persona descriptions than refining the visual details. (Goltz, 2014b.)

Designers have various options when they are making persona documents either to present an individual persona or multiple personas. The same persona can even be represented by several different kinds of documents so that designers can use the document that fits the current purpose best (E.g. Pruitt & Adlin, 2006, chapter 5; Scheja, Schmidt, & Masuch, 2016). It is also possible to demonstrate persona descriptions and make them alive with other means than printed out persona documents. Professional actors or voluntary coworkers may play the persona role for a short video or audio recording. (Nielsen, 2014; Handa & Vashisht, 2016.)

4.5.1 Presenting individual personas

There is no particular right way to make a persona document or a format that always works out, but many recommend persona documents to be only one page long because shorter documents are faster to read and easier to remember (Goltz, 2014b; Holtzblatt & Beyer, 2016, chapter 8; Holtzblatt et al., 2005, 182). All persona documents in a single project should be made with the same layout so it is easier to see differences between personas. The layout can, for example, be divided into three columns so that the left column has name, photo and background information, the middle column has scenario and the right column has goals, concerns and attitudes with bulleted lists. (Esser, 2020.) There are also some very experimental layouts, such as speech-bubble persona that has dialogue bubbles instead of sliders and bulleted lists (Nagy, 2012).

Designers need to decide which elements they want to include in the limited space of persona documents (Pruitt & Adlin, 2006, chapter 2). Visual aids, such as pictures, tables and diagrams, make understanding personas easier. Persona documents need to be readable, so using suitable font and colors is advisable. (Brangier & Bornet, 2011.) The length and presentation style of different elements also needs to be considered. Longer narratives are useful for describing a day in the life and key scenarios of the persona and providing an overview of persona's motivations, fears and aspirations. Shorter elements, such as bulleted lists, tables or scales, are good for describing persona's goals, knowledge, skills, equipment and environment. (Esser, 2020; Pruitt & Adlin, 2006, chapter 4.)

I have gathered examples of what manual, semi-automatic or expert personas can look like in a traditional persona document in Figures 4 and 5. They have varying amounts of information and different layouts. Figure 4 has less text so it can read quickly. Challenge is that since readers do not receive much information, they fill blanks in the persona's description with their imagination, which can lead to a different view of the persona than designers intended. Also, readers can interpret the values in the sliders differently. On the other hand Figure 5 has lots of text in it, which gives readers much information, but it takes longer to get a good understanding of this persona.

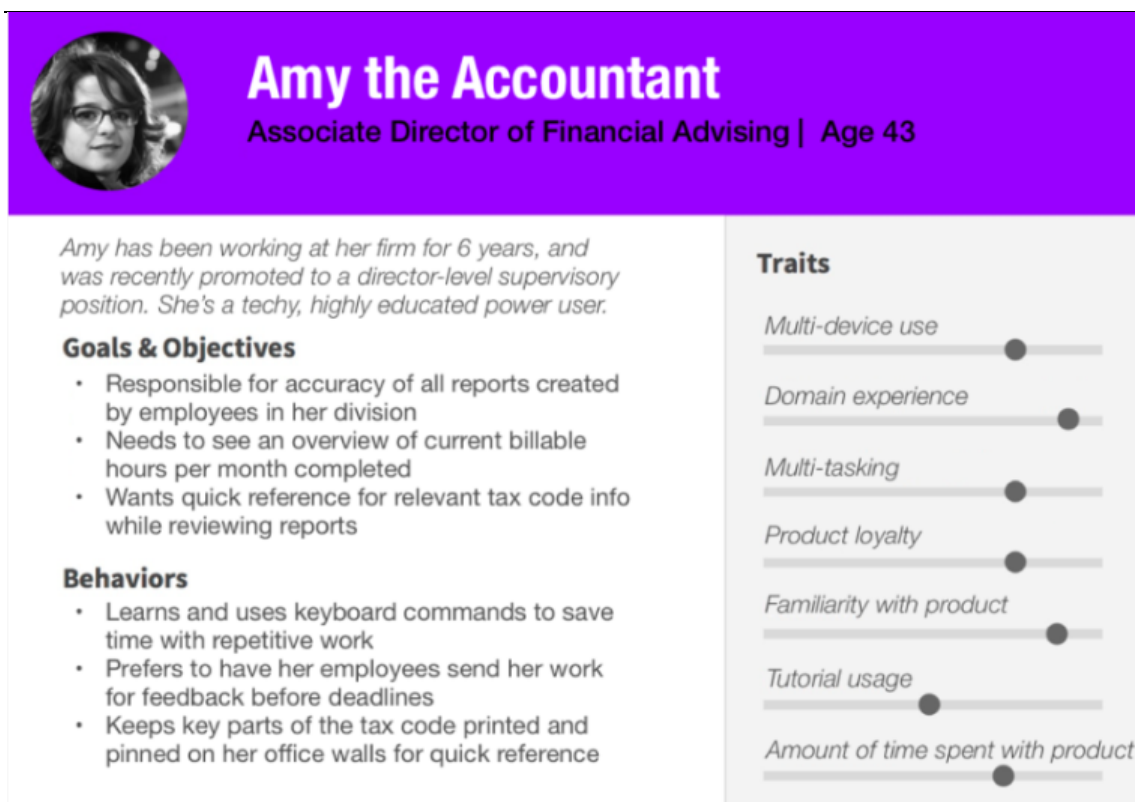


Figure 4. A first example of a traditional persona document. (source: Laubheimer, 2017)

When personas are created automatically, making documents is also automated, but someone still has to decide what kind of document software is set to produce. I have gathered examples of automatic personas in Figures 6 and 7. Figure 6 resembles a static, traditional persona document since it aims to show all the information at once. Still, reader can click symbols to get more information and add comments to the persona. Figure 7 is a fully interactive application that shows for example estimation about how many users in different demographic groups are represented by this persona after a click. Both of them have a short textual section about the persona's background information, preferences and typical usage of the product, but they do not describe users' deeper needs or pain points.



Teach Me TINA

LEARNING FOCUSED Teacher

<p>title Science Teacher</p> <p>company name Crabapple Middle School</p> <p>industry Education</p> <p>location Roswell, Georgia</p> <p>description Crabapple Middle School has enjoyed twenty plus years of excellence in education since its opening in 1983. In 1988, Crabapple Middle became Fulton County's first National School of Excellence and a Georgia School of Excellence. In 2003, Crabapple Middle was recognized as one of the first Georgia Lighthouse School to Watch for excellence in middle level education.</p>	<p>“Tell me more! I need Internet at home and in my classroom. So, it’s got to work. When I do have trouble, though, I want to be able to fix it quickly on my own.”</p> <p>My school continuously strives to be a premier educational institution in the state of Georgia. Technology is now a part of our everyday lives, so I use technology and the Internet in my classroom. I use it for personal projects, but also for classroom projects with all of my students. When in a classroom with 30 middle school kids, I don't have time to call the DSL provider if I have trouble with the connection. So, I need to be able to troubleshoot problems on my own, right there on site. If I have too many connection problems, I will report it to our school principal and recommend that we use a different DSL provider. As Teachers, we don't have a lot of time to deal with extra problems, outside of our everyday chaos.</p> <p>At home, I use the Internet to do research for the book I am writing. I am also an avid cook, so I connect almost every evening to pick out recipes and view the recipes I've saved online. When I am at home, I have a little bit more time to troubleshoot if needed. And, I do prefer to fix the problem myself, if possible.</p> <p>This user has a high need for connection and a moderately high willingness to troubleshoot problems when they arise. She is interested in what is happening and why the function is being performed. She wants to learn about her computer and DSL. Tina will study simple wiring diagrams, try to check connections and will download DSL software. She wants to learn more computer jargon, but explanations may be needed. She may also use a chat for customer support, to learn how to fix her DSL connection in her classroom or at home by herself.</p>
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KEY VALUES

- Learning
- Educating and Innovating
- Autonomy

CONNECTION NEEDS

In her classroom, for both personal and classroom use

At home, for research, web browsing and checking email

Connection needs to work most of the time or Tina will move to a new company

QUESTIONS ASKED WHEN CONSIDERING A PROVIDER

- "How reliable is this service in providing a connection in my room and at home?"
- "Do they provide information to me on my connection?"
- "Do they provide online chat and an online troubleshooting tool?"
- "Do they contact me about upgrades and security updates?"

EMPLOYMENT

- » Medium sized middle school - Science teacher - Southeastern United States

TECH SAVVY

- » Knows some computer jargon, but may need further explanations for some terms and concepts

COMMUNICATION PREFERENCES

- » Likes seeing connection speed and other detailed information pertaining to her DSL connection
- » Appreciates being able to learn about updates and new services from the main webpage
- » Wants to be exposed to relevant articles pertaining to her internet connection
- » Wants to be notified about key updates and upgrades and will update her computer when prompted. May look at detailed information about the update if it interests her

SUPPORT PREFERENCES

- » Writes an email or chat to customer support with questions or problems
- » Will use a tutorial, especially on first visit to a tool or site and will read it carefully, applying knowledge to other areas of the company's products
- » Expects a self-help tool and will troubleshoot on her own whenever possible, using the tool
- » Will only call customer support via telephone as a "last resort"

SECURITY CONCERNS

- » Implements security tools and likes that they are provided for her
- » Wants to be sure that her passwords are secure and appreciates any information that helps her with password security

Figure 5. A second example of a traditional persona document. (source: O'Connor, 2011)

al., 2018)

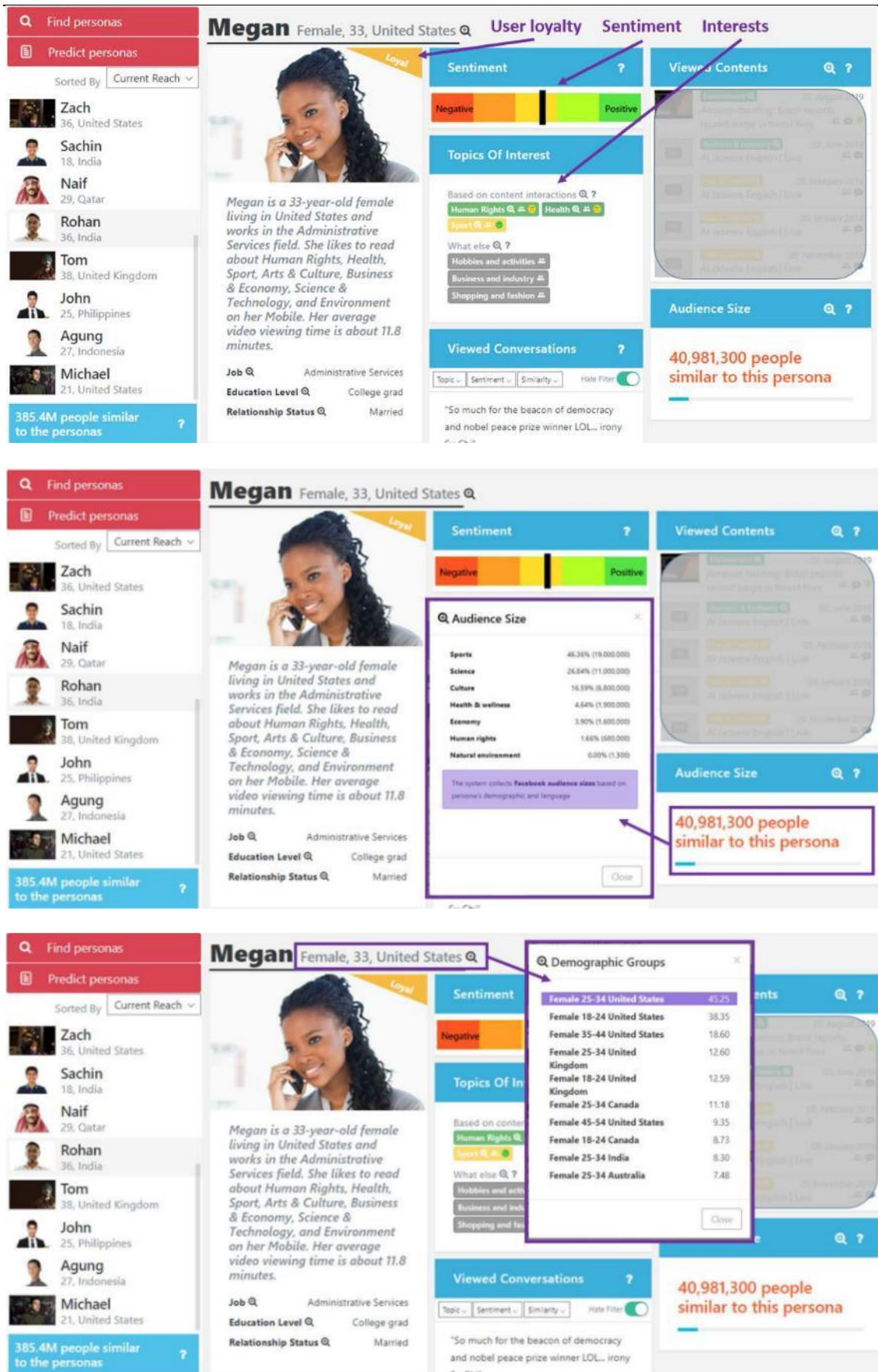


Figure 7. A second example of a persona document meant for automatic personas. Different parts of the user interface can be clicked for additional information. (source: Jansen et al., 2020)

There are also alternatives to the traditional persona document. Introduction posters shown in Figure 8 are usually the first public documents made about the personas. They have names, roles and photographs and are meant for quickly demonstrating what personas are. Introduction posters should be readable in ten seconds. Despite their name they can stay on the wall throughout the project since they tell readers where they can find more information. (Pruitt & Adlin, 2006, chapter 5.)



