Identifying Possible Requirements using Personas
A Qualitative Study

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Abstract: Involving end users in requirements elicitation helps to generate applications with a positive usage experience. However, in the current context of software development, having users involved in the requirements elicitation is difficult due to factors such as: lack of paying customers; users' unavailability for validations; and budget and time restrictions for applying traditional techniques, such as interviews and questionnaires. Therefore, using alternative techniques to understand and gather users' needs is indicated. Persona is a technique that was created to help understanding users, their characteristics and what they expect from an application. The technique allows describing users' profile and understanding their characteristics, attitudes and behaviors. However, the description of a persona may have many irrelevant information not generating requirements for the development of the application. Therefore, we proposed the PATHY technique to support the creation of personas and to generate more focused descriptions regarding specific requirements identification for a particular application. This paper presents a study using the PATHY technique (version 2.0). This empirical study aims to evaluate the quality of the possible software requirements the technique helps identifying, while gathering the participants' feedback on using the PATHY technique. The results show that PATHY supports creating personas' descriptions that lead to the identification of requirements to help in application design according to target users' characteristics and preferences.

SCIENCE AND TECHNOLOGY PUBLICATIONS

1 INTRODUCTION

The software development industry has become extremely competitive, since there are many products from the same domain that strive to satisfy users (Bhowmik et al., 2014). To stand out from competitors, it is important to understand the applications' target audience to meet their needs and provide a good usage experience. However, an obstacle frequently encountered by teams when developing an application is the absence of paying customers or users directly involved in the design of the application (Anvari and Tran, 2014). Therefore, the access to users is limited (Thalen and Voort, 2014), which can generate issues when collecting requirements using traditional techniques such as interviews and questionnaires (Marsden and Haag, 2016). Furthermore, budget and time for the application development may be limited for using elicitation techniques with end users (Viana and Robert, 2016). These facts can make it hard to define users' specific characteristics and needs about the requirements for the application design.

Considering the context described above, it is necessary to employ others techniques to help software engineers understand the users' needs and characteristics, while generating possible application requirements even when users are unavailable for usual validations during the development. The Personas technique is a way to support the immersion in the users' characteristics during the requirements engineering process (Schneidewind *et al.*, 2012). This technique provides the development team with an understanding of the users' characteristics, needs and goals to allow software engineers to design and implement applications to meet the users' needs (Väänänen-Vainio-Mattila *et al.*, 2008).

Although the Personas technique provides support in understanding target users, it has some aspects to be improved. For instance, the description of the personas is more focused on the users' attitudes (beliefs, personality, motivations, and

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personal desires) (Guo *et al.*, 2011) in order to help the development team create empathy. On the other hand, the behaviors of the persona that support the application design (searched information, accessed tools, perfomed tasks) are superficially described (Guo *et al.*, 2011). Therefore, the Persona technique helps software engineers to become familiar with the persona as a person. However, it does not detail what should be designed to meet the needs of this persona. Adsitionally, a lot of the information generated in the description of the personas can be irrelevant (not useful for identifying possible requirements) for designing an application, causing lack of focus on the application domain.

Empathy Map (EM) is a method that can be employed to create personas (Osterwalder and Pigneur, 2013). It helps designing business models according to customers' perspective (Osterwalder and Pigneur, 2013). However, the EM is not focused on software development.

We proposed the PATHY technique (Personas empATHY) to support the software engineer in understanding users' needs, even when there are not available users, and to identify possible application requirements. PATHY is based in EM, because it integrates guide questions to describe users' profile through personas. However, as opposed to EM, PATHY has guide questions to reflect about user in software context. Therefore, PATHY aims to drive the creation of personas whose descriptions are more focused on the application domain. In addition, PATHY aims to support finding possible requirements for the application without losing focus on the user.

We performed an empirical study to evaluate the quality of possible requirements generated by the personas' description and to collect the participants' feedback about using PATHY. During the study, we used the technique to create personas. We evaluated the created personas and the participants' feedback. The analysis of the personas showed that the technique helps identifying possible requirements for the application, such as functionalities and user interface details. Also, the participants' feedback suggests some features regarding the usefulness, difficulties and possible improvements in the technique.