Figure 8. Two examples of introduction posters. (source: Pruitt & Adlin, 2006, chapter 5)

Trading cards presented in Figure 9 are small cards that contain the most important parts of the persona description. They can be used easily in workshops and distributed to people. (Pruitt & Adlin, 2006, chapter 5.)



Figure 9. An example of persona trading cards. (source: Pruitt & Adlin, 2006, chapter 5)

I found two examples of making a three-dimensional document for a persona. Scheja et al. (2016) created play-personas that combine the persona method with the Big Five personality theory and game design since they felt that using only the persona

method would offer a too limited understanding of different players. They presented personas as a triangular pyramid shape with four sides as shown in Figure 10. Each side represents a certain type of information about the persona: general demographics, user-centered design specifics, applied game-related content and psychological aspects of the user. They felt that three-dimensionality makes persona document more playful and promotes creative ideation in workshops since participants can touch and spin it. The same persona description can also be presented in a single sheet of paper for situations where that is more appropriate.



Figure 10. A first example of a three-dimensional persona document. (source: Scheja et al., 2016)

Valls et al. (2011) presented personas as a cube or box shown in Figure 11. Each side has different elements of the persona description or three silhouette photos of the persona doing his or her daily activities. They felt that box shape and silhouette pictures in relevant situations promote playfulness and empathy. In their study participants using box persona with silhouette photos remembered details of the persona more accurately both immediately after the test and a month later compared to participants using a traditional A4 paper persona document with a face photo. However, authors do not tell whether the difference was statistically significant or not. Also, there is no way to tell whether differences were due to the different photos or the shape of the documents.



Figure 11. A second example of a three-dimensional persona document. (source: Valls et al., 2011)

4.5.2 Presenting several personas

A persona comparison document shows the relationships and differences between several personas. It assembles all the personas in a list or table and includes detailed information in key domains of the product as shown in Figures 12 and 13. A persona comparison document offers a quick overview of all personas and their relationships so they can reveal partly overlapping needs or challenges in multiple personas. (Brangier & Bornet, 2011; Pruitt & Adlin, 2006, chapter 5.)

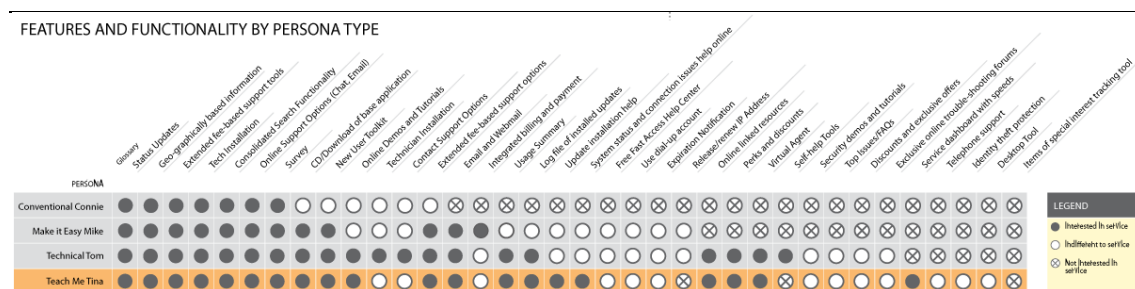
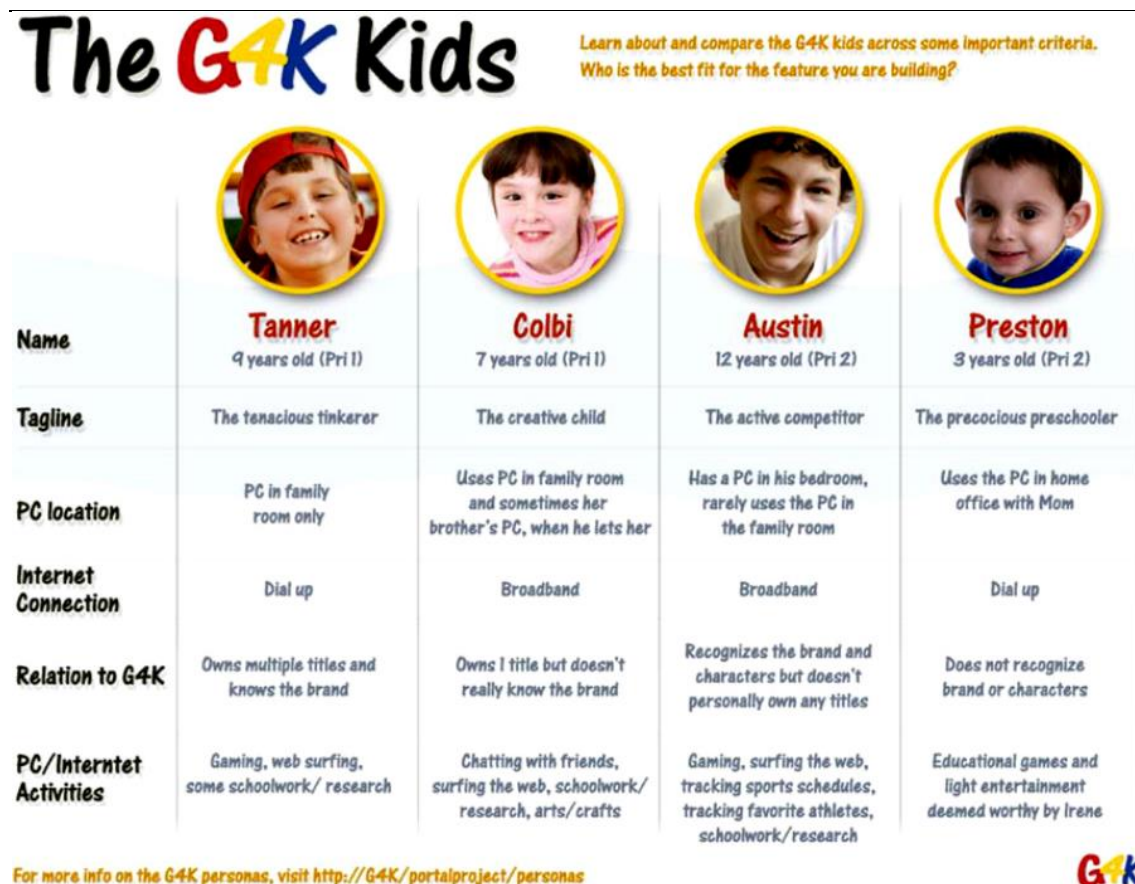


Figure 12. A first example of a persona comparison document. Each row represents a single persona. (source: O'Connor, 2011)



For more info on the G4K personas, visit <http://G4K/portalproject/personas>



Figure 13. A second example of a persona comparison document. Each column represents a single persona. (source: Pruitt & Adlin, 2006, chapter 5)

A communication constellation document shown in Figure 14 presents visually in a constellation how personas are linked to or interact with one another through the product (Pruitt & Adlin, 2006, chapter 5). A persona ecosystem presented in Figure 15 on the other hand emphasizes the organizational hierarchy of personas and demonstrates which personas are related to different departments and tasks (Bhattarai et al., 2016).

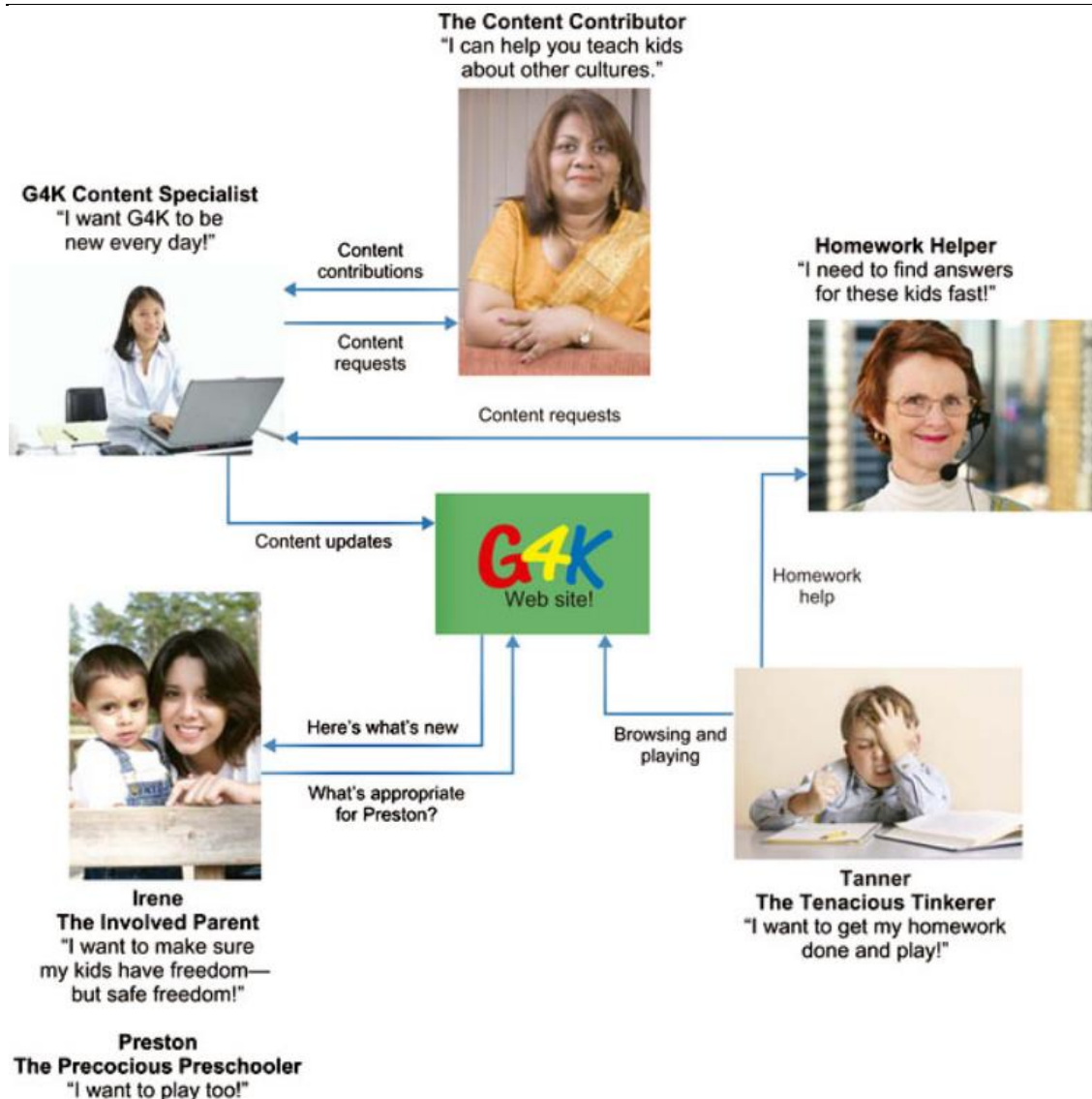


Figure 14. An example of a persona communication constellation. (source: Pruitt & Adlin, 2006, chapter 5)

4.6 Designing with personas

One common pitfall of the persona method is that personas are forgotten and never used after making persona documents (E.g. Doody, 2013; Handa & Vashisht, 2016; Noetzel, 2018; Flaherty, 2018). It is useful to have visual reminders of the personas, such as