This paper is organized as follows. Section 2 presents some concepts about Personas and Empathy Map. Section 3 presents the PATHY technique. Section 4 describes the study, followed by the results in Section 5. Finally, Section 6 discusses our conclusions and future works.

2 BACKGROUND

2.1 Persona

A Persona is a hypothetical archetype of a real user (Grudin and Pruitt, 2002), which describes a user's goals, skills, and interests (Cooper, 1999). The Personas technique mainly consists of the collection of users' data, so software engineers can understand users' characteristics and, based on this, they can define specific descriptions of these users and focus on these personas during the software development process (Castro *et al.*, 2011). In order to describe Personas, some of their characteristics should be detailed, such as the name, image, occupation, family, age, sex, ethnicity, education, socioeconomic status, life story, goals, and tasks (Pruitt and Adlin, 2010). Figure 1 presents a persona description example. We created this persona for an application to monitor epileptic people.

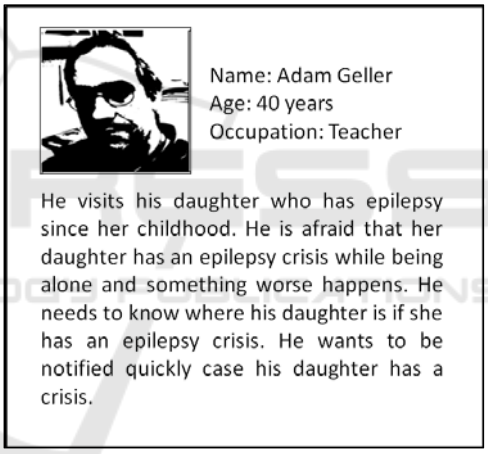

Figure 1: An example of the description of a persona.

Some examples of possible requirements extracted from Figure 1 with a described persona are presented below. From the information: "He needs to know where his daughter is if she has an epilepsy crisis" one possible requirement is that the application must have a functionality to locate the epileptic person. From "He wants to be notified quickly in case his daughter has a crisis", a possible requirement is: the application must recognize when the person has on an epilepsy crisis and send a notification for her family or friends.

Some benefits of using personas are: to engage teams on thinking about users and their needs during the whole design process; to help teams on decision making about efficient design, with no inadequate generalization; and communicating knowledge about

users to all stakeholders (Mashapa et al., 2013).

Some techniques to describe personas have been proposed to involve users in the software development process and generate possible requirements for an application. Acuña *et al.* (2012) proposed Personas for SE, based on Cooper's version. New steps to adapt personas to the software development process had been included in this technique. Use cases are built in one of the stages, based on both the generated personas and the obtained knowledge about users by the process of creating the personas. Idoughi *et al.* (2012) proposed a technique where elements of the persona description help designing the application`s interface while the identifyed functionalities are extracted. Aoyama (2007) proposed the Hanako method to integrate scenarios and personas. The method is goal-driven and helps extracting requirements from a users' group. Table 1 presents the described characteristics using the presented personas techniques.

Table 1: Characteristics of some Personas techniques.

Characteristics	Acunã *et al.* (2012)	Idoughi *et al.* (2012)	Aoyama (2007)
Persona Identification	X	X	X
Usage Context/ Environment	X		
Psychological Details	X	X	X
Used Applications / Services	X		X
Needs/ Expectations	X	X	
Skills/ Previous Experiences	X	X	X
Goals	X	X	
Segments	X		
Special Needs/ Accessibility	X	X	
Relations/Interactions with other people	X	X	
Problems			
Existing Solutions			

In Table 1, we can see the characteristics that these techniques consider to create personas. Most of the presented characteristics are related to characteristics of personas' attitudes (Identification, Psychological details, needs/expectations, special needs/accessibility, relation/interation with other persons, usage context, and enviroment), i.e., they describe personal life and psychological details. These characteristics are important to empathize in the users but they do not identify possible requirements of the application. Furthermore, the techniques presented some characteristics (goals, experiences/skills, used applications/ services) that can help to indentify possible requirements. However, they are generically described. Therefore, they can present information that is not part of the application domain and does not generate possible requirements.

It is important that both attitudes and behaviours' characteristics are described in the personas to empathize and identify possible requirements that are useful for the development of the application (Guo et al., 2011). Therefore, we identify some limitations in the techniques listed in Table 1: (i) they focus more on empathy than on the identification of possible requirements; (ii) the characteristics that help to identify behaviors do not focus specifically in the application domain because these characteristics are generically described. Consequently, it is necessary to propose specific techniques to guide the description of personas focusing in identify possible requirements related to the domain of the application that will be developed. Motivated by this need, we proposed the PATHY technique. PATHY aims to support the identification of possible requirements for an application. The PATHY technique is based on the Empathy Map that is described in the next Subsection.

2.2 Empathy Map

Empathy Map (EM) (Gray et al., 2010) is a method to support business models design according to customers' perspectives. It goes beyond demographic characteristics gathered from users' interviews and questionnaires, and provides a better understanding of customer's environment, behaviour, aspirations and concerns (Osterwalder and Pigneur, 2013). Although it is a business plan method, the Empathy Map can be adapted to other goals, such as the creation of personas.

The goal of the EM is to create an empathy level for a specific person (Gray et al., 2010). The EM template is presented in Figure 2. Empathy Map is composed by 6 fields (Bratsberg, 2012): (a) See – what user sees in his/her environment; (b) Say and Do – what user says and how he/she behaves in public; (c) Think and Feel – what goes through the user's mind; (d) Hear – how the environment influences the user; (e) Pain –frustrations, pitfalls and risks experienced by the user, and (f) Gain –

what the user really wants and what can be done to achieve his/her goals.

EM helps to design for the users' needs, making the persona creator immersed in the users' experience, which would be difficult to achieve if (s) he were to read a report. The filling of the EM is done in a collaborative way. After understanding the user, stakeholders can know how small design changes can have major impact on users (Bratsberg, 2012).

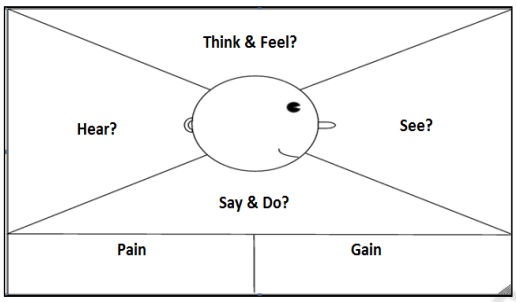

Figure 2: Empathy Map Template (Osterwalder e Pigneur, 2013).

3 PATHY TECHNIQUE

PATHY is a technique for creating personas and supporting the identification of possible requirements for an application about to be designed. It keeps focus on the users without leaving the application domain. To achieve this goal, the technique provides guide questions to drive the software engineer on empathizing with users and then reflecting on their behaviors and attitudes. Therefore, the technique helps identifying new possible requirements or improves existent requirements, according to the users' needs.

The technique is based on the Empathy Map. However, Empathy Map is not focused on software development, being used for business model design, bringing many features that are not useful to generate possible requirements for the design of an application. Therefore, PATHY aims to adapt Empathy Map for using it in the context of the design of an application. As a result, the elaborated personas using PATHY can generate more relevant information to find possible requirements.

The technique's first version (Ferreira *et al.*, 2015) had guiding questions providing irrelevant information to identify possible requirements for an application. We performed an analysis of the generated personas with PATHY 1.0, presented in (Ferreira *et al.*, 2015). From this analisys, we evolved the technique and generated PATHY 2.0. Figure 3 presents the template from the PATHY 2.0.