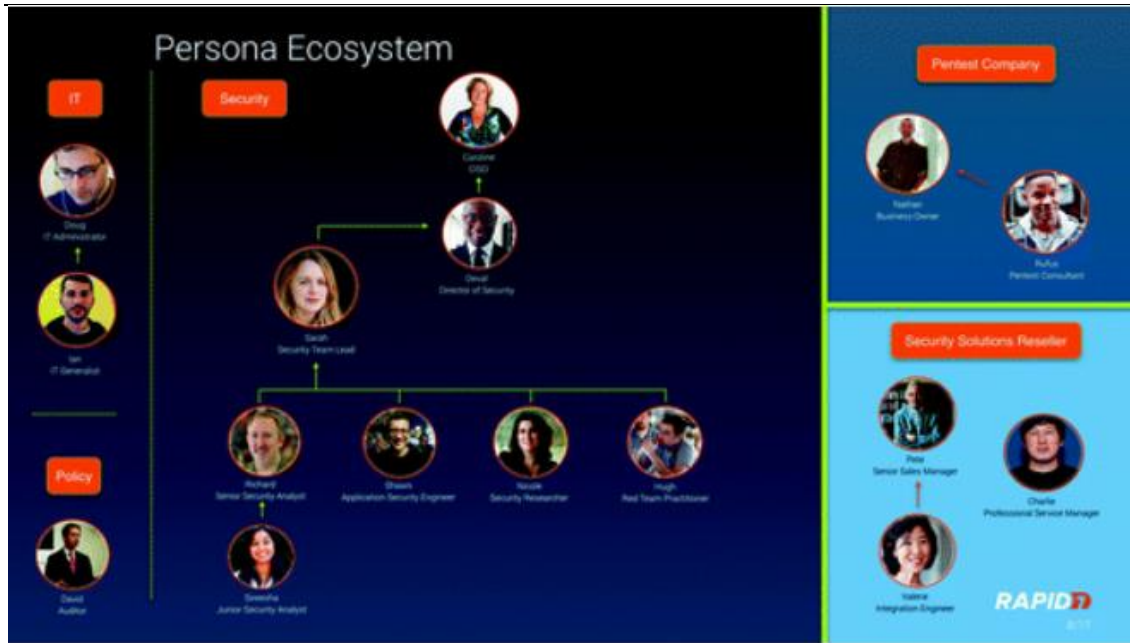


Figure 15. An example of a persona ecosystem. (source: Bhattarai et al., 2016)

printed out persona documents, on the wall (Hodges-Schell & O'Brien, 2015, chapter 16).

When personas and their documents are complete enough to make them public, designers need to introduce human-centered design, persona method and the created personas to the organization. Enough attention should be put into the way personas are introduced and sold since personas are effective only when they are used. Showing the benefits of personas is favorable in every case, but different audiences, such as designers, programmers, engineers, executives and the marketing department, can benefit from tailored introductions. (Pruitt & Adlin, 2006, chapter 5.)

How personas can be used depends greatly on the developmental stage of the product. Coworkers should be given instructions, templates and tools for using personas, but still encouraged to be creative and flexible in employing them. (Pruitt & Adlin, 2006, chapter 6.) Personas can be used as a continuous reference to evaluate ideas and prototypes with personas' needs instead of only as a starting point to support focusing and refining the problem (Heck et al., 2018). It is also possible to conduct a role-playing session where one team member plays the part of the persona and others ask questions (Edeker & Moorman, 2013; Lepore, 2009; Kolski & Warin, 2018). Role-playing a persona offers a reality check and makes sure everyone is designing for the same persona and his or her needs and pains (Heck et al., 2018). Personas can also be used together with other methods, such as storyboarding, sketching or moodboarding. For example, making sketches from the persona's point of view can help in seeing the product with the user's eyes. (Hodges-Schell & O'Brien, 2015, chapter 16.)

It is important to remember that even though personas have been published, it is still possible and recommendable to do persona-based user research and gather new information to refine existing personas or develop new personas. It is a good idea to appoint someone to be responsible for keeping track of the raised questions, new information and updates done for the personas so that personas continue to be coherent. The same person could also remind others about personas if their usage has been forgotten. (Pruitt & Adlin, 2006, chapter 5; Edeker & Moorman, 2013; Nielsen 2014.) If the project has used automatic personas, updating them is extremely easy and fast (E.g. Jansen et al, 2020; An et al., 2018).

Opinions about how often personas should be updated vary. Some say it should be done at least once a year (Stickdorn et al., 2018, 40). Others say that it should be done at a minimum monthly when working on early-stage or rapidly changing products and every 6 – 12 months when working on more complete products (Noetzel, 2018). Up-to-date personas help in designing successful products, but personas that are revised and changed several times a year may overwhelm and confuse some stakeholders. Changes in business, competitors and technology or use base may signal a need for updating personas. (Flaherty, 2016.) Some recommend updating personas every time user research is conducted or new user behavior is observed (Skand, 2019). Analytic data of real users' behavior from a website or application can be used to validate and refine personas after their original creation (Harley, 2015).

When the project concerning personas is ending, it is useful to take time to assess things. Designers and stakeholders should discuss together how well the persona method and created personas worked, how much they increased focus on users while designing and what was the return on investment of all the resources put into developing personas. If personas did not succeed, it is important to analyze why they failed to avoid the same mistakes and problems next time. (Pruitt & Adlin, 2006, chapter 7.)

Personas may be reused in other projects or retired completely. If some part of the old data is appropriate for another project, it can save time to reuse old personas. It may be necessary to gather some new data, refine persona descriptions or change the prioritization of personas. It is also possible to retire old personas and start developing new personas from the scratch if old data is not applicable or reliable. Designers can create a collection of personas from different projects so that at the beginning of new projects designers can check if there is some previously made persona that could offer some insights. (Pruitt & Adlin, 2006, chapter 7.)

5 TELLING STORIES WITH PERSONAS

Designers tell stories when they convince users, executives and marketers about the benefits of a certain product or write scenarios or user stories (Khalili, 2020). Stories are a very old form of communication that distill, organize and transmit information and make details vivid. Humans learn naturally from stories, and stories can look back to preserve and explain the past or look forward. When designers want to initiate change, stories open up the imagination and allow people to see that things can be different. (Quesenbery, 2006.) Storytelling skills can distinguish great designers from good designers. Great storytelling means stories with a purpose and something new to tell, credible events and plot, overcoming obstacles to elicit emotions and a structure that has a beginning, middle and ending. (Khalili, 2020.)

In Chapter 5.1 I will define different types of textual narratives used together with personas. In Chapter 5.2 I will tell about writing textual narratives and in Chapter 5.3 about different usages and benefits for them. In Chapter 5.4 I report criticism and challenges concerning them and in Chapter 5.5 the characteristics of well-written narratives. In Chapter 5.6 I will tell about academic research conducted about scenarios and user stories and in Chapter 5.7 I will summarize how textual narratives can be used together with personas.

5.1 Definitions and different types

In my thesis, I concentrate on stories that are presented as textual narratives with the help of personas. Scenarios and user stories are the most common ways to write stories for personas (Minichiello et al., 2018). Personas, scenarios and user stories can be used separately, but they are most useful when combined (Pruitt & Adlin, 2006, chapter 1, Nielsen, 2014; Minichiello et al., 2018; Khanh et al., 2017). Persona's foundation document can have several scenarios and user stories even when there is no space for all of them in a single persona document (Pruitt & Adlin, 2006, chapter 4).

It should be noted that authors may mean different things when they talk about scenarios and user stories. Task scenarios are a task and explanation presented to participants in usability testing to give them a context about why they are doing some task

(McCloskey, 2014). Future scenarios combine market and environmental factors to illustrate and explore different ways the future might realistically develop without focusing on an individual user (Wade & Wagner, 2012, chapter 1). Client scenarios are written from the perspective of main stakeholders and describe what they want users to do with the product (Bolchini, 2010).

User stories typically mean a single sentence user stories that are used in agile development (E.g. Dam & Teo, 2017; Domingo, 2019). However, Nielsen (2014) sees user stories as several sentences long stories that resemble scenarios, but have more illustrated and narrative tone, causality, timeline and multiple events connected with a plot. Gibbons (2017) in turn uses the term UX stories when she means longer stories that are told from the user's perspective and describe evolving UX with deep characters, rich context and well-formed plots written in an emotionally evoking way.

In my thesis, I use the term scenario for several sentences long textual narratives about a certain user using a certain product and term user story for a single sentence long narratives. I have placed Nielsen's (2014) and Gibbons' (2017) ideas into my text regarding scenarios since I did not find other sources that would have separated scenarios and more detailed stories. In addition, I believe that scenarios can be written with plot and deep characters even though they are not always written so.

Khanh et al. (2017) also used different terms for a scenario and persona document than other authors. They use the term persona-story when they mean longer stories written from the persona's point of view (i.e. scenarios). They use the term human-story when they mean a document that has a picture of the persona, some background information and a scenario and user story written from the persona's point of view (i.e. persona document). In my thesis, I have used more the traditional terms scenario and persona document when citing their results instead of persona-story and human-story so that their results can be more easily understood and compared.

5.1.1 Scenario

Scenarios are stories about users describing how the product is used to meet the real-life needs and goals of users (E.g. Lior, 2013, chapter 5; Parush, 2015, chapter 13; Goltz, 2014b). Scenarios describe causal relationships between user and product from the persona's point of view within context. They are sketches of possible use and narrative descriptions of how the product might be used, who might use it, when and where it might be used and how the product reacts to its use. Scenarios are often based on user research instead of how designers assume the product might be used. (Liu, Zhang, & Chen, 2012; van der Bijl-Brouwer & van der Voort, 2013; IDF, 2017; Ross, 2013; Nielsen, 2014.) Scenarios are similar to journalism and investigation since they reveal who did

what where, when and why (Leisio, 2016). Scenario have varying amounts of details about user's thoughts, emotions, problems and possible solutions since scenarios concentrate on the key interactions with a system instead of all possible interactions. (Nielsen, 2014.) Scenarios are sometimes called user scenarios (Leisio, 2016; IDF, 2020a).

Personas alone do not describe specific tasks in a specific context (Nielsen, 2014) and creating personas without relevant, real-life scenarios has been seen as one of the most common pitfalls of personas (Skand, 2019). Persona descriptions help in creating specific and precise scenarios (Nielsen, 2014) and persona gives a context for the scenario (IDF, 2017). If scenarios are written without personas, they often do not focus on users and leave out critical details about the user's motivation, preferences and previous actions. These kinds of scenarios do not promote insight, interest and empathy. (Pruitt & Adlin, 2006, chapter 1.)

The length of a scenario can vary from one paragraph to several depending on its scope and focus (Parush, 2015, chapter 13). Each persona can have several scenarios describing the user from different perspectives:

- *Everyday life scenario*: Describes the typical behavior and life of the persona.
- *Problem scenario*: Describes a problem that is will be solved when the product appears. Can be used as a frame of reference for evaluating solutions.
- *Future use scenario or design scenario*: Describes a possible future use of the product and what the user may accomplish with it. Proposes new design ideas.
- *Negative scenario*: Describes failures and problems users have when they use the product. Describes reasonable alternative paths that users might take. (E.g. Parush, 2015, chapter 13; van der Bijl-Brouwer & van der Voort, 2013; Nielsen, 2014.)

Designer should choose the type of scenario based on the purpose and focus of personas (Bolchini, 2010). For example, when they want to describe the usual life of a persona they can use an everyday life scenario like this: *"A group of Odetta's friends and relatives is coming to her house for a get-together on Friday evening. At the beginning of the week when she has free time from her work and studies she looks for inspiring recipes online. After deciding the dish she orders the necessary ingredients online and selects a suitable time slot for picking up ingredients on Friday at the store. The store is located in her route from work to home, but she does not want to waste time walking in aisles looking for ingredients. She takes pictures while cooking and at the get-together so that she can post later on Instagram."*

When designers want to concentrate on a certain pain point of a persona they can use a problem scenario like this: *"Odetta wants to fasten her cooking by using dry sauce kit, but she cannot find instructions for its cooking. Text information only lists its ingredients and the photograph becomes too pixelated when zoomed in to read instructions"*

from the side of the package. She is forced to search for the information elsewhere. She gets frustrated since ordering takes more time than she had anticipated."