The template of the PATHY is composed by the

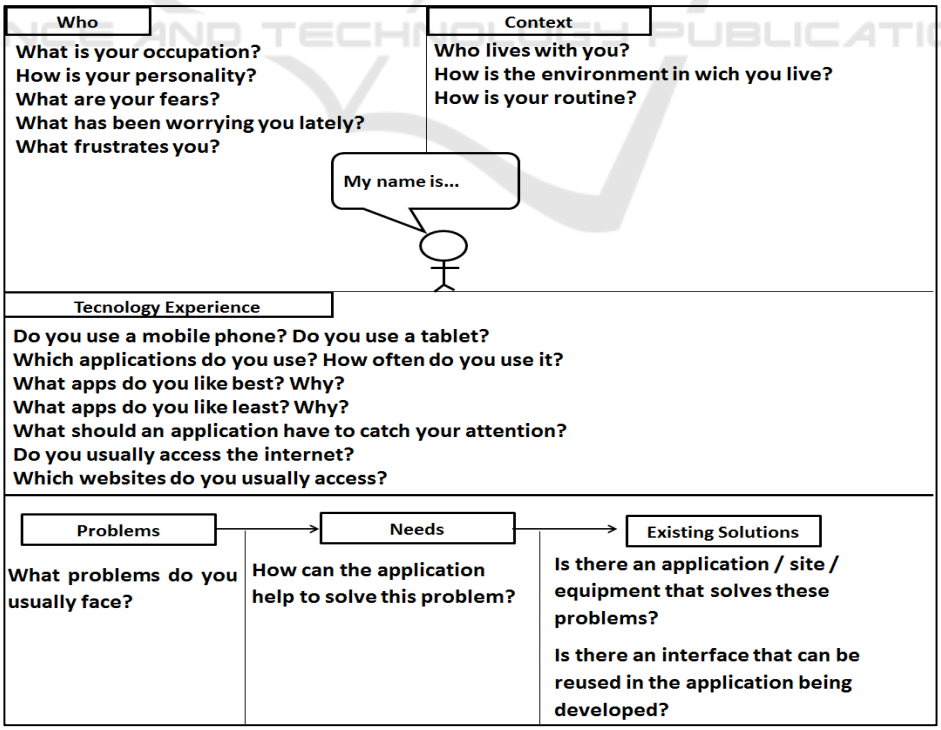

Figure 3: Template of the PATHY 2.0.

following fields: (1) Who; (2) Context; (3) Technology Experience; (4) Problems; (5) Needs, and (6) Existing Solutions. Furthermore, the template also presents guiding questions to compose each field. PATHY 2.0 fields are described as follows.

- **Who:** Description of who is the persona who will use the application. This field brings guiding questions related to the persona's characteristics itself, for example: personality, frustrations and concerns.
- **Context:** Characteristics of the persona's routine. Additionally, aspects about the environment the persona lives in and people it has contact with are described in this field.
- **Technology Experiences:** Experiences that the persona had with others technologies or applications. Furthermore, applications' characteristics that the persona likes and does not like can be described.
- **Problems:** Problems faced by the persona which can be solved by the application about to be designed are described in this field. This field's goal is to increase the understanding about the users' issues.
- **Needs:** It describes what is necessary to be done in order to solve the problems described in the previous field (Problems).
- **Existing Solutions:** It describes existing solutions related to the ideas and interfaces to be improved or included in the application about to be designed for solving the identified problems.

The PATHY technique proposed in this paper addresses users' (persona) problems description which other techniques (as shown in Table 1) do not address. The identification of problems helps to analyze which aspects the application must solve. PATHY also has the existing solution field to help comparing with other applications of the same domain, bringing possible requirements for the application to be designed. The presented techniques do not include fields with characteristics about similar applications.

4 EMPIRICAL STUDY

We performed an empirical study to evaluate the quality of possible requirements generated in the personas and to collect the participants' feedback on using PATHY version 2.0. The steps for this study were: Scenarios Elaboration, Training on the PATHY technique, Creation of personas and Filling the Feedback Questionnaire. These steps are presented in Figure 4 and are described as follows.

We perform this study with eight Information Systems graduate students. The students were attending a class on Software Process in the Federal University of the State of Rio de Janeiro. They also signed a confidentiality term to maintain the anonymity of their data. By signing this term, they agreed to provide collected data for analysis and publication.

As a previous assignment, the participants had defined a software development process for a fictional company. As part of this process, they elaborated scenarios describing an application that would be developed. The scenarios were also used in this study to create the personas. Prior to the personas creation, the participants had already identified some requirements for the application. They were about to develop the application and had already started the requirements elicitation process.

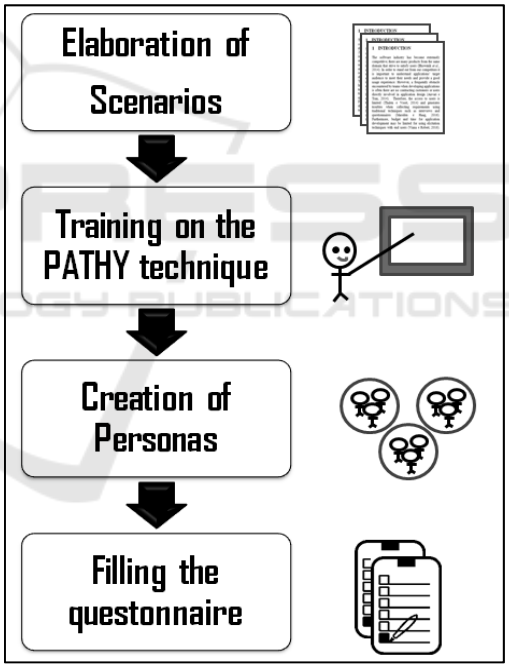

Figure 4: Steps to perform study.

Table 2 presents the description of the scenarios. They development the three scenarios in groups: two students created Scenario A (SA); two other students created Scenario B (SB) and four students created Scenario C (SC). At all, six personas were created, as shown in Table 2.

Table 2: Description of application scenarios selected by the participants and related personas.

Scenario	Scenarios Description	Created Personas
SA	Educational Quiz to take advantage of the phenomenon on increasingly young people online and to present a new way of doing class exercises in the classroom to attract this audience. Furthermore, teachers can monitor students' performance and assess if and in which topics they are having more difficulty.	P1, P2
SB	Application to generate managerial reports from text files. The report should have sales entry data, employees, commissions and others. The application will be able to better manage and control sales and precisely emit proper commission for each seller.	P3
SC	Application for the automation of purchase's processes through Quick Response (QR) code. The app must be able to register products, as well as generate, print and send purchases' receipts by e-mail.	P4, P5, P6

Before the creation of tge personas, all participants had a 40 minutes training with a PATHY use example. After the training, the participants had created personas using the PATHY 2.0 technique. After creating the personas, the participants had answered a questionnaire containing open questions about the usage of the technique. Table presents these questions. After the participants had created the personas, we analyzed their descriptions to verify all the generated possible requirements.

Figure 5 presents an example of a persona (persona P1 for SA) following the PATHY 2.0 template.

Table 3: Feedback questionnaire.

ID	Question
Q1	Did you have difficulties when using the PATHY technique? Which difficulties did you have?
Q2	Did you have difficulties while extracting possible requirements for the personas? Which difficulties did you have?
Q3	Which positive aspects do you identify on the used technique?
Q4	Which negative aspects do you identify in the used technique?
Q5	Would you use the technique again? (Please, comment)
Q6	Considering the mapped requirements for the application to be developed (in the prior tasks of the class work), would you adjust any already mapped requirements? Why? Which adjustments would you make?

The extracted information of the created personas presents behavioral aspects, i.e, characteristics that directly contribute to development the application to be designed.

The identified characteristics as parts of the personas' descriptions can generate possible requirements for an application. These parts, extracted from the descriptions, represent situations or personas' characteristics to help thinking about possible requirements for an application.