5.1.2 User story

User stories are the most inspiring, user-centered and goal-oriented stories from users condensed into a single sentence. In agile development user stories are written in format *"As a <type of user/persona's name>, I want to <goal> so that <benefit>".* The first part of a user story is a role that defines which persona or type of user expresses the need. The second part is means that represent different types of requirements and goals that the user has. Role and means are compulsory, but the number of endings explaining why the means are requested can vary from zero to several. They are usually written on post-it notes. (E.g. Lucassen et al., 2016; Dam & Teo, 2017; Domingo, 2019.) However, the real value of user stories is the insights and discussion they provoke, not in using any predetermined format. If the user story does not fit the format without forcing, then it is alright to diverge from it. The user story does need to be written in the typical format to be considered a user story. (Patton, 2015, chapter 7.) For example, user story can be: *"As a busy cooking enthusiast, I want to order food online fast so that I can spend my time cooking instead of queuing in the store."*

User stories do not have complex plots or any unnecessary details about the context or timeline. They focus solely on telling what the user wants to do and how the product helps him or her achieve that goal from the user's perspective. (Dam & Teo, 2017; IDF, 2020b; Laubheimer & Loranger, 2017.) User stories are collaborative design tools, so all stakeholders should participate in the definition and sorting of user stories (Domingo, 2019). User stories do not force solutions and prescribe how the product should handle things, but instead capture user requirements. They may also describe non-functional capacities of products such as privacy or security requirements. (IDF, 2020b.)

In agile development combination of user stories is called epic. Epics have their own themes and give an overview of a feature that provides value to users. Epics are too large or complex to complete within one sprint, but they can be broken down into smaller, more detailed user stories that can be implemented during a single iteration or sprint. Epics enable designers to see the design from the perspective of many users and prepare for situations that would be overlooked while focusing only on a single user story. (Six, 2012, 2016; Domingo, 2019.) Agile development typically uses product backlog to develop, share, evaluate and prioritize user stories and implement them in code (Sedano et al., 2019).

5.1.3 Combining user story and scenario

Behavior-Driven Development (BDD) aims to develop higher quality software faster using a common language based on simple, structured sentences expressed in English. (Smart, 2014, chapter 1.) It specifies user requirements in a format presented in Figure 16 that combines user stories with scenarios. They are usually written inside index cards that have key words printed in them. There are three parts in the format:

- *Title*: One line describing the whole story.
- *Narrative*: Typical agile user story preferably written from the persona's perspective.
- *Scenarios representing acceptance criteria*: One or more scenarios written with title and predetermined keywords, such as "given", "when", "and" and "then". Scenarios are written from the first perspective. (Silva, Winckler, & Bach, 2019; Hodges-Schell & O'Brien, 2015, chapter 7.)

Title: Flight Tickets Search

Narrative:
As a frequent traveler
I want to be able to search tickets, providing locations and dates
So that I can obtain information about rates and times of the flights.

Scenario: One-Way Tickets Search
Given I go to the page "Find flights"
When I choose "One way"
And I type "Paris" and choose "Paris, Charles de Gaulle (CDG)" in the field "From"
And I type "Toulouse" and choose "Toulouse, Blagnac (TLS)" in the field "To"
And I choose "2" in the field "Total number of passengers"
And I choose "12/15/2016" in the field "Depart"
And I click on "Search"
Then will be displayed the list of available flights

Figure 16. An example of combining a user story and scenario as they are formatted in behavior-driven development. (source: Silva et al., 2019)

5.1.4 UserX Story

Choma, Zaina and Beraldo (2016) have developed their own template for a user story called UserX Story by combining user stories, personas and Nielsen's heuristics. UserX Stories are told from the perspective of a single persona even when multiple personas might have the same need. They describe the persona's actions to achieve a certain goal, conditions for achieving the goal and heuristics that will be satisfied once the goal is successfully achieved.

The first version of UserX Story was simple: "*As a <persona>, I want/need <goal> so that <Nielsen's heuristic(s)> will be met.*" (Choma et al., 2016). For example, UserX Story could be "*As an Odetta the Online Shopper, I want a fast way to order*

my favorite products so that the heuristic about flexibility and efficiency of use will be met.

Based on feedback UserX Story was developed into more complex form: "*As a <persona>, I want/need <goal>, for this <interaction>, through/when [<task>/<context>]. I evaluate that my goal was achieved when <feedback.>*" In addition to the user story itself, there can be multiple acceptance criteria in the form of "*Checks <action> through <set of conditions> to satisfy <Nielsen's heuristic(s)> of action, and <Nielsen's heuristic(s)> of feedback.*" (Choma et al., 2016.) For example, UserX Story could be "*As an Odetta the Online Shopper, I want a fast way to order my favorite products, for this the website allows me to list my favorite products when I browse through the products. I evaluate that my goal was achieved when I can order my favorite products with a few clicks.*" Acceptance criteria could be for example "*Checks that website allows users to mark or unmark products as favorites through clicking an icon next to the product to satisfy heuristic about a match between system and the real world of action, and heuristic about recognition rather than recall of feedback.*"

I did not find other sources using this template, which does not surprise me. Following the format strictly can result in awkward sentences. In addition, defining acceptance criteria can easily describe the solution and details of the user interface, which might not be desired at the beginning of ideation. Nevertheless, UserX Story is an interesting idea about combining well-known methods of the HTI field into a new form.

5.2 Writing textual narratives

5.2.1 Similarities in writing scenarios and user stories

Some things are mutual for writing both scenarios and user stories. Designers might end up writing too many scenarios or user stories, which can overcomplicate the design process. Scenarios and user stories should be prioritized with all stakeholders for example by frequency and necessity of use. (van der Bijl-Brouwer & van der Voort, 2013; Hu & Zhou, 2017; Zazelenchuk & Larson, 2013; IDF, 2020b.) Stakeholders and designers need to have a mutual understanding of the purpose of each narrative and select suitable research facts and a story type. Designers need to have a clear reason for writing the story and a goal they want to achieve with it. (Quesenbery, 2006; Zazelenchuk & Larson, 2013; IDF, 2020b.) It is important to agree about the level of detail in stories and their focus before the writing starts (Domingo, 2019). It is preferable to write stories when every team member is in the same place, but it is also possible to write stories in a geographically distributed team with shared documents (Hodges-Schell & O'Brien, 2015, chapter 7).

Stories should be iteratively refined, tested and evaluated (van der Bijl-Brouwer & van der Voort, 2013). The designer can do the first iteration by himself or herself by reading the story out loud and listening if it is easy on the ears and uses everyday speech patterns. After initial improvements, it is a good idea to read the story to someone else and see how they perceive it. (Quesenbery, 2006.) While rewriting scenarios, it is advisable to check in regularly with research data to make sure that designers are staying grounded in real pain points and needs (Gibbons, 2017). On the other hand, user stories usually do not need much updating, but they can be modified iteratively if necessary (IDF, 2020b). It is useful to have sticky notes, sketches, wireframes, paper prototypes and any other artifacts at hand while iterating user stories (Gothelf & Seiden, 2013, chapter 7).

Both scenarios and user stories should be based on research data so they reflect real users' needs, goals and behavior. With just designers' imagination, some details can be overstated and others overlooked. (Domingo, 2019.) If design and development happens in a short, one- or two-week agile sprint, user research may be done in advance (Laubheimer & Loranger, 2017). Involving users in the creation or at least evaluation of the stories helps in validating them. Van der Bijl-Brouwer and van der Voort (2013) separate indirect and direct participatory scenarios. Indirect participatory scenarios are based on user research and they are validated with users' feedback, but users are not involved in the writing. Direct participatory scenarios are based on user research and users participate in writing and validating scenarios. When scenarios are used as a frame of reference to evaluate ideas and prototypes, it is extremely important that scenarios are valid and preferably verified representations of possible future use.

It is usually beneficial to combine both empirical research and the designers' own imagination (van der Bijl-Brouwer & van der Voort, 2013). User research data can reveal different triggers for using the product and the user's requirement for the product (Nielsen, 2014). If there are multiple triggers for the same task or goal, using the most important or common one is advisable. If there are multiple strategies that users may use in the same task, the most typical strategy or a strategy that can be simplified should be chosen. Designers can also write several scenarios if there are multiple equally important triggers or strategies. (Holtzblatt et al., 2005, 190.) Listing all tasks relevant to a certain persona can also serve as a starting point when writing stories (Lior, 2013, chapter 5). Another possibility is to start writing from the end by defining what the end goals are. It helps in focusing on why people use certain feature instead of how it is presented in the user interface. (Khalili, 2020.)

Hodges-Schell and O'Brien (2015, chapter 7) prefer using the combination format of BDD and index cards to write user stories with scenarios. Index cards with printed keywords make it easier to follow the given format than post-it notes. They help design-

ers in remembering to write only a single user story per card, and cards are also easy to use in collaboration, discussion and prioritization of the stories. Ideally, user stories are written in a team that has also stakeholders in it. Jeffries (2001) emphasizes that card is still only one of the C's (Card, Conversation and Confirmation) associated with user stories. The card gives a physical form to stories and helps in tracking them, but they do not have all the information that makes up the requirement. Conversations about the user story exchange thoughts, opinions, and feelings within the team. Confirmation of the user story is done with acceptance testing and checking that the story has been implemented correctly.

Sequence models (Holtzblatt et al., 2005, 190), storyboards (Holtzblatt et al., 2005, 284) or user workflows (Leisio, 2016) based on the research data may also help in creating scenarios. User stories can also be created from findings of a cognitive walkthrough (Kille, 2019). Designers should make sure that stories are consistent with wireframes, mockups and selected persona (Hodges-Schell & O'Brien, 2015, chapter 7). Kusano, Nakatani and Ohno (2013) have developed a scenario-based interactive user interface design tool to facilitate writing scenarios and designing user interfaces, but I did not find any articles about its further use or development.

User stories should be written from the perspective of the most appropriate persona to ensure that designers remember to focus on users instead of themselves. Persona documents should be visible during the writing so they can be used as a reference. (Hodges-Schell & O'Brien, 2015, chapter 7.) Personas and scenarios can be used while creating user stories (Domingo, 2019). In addition, role-playing personas can help in creating realistic and believable scenarios. Role-players can interact with a prototype and give new insights to designers. (Lepore, 2009.)

I found two sources that had semi-automated writing scenarios. Shiga and Nishiuchi (2013) filled blanks in previously made persona document with the results of the Bayesian network analysis regarding survey answers. Since the structure and topics of the scenario were predetermined, resulting scenarios were not as versatile and unique as some other scenarios have been. On the other hand, Kanno et al. (2011) used results from human modeling and simulation for different personas as a basis for scenarios. Concerning automating writing user stories Rodeghero, Jiang, Armaly and Mcmillan (2017) developed an algorithm to automatically extract information relevant to user stories from recorded conversations. They recorded and transcribed approximately 24 hours of spoken conversation between customers and developers and used machine learning to classify turns in conversation and turn them into user stories

5.2.2 Differences in writing scenarios and user stories

The biggest difference in writing scenarios and user stories is the differing length and elements. Typical elements in scenarios are the same as in any book or film:

- *Actor*: Specified user (preferably a persona) and the main character of the scenario. User's actions can be written from the perspective of a certain role if user has several roles.
- *Settings*: Particular task the user is performing and description of the context, location and time of the scenario.
- *Goals*: Clearly defined desired goals or objectives for the user that explain his or her motivation.
- *Beginning*: Task or situation that triggers scenario.
- *Actions and events*: Specific features or functionalities the user will need or use.
- *Obstacles*: Problems that user faces and how he or she solves them.
- *Plot*: Sequence of events that describe a procedure or task flow.
- *Ending*: How the scenario ends. A clearly defined outcome. (Pruitt & Adlin, 2006, chapter 1, chapter 6; Liu et al., 2012; Quesenbery, 2006; Nielsen, 2014; Gibbons, 2017.)

Some scenarios can be simpler and leave out an element or two if the scenario is understandable without them. On the other hand, more complex scenarios may include several causal sequences of events and actions. (Liu et al., 2012.) The recommendable elements for each scenario depend on the purpose and focus of the scenario (Quesenbery, 2006). Complex scenarios may be divided into smaller subscenarios or user stories (Liu et al., 2012). If scenarios use personas as an actor, they do not need to repeat information about the persona's needs, skills and expectations (Pruitt & Adlin, 2006, chapter 6).

User stories on the other hand have typically the following three parts:

- *"As a []"*: the role of the one who makes the action and who benefits.
- *"I want []"*: the action that is executed.
- *"so that []"*: added value that the user gets from the action. (Domingo, 2019.)

If there is a need to write more detailed user stories, there can be an additional end part in the form *"and verify that [conditions of satisfaction]"*. The total number of user stories is usually not limited. If necessary, designers can write new, more fine-grained user stories. (Six, 2012, 2016.) One way to write user stories on a post-it note or card is to first write a short, simple title for the story and then key words "Who", "What" and "Why" on separate lines. Designers need to remember to leave enough space between

lines for writing additional information while talking about the story. (Patton, 2015, chapter 7.)