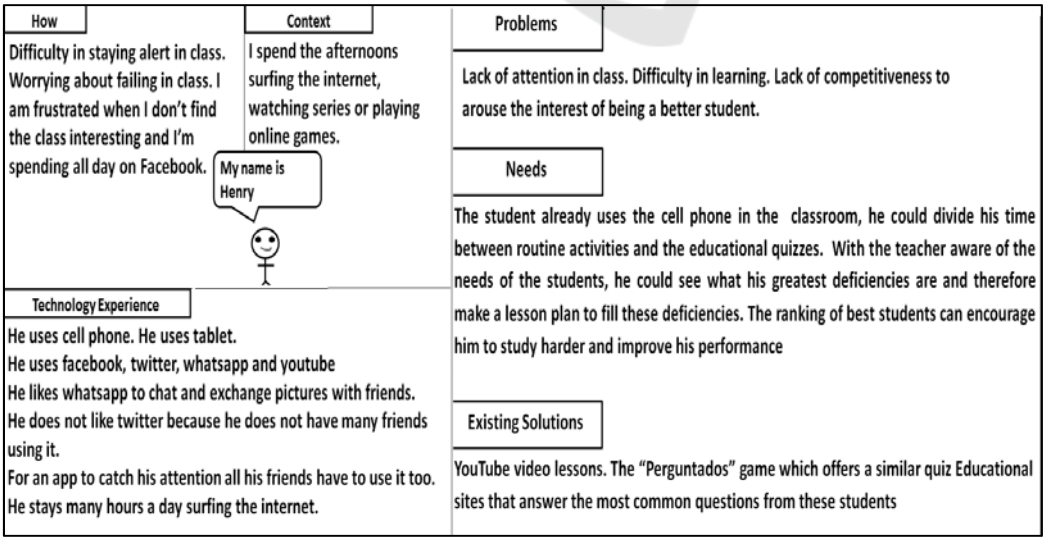

Figure 5: Example of Persona (P1) for Scenario A (SA) created using PATHY 2.0 template.

We performed the analisys as follows: we extracted some parts of the personas' descriptions and then we identified possible requirements of the application. In Table 2, we present the analysis of the elaborated personas for the listed applications.

5 RESULTS

5.1 Personas Analysis

Besides identifying possible requirements, two researchers classified them using the following categories (Buisine *et al.*, 2016): (1) Users' Needs: users' expressed ideas with no reference to any application or how to fulfill these needs, for example: "He is afraid of failing"; (2) Product Functions: users' desires about product features but with no reference to concrete solutions, for example: "For an app to catch my attention all my friends have to use it too"; (3) Technical Solutions: direct reference to technologies or components, for example: "The mobile app for managing contacts could be used to manage customers". In addition to those three categories, we included a new one: (4) Experience: Characteristics to allow identifying if the user has experience about other applications / technologies. In this category, there are no direct references about applications/technologies, for example: "he uses cell phones". We calculated the Cohen's Kappa to measure the degree of agreement between the two researchers (Fleiss, 1981). Kappa is a measure of interobserver agreement and measures the degree of agreement beyond what would be expected by chance alone (Landis and Koch, 1977). We obtained 0,614 as a result for Kappa. According to the interpretation of Kappa suggested by Landis and Koch (1977), the obtained result indicates the level of significative agreement among the researchers. Figure 6 shows the amount of possible requirements types generated from each persona. The information presented in Figure 6 is described as follows.

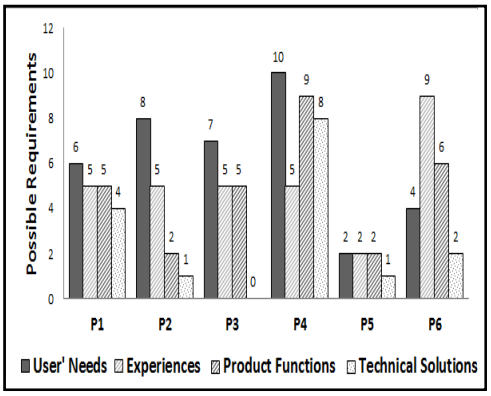

Figure 6: Amount of possible requirements for each application.