Another difference besides the elements is that since scenario is longer and describe context more, scenario can have a more colorful description to make sure designers understand the user's state of mind and can recognize the user as an individual and human agent instead of a stereotype. The more data and description there is, the less the designers have to rely on their assumptions. (Nielsen, 2014.) User stories on the other hand are so short that they are usually written on post-it notes (Domingo, 2019). If the design team is distributed into different locations, writing user stories with shared documents is helpful. User stories can be written on a table with columns for a user role, user action, user value, conditions of user satisfaction, additional notes, priority number and level of effort. (Six, 2012.)

5.3 Usage and benefits

Scenarios and user stories share many usages and benefits:

- Clarifying user requirements and focusing discussion on users' needs. Verifying or falsifying designers' assumptions about users.
- Giving inspiration and facilitating ideation and talking about difficult topics. Encouraging rich dialogue between project stakeholders and refining ideas and altering previous assumptions.
- Creating a shared vocabulary and common understanding for all stakeholders.
- Facilitating distributing information and condensing research results to stakeholders. Delivering the who, what and why of user requirements and solution's anticipated effects in a format that can be easily understood by all stakeholders.
- Evaluating ideas and prototypes early on to promote iterative design. Evaluating the appropriateness and consequences of solutions.
- Helping in maintaining a holistic vision for a product and prevent project devolving into an incoherent collection of features. Finding the balance between users' needs and commercial purposes of the product. (E.g. van der Bijl-Brouwer & van der Voort, 2013; Hu & Zhou, 2017; Liu et al., 2012; Nielsen, 2014; Hughes, 2011; Sutcliffe, 2014; Gibbons, 2017; Domingo, 2019; IDF, 2020b; O'hEocha & Conboy, 2010; Dam & Teo, 2017; Zazelenchuk & Larson, 2013).

Some usages and benefits have been reported only for scenarios. Scenarios evoke more empathy and deepen and give real meaning to personas. They show personas in action and help designers explore how personas might interact with a product. Stories can establish a context, illustrate problems or positive experiences and propose new

solutions. They can also be used when recruiting test participants for user tests and deciding test settings and tasks. (E.g. van der Bijl-Brouwer & van der Voort, 2013; Hu & Zhou, 2017; Liu et al., 2012; Nielsen, 2014; Hughes, 2011; Sutcliffe, 2014; Gibbons, 2017; Quesenbery, 2006; Khanh et al., 2017; Nielsen, 2014.) In addition, scenarios help in modeling interactions between a product and its working environment (Liu et al., 2012) and identifying pain points of the product (van der Bijl-Brouwer & van der Voort, 2013; Hu & Zhou, 2017). User requirements and usage phases are easier to understand and remember in story form (Holtzblatt et al., 2005, 190). Scenario-based design is a general term that applies to many different techniques used in creating and using scenarios in every step of the development process. It emphasizes using flexible and vivid scenarios to let designers explore the future use of products. (van der Bijl-Brouwer & van der Voort, 2013; Hu & Zhou, 2017; Sutcliffe, 2014.)

Some usages and benefits have been reported only for user stories. User stories help in defining project scope and planning the next steps. They allow splitting the project into smaller milestones and making it easier to estimate costs on the project. They reduce information redundancy and tell user requirements in a manageable size. They shift focus from solutions, features and abstract functionalities to concrete and tangible end goals. (E.g. Domingo, 2019; IDF, 2020b; O'hEocha & Conboy, 2010.) They can facilitate creating content for a website and for example reveal the need for multilingual content (Mills, 2015). They can also be used to explain stakeholders the difference between UX design and user interface design (Walter, 2020). User stories can be used while segmenting users while developing personas since user stories clarify differences between groups (Noetzel, 2018).

The biggest difference between scenario and user story is their length so it is no surprise that the scenario's advantage is that it provides more context and details and the user story's advantage is that it provides information in a short, standardized format. Scenarios are told from the persona's point of view and user stories from the role's point of view so they complement each other in situations where individual persona has multiple roles. (Khanh et al., 2017.) Designers should use multiple user stories at the same time due to their shortness (Dam & Teo, 2017). When designers talk about user stories, it is good to talk also about what the user does outside the software to get a better understanding of the overall picture. In addition, pondering what can go wrong while implementing the story and what is taken as granted in the story can give new insights. (Patton, 2015, chapter 7.) The same could be applied to scenarios.

Scenarios and other design tools complement each other. I will introduce in Appendix E concepts and methods that are related to scenarios and user stories. Scenarios can be combined with task analysis or journey mapping to analyze data more circumstantially (Parush, 2015, chapter 13). Scenarios can also be illustrated graphically since sto-

ryboards starring personas make product plans and personas come to life and to communicate the planned end result. (Pruitt & Adlin, 2006, chapter 6; Gibbons, 2017.) Scenarios provide content and tangibility when conducting walkthroughs and reviewing and presenting conceptual models, storyboards and prototypes (Parush, 2015, chapter 16 – 18; Hughes, 2007). If designers want to know about the usability of a prototype, prototype testing gives more valid results about it than just scenarios (van der Bijl-Brouwer & van der Voort, 2013).

User story mapping presented in Figure 17 shows visually how user stories can be placed inside user journey maps or scenarios and how they are positioned in the task flow. User story mapping helps in getting focus for both small details presented in user stories and larger overviews presented in journey maps and scenarios. It can also be used for prioritizing user stories and finding gaps in user research and user stories. (Patton, 2015; Szuc & Wong, 2014.)

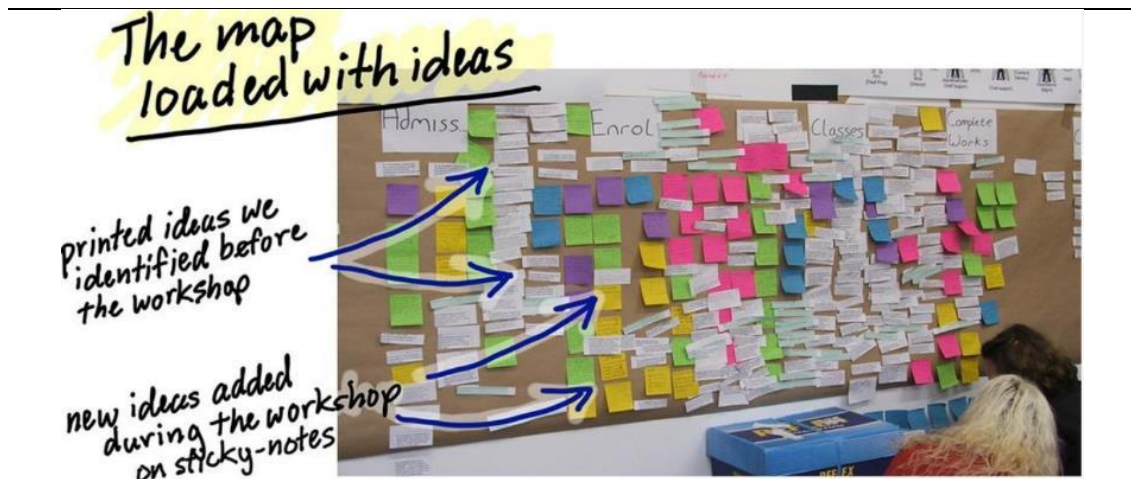


Figure 17. An example of a user story mapping (source: Patton, 2015, chapter 1).

Scenarios can also be acted out live or on video (Pruitt & Adlin, 2006, chapter 6; Gibbons, 2017). Team members can play out scenarios themselves or with miniature figurines in a miniature environment. In a technique called The Envisioning Use, design team collaborates and explores scenarios through steps of remembering, imagining, experiencing and envisioning possible uses. (van der Bijl-Brouwer & van der Voort, 2013.)

In the sources that I found scenarios were often used in persona descriptions (E.g. Khanh et al., 2017; Eriksson et al., 2013; Williams et al., 2013; Björndal et al., 2011). They helped also in conducting usability expert reviews (Stojmenova et al., 2013), developing a situation-aware safety service for children (Pantsar-Syvänniemi et al., 2015) and making future scenarios more concrete (Vallet et al., 2020). User stories on the other hand have been used to study the needs of project managers in small and medium-sized enterprises who deal with international and/or distributed virtual teams (Quade,

Habermann, & Birkenkrahe, 2012). They have also been used in a prototype tool called ReViz to recommend a visualization type for data (Liu, 2019).

User stories and scenarios formatted in the combination style of BDD have been used in writing automated test requirements for checking the consistency and compatibility in different design artifacts, business models and user requirements (Silva & Winckler, 2017). They are not so useful as such in persona descriptions since they are written in a predefined format rather than as a free narrative, but they are a good tool to be used together with personas.

Bauer and Kientz (2013) invented a different way to promote innovative thinking with scenarios presented in Figure 18. They asked participants to come up with a name, age, device and other words to fill in the blanks in prewritten scenarios. The drawback of this method is that it is clearly a scenario written without a persona since the user needs to be defined at the beginning of the scenario.

is ayear old

(A name)
(An age)
(Job type)

who has been struggling with a lot of job related stress. He/she decides to try a new application to relieve stress that runs on a/an

to help improve his/her mood. The

(Computing device)

application senses his/her mood through a device he/she wears on his/her

(A body part)

When the device senses that he/she is

, it responds by

(A mood word)
(An action word)

Figure 18. An example of a scenario exercise where designers fill in blanks of a prewritten scenario. (source: Bauer & Kientz, 2013)

5.4 Criticism and challenges

The critique and challenges I present in this chapter might not be cited authors' personal opinions but just something thought they have heard and reported. Stakeholders might not be accustomed to seeing and using scenarios. Writing scenarios and refining their sentences might not feel like designing for people who are more used to drawing visual deliverables. Some designers might not have the necessary writing skills to produce effective scenarios. (Ross, 2013.) Tangible wireframes or prototypes are easier to understand and explain the user's needs to stakeholders better than even well-written scenarios (Hughes, 2007). Textual methods alone do not convey all the traits and aspects of the new product (Holtzblatt et al., 2005, 231).

Like any tool, narrative techniques may be misused and lead to unwanted results. Narrative bias means people's tendency to interpret information as being part of a larger

narrative, whether presented facts support the full narrative or not. Specific details that make the narrative realistic and memorable may trigger biased conclusions and strongly influence the designer's behavior. This may also be caused by cause and effect explanations in the stories since people often see a cause even if something happened completely randomly. (Whitenton, 2017.) Badly written scenarios do not evoke empathy and help in designing new products. Even if there are multiple scenarios, they might not cover all the relevant tasks and problems with the product. Designers might be unsure about which parts of the scenario come from research data and which parts are fabricated. (Nielsen, 2014.) If scenarios are not based on user research, they only reflect the designer's imagination (Gibbons, 2017).

Designers might end up imagining an endless number of scenarios and spend much time on finding the right scenario (van der Bijl-Brouwer & van der Voort, 2013). A scenario only describes a single potential path for the user and no matter how many scenarios there are, they will not cover all the possible ways the user can or want to use the product. If designers look only at a single scenario at a time, design may become fragmented. Sometimes designers need to consider all the scenarios at the same time to form a coherent structure to the product. (Holtzblatt & Beyer, 2016, chapter 11 – 12.)

Due to the shortness of user stories, they break UX into tiny, independent chunks. They are so fine-grained that they make it hard to see the product structure and how features relate to each other and other parts of the design. (Holtzblatt & Beyer, 2016, chapter 16, chapter 18.) Using user stories too much and in an overly-dependent way can lead to difficulties. Large scale project might need thousands of user stories, which make working with them difficult. User stories might also be too vague to be useful or different stakeholders might interpret them differently. They might also be too simple and not capture performance measurements and non-functional aspects of the product. (IDF, 2020b.)

5.5 Characteristics of successful textual narratives

Just like persona descriptions, scenarios and user stories should be written with language that does not require knowledge or expertise in the domain, but is vivid enough to be relatable and emotional (Nielsen, 2014). Effective stories use the same language as real users (Krause, 2019; Quesenbery, 2006). Well-written scenarios are also written with an active voice so that persona does or did things instead of things passively happening (Quesenbery, 2006). Well-written scenarios are not written like an advertisement. They are neutral and do not have unnecessary details about politics, health or religion since they can be too emotional to some readers. They do not try to be overly funny or make jokes. (Schade, 2017.)

Scenarios are not meant to be lengthy, entertaining stories, but to make their point quickly and effectively. They should be told linearly without time transitions. Well-written scenarios compress information into a short form with the right details. Too many details confuse and overwhelm the reader and get the scenario stuck in insignificant side issues. Too few details make the scenario lose its authenticity and force readers to deduce and guess things. Well-written scenarios focus on relevant things (i.e. the product under design). They have actual examples from research data and are compatible with the chosen persona description. They are realistic and not overly optimistic. They should not be stereotypical and only confirm prior beliefs. If the scenario is set in a certain season, timeliness of the details should be appropriate. Good scenarios also communicate a point of view, for example illustrating that some users may have problems using the product. (Quesenbery, 2006; Nielsen, 2014; Holtzblatt et al., 2005, 190.) The number of scenarios can be limited by focusing on specific user groups, goals and use situations based on their criticality and frequency (van der Bijl-Brouwer & van der Voort, 2013).

Well-written stories focus on the persona's actions and motivations instead of technical details (Quesenbery, 2006). User stories should be written from the perspective of UX, not the user interface. For example *"As a user, I need a progress bar to determine how long I must wait for a process to complete."* describes a part of the user interface. On the other hand *"As a user, I need clear feedback on how long it takes to complete a task so that I can reduce uncertainty and manage my time accordingly."* describes UX. When user stories do not determine components prematurely, designers are free to create innovative solutions. (Walter, 2020.) Good user stories are written for a specific user and focus on describing what the user wants to be able to do and why instead of a general user doing obvious tasks for self-evident reasons (Patton, 2015, chapter 7).

Gkikas, Nathanael and Marmaras (2017) asked 51 university students to do user research and write multiple scenarios in groups. The resulting 298 scenarios were graded and analyzed by three experts in user-centered design. Groups that did more thorough and systematic research and data analysis wrote better scenarios. Students were not especially asked to develop personas, but it was not forbidden. They found three characteristics for rich scenarios and four characteristics for poor scenarios presented in Table 5.

Lucassen, Dalpiaz, van Der Werf and Brinkkemper (2015, 2016) developed and tested the Quality User Story framework presented in Table 6 based on for example INVEST criteria for user stories. Its original version had 14 quality criteria for well-done user stories, but in the refined version there are 13 quality criteria divided into three categories. Some of the criteria consider only a single user story and others a set of user stories. They also developed the Automatic Quality User Story Artisan software

Table 5. Characteristics of rich and poor scenarios according to Gkikas et al. (2017).

Rich scenarios	Poor scenarios
<ul style="list-style-type: none"> Describe recurring situations that are not very obvious, for example infrequent absolutely necessary situations and situations that affect many users under uncommon, but plausible circumstances. Combine two or more specific elements, such as the type of actor or task. Specific details facilitate the dramatization of the story, evoke empathy and help in separating scenarios. Written from the perspective of a particular user group instead of writers themselves. 	<ul style="list-style-type: none"> Describe trivial and common situations in an obvious, general and superficial way. Describe extremely marginal scenarios that can divert the design process away from more essential user needs. Describe the same story as other scenarios, but with only minor changes. Written with direct solutions instead of just describing the problem.

tool that can detect quality defects in user stories and suggest possible improvements based on the framework. After analyzing a set of user stories software reports how many user stories had errors or warnings in them and highlights the problematic parts.

Table 6. Quality User Story framework by Lucassen et al. (2016).

Category	Criteria	Definition
Syntactic quality	Well-formed	User story includes at least a role and means.
	Atomic	User story expresses a requirement for exactly one feature.
	Minimal	User story contains nothing more than role, means and end(s).
Semantic quality	Conceptually sound	Means expresses a feature and end expresses a reason why the means are requested.
	Problem-oriented	User story specifies a problem, not a solution to it.
	Unambiguous	User story avoids terms and abstractions that can lead to multiple interpretations.
	Conflict-free	User story is consistent with other user stories.
Pragmatic quality	Full sentence	User story is a well-formed full sentence.
	Estimatable	User story does not refer to a large, general requirement that is difficult to plan and prioritize.
	Unique	Every user story is unique and there are no duplicates.
	Uniform	All user stories are written with the same template.
	Independent	User story is self-contained and has no dependencies on other stories.
	Complete	Implementing a set of user stories creates a feature-complete application without missing steps.

Hodges-Schell and O'Brien (2015, chapter 7) have listed the main reasons why developers sometimes feel that poorly written BDD stories hinder the implementation of the design. I have transformed them into a positive list of things that ensure designers write good quality stories:

- Write task descriptions that are precise and short. If the task description becomes too long, break it into simpler tasks.
- Write stories from the persona's point of view, not your own. Show how persona benefits from implementing the story.
- Write stories that state the deeper user benefit or business value of implementing the story. Pay attention to how the end part of the user story is phrased so that it is not superficial or self-evident.
- Write stories that include clear acceptance criteria so that developers and quality assurance specialists know what success looks like for the story.

5.6 Academic research about textual narratives

I could find only one study about user stories that had used statistical significance testing. There was no difference in quantity or comprehensiveness of the user stories developed individually or in groups by university students (Nguyen, Gallagher, Read, & de Vreede, 2009). In Long's (2009) study persona document that had a scenario as a storyboard was more effective than a textual scenario since it facilitated more detailed design solutions, but the study did not state that whether that difference was statistically significant or not. Nevertheless, it should be remembered that not all persona documents have enough space in them for a storyboard so deciding between textual scenarios and storyboard is a complex matter.

When Silva et al. (2019) taught four product owners who had no experience with agile methods to write user stories and scenarios in the format used in BDD, some participants forgot to write a title or misnamed their role in the user story. However overall participants used to given template well and understood the purpose of user stories and scenarios even when they had only briefly been introduced to the method.

In addition, I found only few Master of Science theses in TUNI that concerned textual narratives in the same way that I do. Li (2017) utilized scenarios to enhance gamification design and especially help in providing genuinely meaningful gameful experiences. Alastalo (2019) on the other hand created a framework for the requirements definition of an agile software project that involved methods from human-centered design and service design.

5.7 Summary and comparison

Persona- and scenario-based design approaches evolved separately, but combining them benefits both methods. Personas and scenarios gained popularity from the middle to late the 1990s in user-centered design and HTI and they are still the two most common UX design tools. (Minichiello et al., 2018.) According to Rosala and Krause (2019), 46 % of UX professionals write user stories often and 87 % at least sometimes.

The usage of scenarios and user stories in persona documents vary. There might be a scenario that describes the persona's life in a general manner (E.g. LeRouge et al., 2011; Tu et al., 2011) or there might be a scenario that focuses on describing how the persona uses a certain product or service (E.g. Lee et al., 2020; Zhang, 2019). There might be no user stories at all (E.g. Hildén & Väänänen, 2019; Williams, et al., 2013) or there might be several of single sentence user stories that are written a free format rather than the typical format of agile user story (E.g. Rahimi & Cleland-Huang, 2014; Björndal et al., 2011; Cleland-Huang et al., 2013).

Khanh et al. (2017) evaluated with INVEST criteria and their own Agile Requirement Quality Checklist a user story, a scenario and a persona document with a scenario and user story all with the same information on them. I have summarized the advantages and disadvantages they reported in Table 7. Persona document had the advantages of both scenario and user story so persona document met 84 % of the requirements in agile development, whereas a scenario met 56 % and user-story met 44 % of the requirements.

Designers should decide whether to use scenarios, user stories or something else with personas based on the purpose of personas and textual narratives and the available resources. User stories provide a short presentation of how the user uses or wants to use a product that can be read with a quick glance. Scenarios offer a more detailed story with context but they might sometimes be too long or descriptive to fit into a small space.

Table 7. Comparison of a persona document, scenario and user story according to Khanh et al. (2017).

Type	Advantage	Disadvantage
Scenario	<ul style="list-style-type: none"> • Evokes empathy and helps in focusing on designing for users. • Helps in knowing users by telling their real stories. • Enhances attention and memory somewhat. 	<ul style="list-style-type: none"> • Helps the least in understanding user relationships, such as responsibilities and skills. • Complicated. It can be difficult to identify requirements.
User story	<ul style="list-style-type: none"> • Simple and short. • Helps the most in understanding user relationships, such as responsibilities and skills. 	<ul style="list-style-type: none"> • Least complete data. • Evokes little empathy. • Does not help in knowing users. • Does not enhance attention and memory.
Persona document	<ul style="list-style-type: none"> • Most complete data in still in a simple and short form. • Evokes empathy and helps in focusing on designing for users. • Helps in knowing users by telling their real stories. • Enhances attention and memory the most. • Helps somewhat in understanding user relationships, such as responsibilities and skills. 	

6 DISCUSSION

In this chapter, I will reflect on different aspects of my literature review and thesis. In Chapter 6.1 I will talk about the limitations of my thesis and in Chapter 6.2 I will propose further research topics. I have summarized my findings in Appendix F.

6.1 Limitations of my thesis

The process of locating sources for my literature review cannot be completely replicated. Websites have published newer articles, and websites may have fixed problems in their search functions. Limitations I used in Andor and Google Scholar have influenced the results I received from them. Different search parameters, such as widening the included years, would have revealed more and different relevant sources. It is also possible that if I had read paid material on websites, I would have found more sources and perspectives.

It is always a subjective decision about what to look further into and what sources to include or exclude in a literature review. Also, I focused my topic more while conducting the literature review and excluded some sources in later rounds. I was surprised by how many relevant sources I found from scientific databases since TUNI's HTI courses had mentioned only websites and some books related to my topic. In hindsight, it would have been better if I had conducted the first round by locating sources from scientific databases. Now I ended completely rewriting the structure of my thesis in the second round. I did the third round quite quickly, which means that I have missed many sources that would have brought new aspects and insights into my thesis.

Most sources about automatic personas have been written in the last two years. It is quite likely that more relevant sources about automatic personas have been published after I did my search. Therefore my writings about automatic personas can quickly become at least partly outdated.

I treated Nielsen's (2014) writings about user story and Gibbons' (2017) writing about UX story as they would have written about scenarios when they in fact state that their terms mean deeper and more detailed stories than scenarios. I also modified the terms used by Khanh et al. (2017) so that they would be comparable to more traditional

terms used for persona documents and scenarios. My approach leads to oversimplification and cutting corners and can confuse readers who are more familiar with the original work of those authors. Still, I felt that the scope of my thesis needed to be limited and some details needed to be left out to make my thesis more coherent. I did not want to exclude their thoughts completely because they have presented good ideas.

Personas, scenarios and user stories are topics that have been covered in many sources. Some basic thoughts, such as personas evoking empathy or scenarios and user stories distilling research data, have been stated by many authors. In such cases, I have chosen to combine thoughts from several sources. It is possible that I have combined some sources too readily and have not realized that some sources differ in certain aspects or details.

6.2 Further research

It would be beneficial and interesting to have more scientific research about personas, scenarios and user stories even though there has been some of those already. However, it is difficult to conduct experimental research on this topic since all design projects are unique. They may have completely different target users or products under design and varying amounts of resources for the design process. Still, it would be interesting if some company would be willing to devote two separate teams into designing the same product with different methods. Perhaps this would be more easily achieved in university courses where student groups learn about designing.

One specific detail that would deserve more research in my opinion is grouping users. Resulting personas depend greatly on how users are grouped into different segments so I think that designers need to pay extra attention to it. Previous studies have shown that designers develop different personas from the same data and that different algorithms result in different user groups (Korsgaard et al., 2020). More research on this could provide further insights and publicity for this important detail.

An easier and more effortless way to research the topic could be to study UX and design professionals about methods they use and why, how much time it takes to apply those methods and how those methods have helped them. Rosala and Krause (2019) received 693 survey answers and conducted 2 focus groups and 17 semi-structured interviews with UX professionals from around the world to better understand current careers in UX. It would be interesting to conduct a similar study focusing more on design methods in Finland and compare the results of different countries, companies and fields. It would also be interesting to see research results or literature reviews about other design methods, for example jobs-to-be-done, empathy maps and storyboards. In addition,

it would also be interesting to compare persona descriptions, scenarios and user stories to literary theories and narrative research.

7 CONCLUSION

My research questions concerned about developing and using personas together with scenarios and user stories. Despite the many limitations in my thesis, I evaluate that I have achieved the objectives I set for myself. I have learned many new and surprising things about these methods. Some insights have really widened my understanding of what these methods are and how differently they can be developed and used.

I divided personas into four types based on my literature review: manual, semi-automatic, automatic and expert personas. They all have their own advantages and disadvantages, so designers need to decide which of them suits their purposes best. Personas can be developed with six phases: (1) planning the development project, (2) gathering data, (3) segmenting users, (4) writing persona descriptions, (5) making persona documents and (6) designing with personas. Designers can tell short stories about personas with user stories and longer stories with scenarios.

It was interesting to notice that the first-round sources considered user stories either as a single sentence user stories or as several sentences long extended user stories. On the other hand, the second-round sources considered user stories only as a single sentence user story. This is probably because agile development and its clearly defined method is an easier topic for academic research than extended user stories and divided opinions about them. Also, some first-round sources considered scenarios as task scenarios used in usability testing, but none of the second-round sources did so. This might be due to my different search strategies or perhaps writing task scenarios is also an understudied topic in academic literature.

Another interesting notion was that the second-round sources mentioned automatically created personas and utilizing experts' knowledge a lot more than first-round sources. Second-round sources also talked in more detail about grouping users than first-round sources. This wonders me because I see that segmenting users is a very important step in developing personas since if segments are biased, then resulting personas will also be biased.

Personas, scenarios and user stories have been used for decades to facilitate designing truly user-centered products, but still there is relatively little academic research done about them. There is information about them both in blog texts and academic books and

articles, but they usually cover the topic only from one perspective and have a strict view on how those methods should be used. Pruitt and Adlin's (2006) book "The Persona Lifecycle" offers a comprehensive and easily understandable overview of the development and usage of personas, but I did not find as comprehensive more recent sources about personas. Nielsen (2014) has written in detail about personas and scenarios, but I felt that it is harder to get the big picture of these methods with her text. There are no clear summaries and peculiar details like having physiognomy as part of persona description were puzzling.

Why is the information about personas, scenarios and user stories so scattered and under-researched? There is no definite answer. I believe that there are many misconceptions about personas, because some people have only seen poorly made personas or personas that are not used or updated after their creation. Misconceptions and bad experiences can make people avoid personas. There are also many newer methods, like jobs-to-be-done, that may sound more modern and appealing than the persona method created in the last millennium.

Personas, scenarios and user stories are only methods. The main point in using them is not to pin some pretty documents to an office wall, but to facilitate designing better products. They have instrumental value, but no intrinsic value at least in my opinion. This may cut back the researcher's desire to pick them as a research topic. Whatever methods designers choose to use, they should always remember to design for the users and have an open mind when ideating solutions and designs.

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Appendix D: Concepts and methods related to personas

User profile

A user profile is a detailed representation of a user that focuses on presenting research data instead of provoking empathy. They are accurate and concise summaries of user data and have no stories or other fictional elements. (Pruitt & Adlin, 2006, chapter 1.) User profile typically includes demographic information about the user's job title and responsibilities, roles, expertise with a particular product and relevant skills (Holtzblatt et al., 2005, chapter 5). User profile can look for example like this:

U01 profile:

- *Lives in central Tampere*
- *Age 26*
- *Third year student in TUNI in Bachelor's Degree Programme in Computer Sciences*
- *Works 10 – 15 hours per week.*
- *Uses online grocery store 1 – 2 times per month and physical stores 1 – 2 per week.*
- *Orders also clothes, electronics etc. from online approximately 10 times per year.*
- *Uses a smart phone (Samsung Galaxy S10) several times a day and a laptop computer (Windows 10) several times a week. Uses both of them to order online.*
- *Etc.*

User role

A user role is a simplified abstraction that does not intend to resemble real people. It has three parts: the context in which the role is played, the characteristics of the role's performance and the criteria that the design must meet to support the successful performance of the role. It is a more technical and formally structured model than personas. (Constantine, 2006.) User role can look for example like this:

R01 – Customer in an online store:

- *Context: Uses many different devices for shopping, has varying skills and expertise in using technology and ordering online, necessary for making a profit.*
- *Characteristics: Can happen once a week or once a year. Usually orders for over 20 euros. Trivial process for frequent users.*
- *Criteria: Efficient search for products, extensive variety of products, competitive pricing, fast shipping.*

Market segment

A market segment is a representation of a user group that has common characteristics. They can describe for example demographic, geographic or frequency of use with details, but they do not describe specific goals or needs like personas do. (Pruitt & Adlin, 2006, chapter 1.) Market segments can look for example like these:

- *20 – 40-year-old customers who live in an urban environment and order from an online store at least twice a month.*
- *30 – 60-year-old customers who live in a rural environment and shop in a physical store no more than once a week for at least 50 euros per shopping.*
- *Etc.*

Empathy map

An empathy map presented in Figure 19 offers a quick snapshot of users' goals and context (Hodges-Schell & O'Brien, 2015, chapter 4). It helps in condensing gathered data, discovering insights about users and understanding users' needs. An empathy map typically consists of four quadrants, for example reflecting what the user said, did, thought and felt. (Dam & Teo, 2017.)

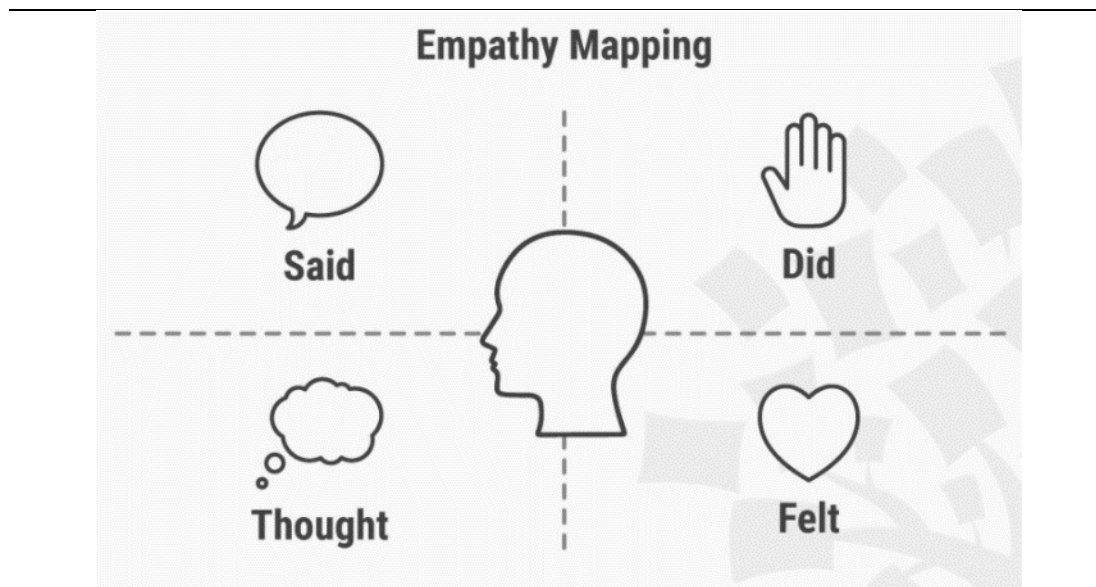


Figure 19. An example of an empathy map (source: Dam & Teo, 2017).

Identity model

An identity model presented in Figure 20 represents a set of identity elements in three groups. "I do..." refers to elements related to doing the target activity. "I am..." refers to how the person approaches the activity and often reflects the general attributes of the

person. The third part is specific to the project. It can be for example "I like..." and refer to how and why the person likes to perform the activity. It can also be for example "In my organization..." and refer to things specific in the person's organization, if that is more relevant to the project. An identity model represents a single user or several similar users in a consolidated way. (Holtzblatt & Beyer, 2016, chapter 7.)

U02 Identity Model

- I like being comfortable & relaxed when I travel
- I double-check available seats on my flight to see if a better seat is available
- I ignore the rules and listen to podcasts during takeoff
- I travel with a tennis ball massager

I LIKE

- I make reasonably priced choices for business travel
- I don't want my boss to think I'm wasting company money
- I'm embarrassed to stay at a \$400/night hotel

I DO

I AM

- I prefer self service
- "I control it and I tailor it" (my travel arrangements)

- I am deserving of travel rewards
- "I travel a lot for work and deserve the benefit for my personal travel"

I am a Veteran Traveler

- I have tips & tricks
- I know how to prep for a trip
- I can bend the rules

I am a VIP traveller --
I'm proud I get early check-in

Figure 20. An example of an identity model (Holtzblatt & Beyer, 2016, chapter 7).

Appendix E: Concepts and methods related to scenarios and user stories

Task scenario

A task scenario is a scenario that is used in usability testing. It describes a task and explanation that give participants a context of why they are doing the task. (McCloskey, 2014.) Task scenario can be for example like this: *"You are going to have a get-together with your friends. Order cucumber, green olives and feta from online store using credentials given previously in the instructions. You want to pick your groceries up at the store at 13.00 on Friday 17.4.2020."*

Future scenario

Future scenarios combine market and environmental factors to illustrate and explore different ways the future might realistically develop without focusing on an individual user. They are typically used in business, but can also be used in other fields. Organizations can develop several future scenarios to map different possibilities for the future. (Wade & Wagner, 2012, chapter 1, chapter 3). A future scenario can be for example like this: *"Ordering groceries online becomes more popular. The amount of registered customers increases at least by 30 %. The amount of orders per month increases at least by 20 %. However, average price of orders stays the same. Some employers will be shifted from serving customers in physical stores to serving customers online and processing orders. The online grocery store has made new contracts with transport organizations to ensure fast and reliable delivery to the customers."*

Client scenario

Client scenarios are written from the perspective of the main stakeholders and describe what stakeholders want to achieve with the product and what they want users to do with it. The protagonist of the story is still a user, but it describes key interactions that stakeholders want the user to do instead of what the user himself or herself might do. They make stakeholders' goals more concrete and visible. (Bolchini, 2010.) Client scenario can be for example like this:

- *User profile: Prospective online grocery store user*
- *Client goal: Increase the number of active users in online grocery store*
- *Client scenario: Odetta visits for the first time the website for online grocery store. She browses through the selection and is impressed by its extend. She can easily find the products she buys most often, but also new interesting and*

reasonably priced products she had not heard before. She is pleased how easy it is to order and how many payment methods and pick-up times are available. Afterwards, she makes positive comments about it in social media and recommends online store to her friends.

Jobs-to-be-done

Jobs-to-be-done are usually sentences that describe why users use the product to achieve some goal, what users have to do and any key contextual information, such as why or where they do it. They do not have a strict format like user stories have. (Laubheimer, 2017.) Jobs-to-be-done describe what the customer can achieve with a particular product. Its scale can vary from describing a single step of performing a task to the whole task. It can help in discovering steps that do not provide value to users and innovating new solutions or gaining an overview of the product. (Stickdorn et al., 2018, chapter 3, chapter 5.) For example, jobs-to-be-done can look like this: *"When I order food online, I want to have many options for payment and delivery."*

Techsona

Techsona describes a fictitious technology in similar manner than persona describes a fictitious user and scenario describes a fictitious situation. Techsona can pinpoint and analyze technological ideas and alternatives for them. They capture and communicate open issues regarding design decisions and the artifact's designed affordances. (Bødker & Klokmoose, 2013.) Techsona can look for example like this: *"Grocery assistant is an application that can check which products are missing or running out in the user's home and order them from a grocery store on behalf of the user. User can tell his or her preferences to the Grocery assistant so that it can recommend new products and recipes for the user. Grocery assistant works on both smartphones and computers."*

Storyboard

A storyboard presented in Figure 21 is a visual technique borrowed from film making that shows visually the sequence of events in a story. It illustrates why, where and how the user performs an activity in interaction with the new product. (Parush, 2015, chapter 18; Hodges-Schell & O'Brien, 2015, chapter 16.) A storyboard is a graphical scenario. It presents sequences of images that show the relationship between user actions or inputs and system outputs. (Stephanidis, 2014.)

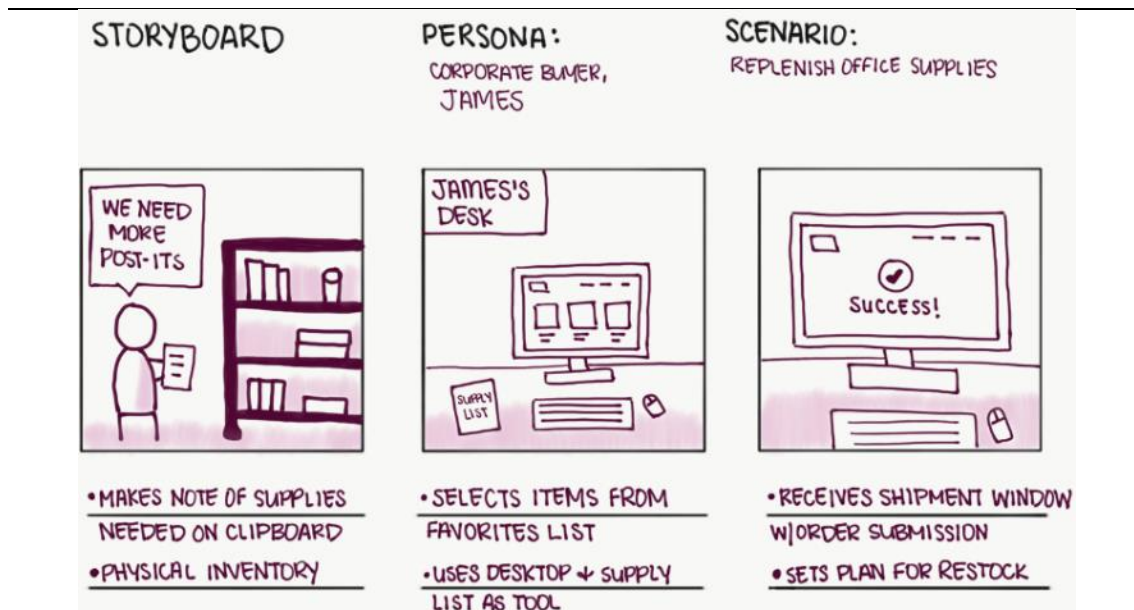


Figure 21. An example of a storyboard (source: Krause, 2018).

Sequence model

A sequence model presented in Figure 22 is used often in the contextual design to represent the chronological steps that the user performs to complete a task. It also shows what triggered the task and which steps were the pain points. It can be based on a single user or in a consolidated way several, similar users. (Holtzblatt et al., 2005, chapter 6 – 7.) A sequence model can guide in detailed design, but they do not offer an overall picture that promotes innovative thinking (Holtzblatt & Beyer, 2016, chapter 8).

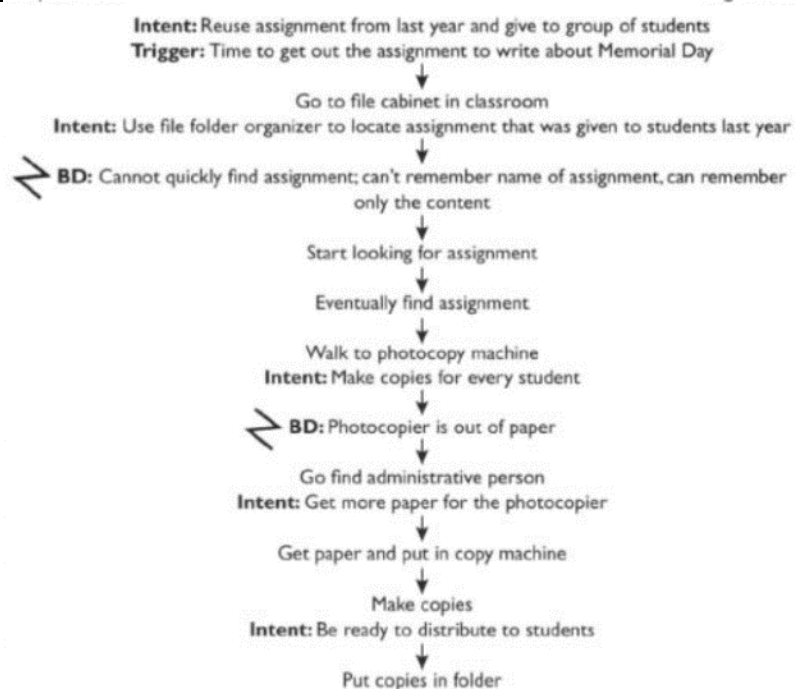


Figure 22. An example of a sequence model (source: Holtzblatt et al., 2005, chapter 6).

Use case

A use case presented in Figure 23 represents the varying actions performed by a system in interaction with external actors such as users or other systems. They capture systems-oriented requirements and can guide the software engineering process, but they are not as helpful in designing a user interface. (Constantine, 2006.) A use case is a barren description of the user's actions and product's reactions represented in Unified Modeling Language (UML). It does not include the user's characteristics or needs. (Ross, 2013; Holtzblatt et al., 2005, 231; IDF, 2020a.)

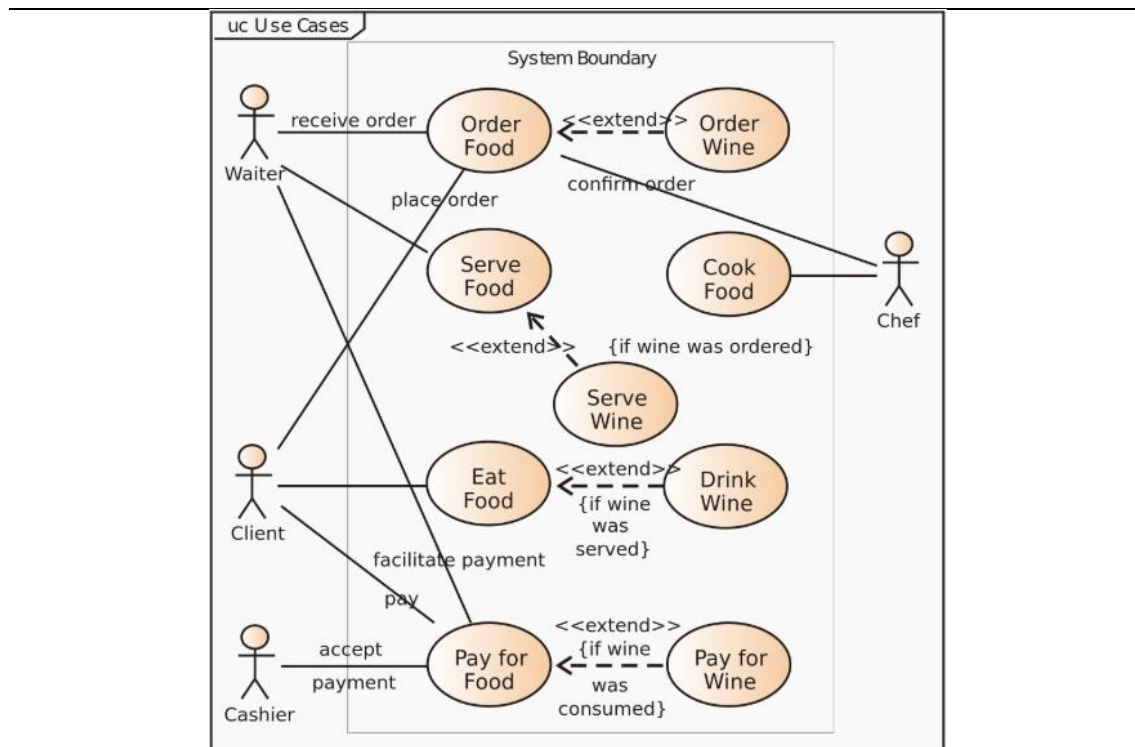


Figure 23. An example of a use case (source: IDF, 2020a).

User journey map

A user journey map presented in Figure 24 is a drawing used for discovering and understanding the big picture of the design (Gibbons, 2018). It visualizes the overall experience that the user has with the product over time. It presents in a matrix the main phases in the interaction between the user and the product or service within a task. It identifies the user's pain points and needs in different channels and shows which parts of the interaction should be improved. User journey maps reveal all the key steps of the experience, not just the steps where the user is in direct interaction with the product. It shows a typical or particularly interesting example of using a product instead of conditionally

branching different variants. (Stickdorn et al., 2018, chapter 3; Parush, 2015, chapter 13.)

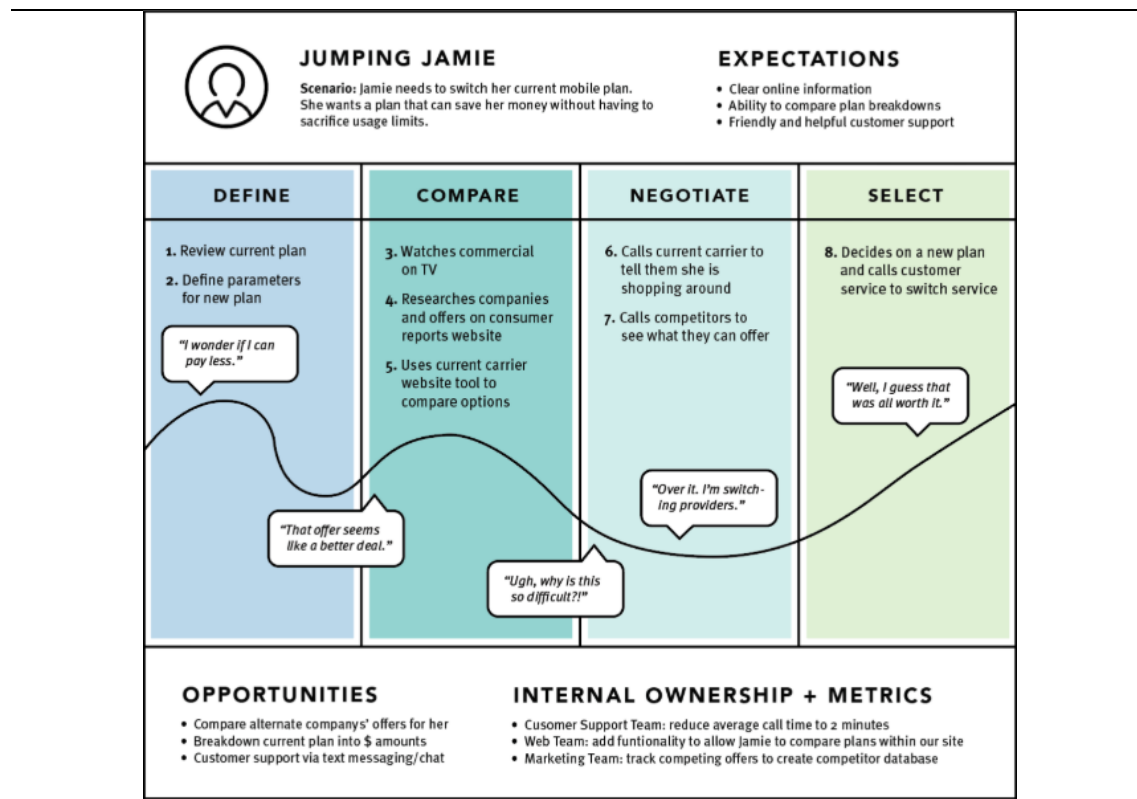


Figure 24. An example of a user journey map (source: Gibbons, 2018).

Appendix F: Summarized findings

Persona is a fictitious and specific representation of a certain user group. Personas give empathy evoking faces to users and are more personal and memorable than market segments. They help in designing for real users and focusing discussion. They also facilitate sharing information and validating decisions and prototypes.

Different types of personas:

- *Manual personas*: Personas are created manually and are based on mostly qualitative user research. Persona descriptions typically have deeper psychological traits but conducting user research and manually segmenting users is subjective and time-consuming.
- *Semi-automatic personas*: Personas are created semi-automatically and are based on mostly user research. Users are clustered with algorithms, but other persona development activities are done manually. Allows designers to see hidden patterns in a larger amount of data and fasten the creation of personas but requires expertise about statistical methods.
- *Automatic personas*: Personas are created completely automatically and are based on mostly quantitative user data. Allow designers to create and update personas very fast from a vast amount of data, but persona descriptions often lack deeper psychological traits.
- *Expert personas*: Personas are based on mostly data gathered from stakeholders, experts and literature. Allow creating personas when conducting user research is too difficult or time-consuming, but poorly made expert personas only represent participants' assumptions.

The six phases in the development of personas:

- 1) *Planning the development process*: Planning the purpose, focus, scope and schedule for the project and its personas.
- 2) *Gathering data*: Conducting user research or gathering data from experts and literature.
- 3) *Segmenting users*: Identifying user groups in the data manually or with algorithms.
- 4) *Writing persona descriptions*: Writing background information, scenarios and user stories for the personas and finding appropriate pictures for them.
- 5) *Making persona documents*: Making persona documents that are suitable for the personas and the project.

- 6) *Designing with personas*: Introducing personas to the organization, using them in design activities, updating personas based on feedback and new information, assessing personas' successfulness and finally either retiring personas or reusing them in other projects after modification.

Textual narratives used with personas:

- *Scenarios*: Several sentences long stories about users using a product to achieve a certain goal. Can describe a daily life or a specific situation that has problems or is successful. Describes user's actions with more detail and in context, but it takes more time to identify user requirements from a longer text.
- *User stories*: Single sentence stories about users using a product to achieve a certain goal. Usually written in the format "*As a <type of user/persona's name>, I want to <goal> so that <benefit.>*" Describes user requirements shortly in an easily understandable format, but does not tell about the context of the use.