The participants created personas P1 and P2 for SA (Educational Quiz application). Persona P1 generated 20 possible application requirements. From these 20 possible requirements, six described users' needs, five described experiences, five described product functions and four described Technical Solutions. Table 4 presents some examples of possible requirements for P1.

Table 4: Examples of Possible Requirements generated in P1.

Persona's Extract	Possible Requirement
"For an app to catch my attention all my friends have to use it too." – Technology Experience field	The quiz can have a social interaction feature.
"Lack of competitiveness so it arouses the interest of being a better student" – Problems field	The quiz may have aspects to encourage competition between students: a scoring rank, for example.
"The 'Perguntados' game which offers a similar quiz" - Existing Solutions field.	One can use features of an existing game ('Perguntados') in the application to be designed.
"In the afternoon he is on the internet, watching series or playing online games." – Context Field	The application user is experienced with using applications.

From P2, we identified 16 possible requirements, where eight described users' needs, five described experiences, two described product functions and one described a Technical Solution. Table 5 presents some examples of these possible requirements.

Table 5: Examples of Possible Requirements generated in P2.

Persona's Extract	Possible Requirement
"Classes are boring; I need to write a lot" – How field.	The application should turn classes more attractive to students.
"He likes music apps, Facebook, snapchat, games, twitter and secret" – Technology Experience field	Apps familiar to the users. These applications' features can be checked to be used (or customized) for the app domain.
"I can use documents or files shared using a device, such as a social network, but allowing to get the material and do exercises on it" – Existing Solutions field	Material (Documents or files) sharing, through social networking. Answer exercises inside the application.
"I keep losing my homework" – *Problems field*	The application can provide functionality for class notes.

For SB (scenario of the application for generating management reports from text files), the participants created one persona - P3. From this persona, they generated 17 possible requirements, where seven described users' needs, five described experiences, five described product functions and five described Technical Solutions. Table 6 presents some examples of the generated possible requirements.

Table 6: Examples of Possible Requirements generated in P3.

Persona's Extract	Possible Requirement
"I am a fair man and I do not tolerate injustice, for this reason I want the software to generate the correct commission for my sale employees." – Who field.	The application must calculate sellers' commissions in management reports.
"I like apps to control my finances because I can have a monthly view of my income and expenses." – *Technology Experience field.*	User has experience with finance applications and has knowledge about accounting terms (expenses and revenues). So the application may be based on technical language (with accounting terms).
"The sales accumulate many files to monthly manually check these sales" – Problems field	The application must include a feature to automatically check sales. Monthly summaries about sales should be generated.
"The application should generate reports that make it easier for managers to make sale predictions." – *Needs field*	The application should generate sales reports.

For SC (Scenario of an application for Purchasing process automation), the participants elaborated three personas: P4, P5 and P6. The amount of possible requirements generated for P4 was 32. From those 32 possible requirements, ten described users' needs, five described experiences, nine described product functions and eight described Technical Solutions. Table 7 presents some possible requirements generated for this application.

Table 7: Examples of Possible Requirements generated in P4.

Persona's Extract	Possible Requirement
"Keeping customers' information when making sales through resellers is hard" – Who field	Automate customers' data manipulation
"Routine: Contacting resellers about product stock, serving customers, analyzing stock at the end of the day" – Context field.	Automate sales inventory management, providing customer service; sending reminders about stock level.
"The app communicates with a local database, where it has an inventory copy to control the products sale. The local database is then uploaded to the server" – Existing Solutions field	This persona's extract presents a way to automate stock and sales management.
"Discounts applied automatically." – *Needs field*	Discounts application should be automatic

From persona P5, we identified seven possible requirements; two described users' needs, two described experiences, two described product functions and one described Technical Solutions. Table 8 lists some identified possible requirements.

Table 8: Examples of Possible Requirements generated in P5.

Persona's Extract	Possible Requirement
"I worry about being able to control my sales without having this affecting my work" – Who field.	The application should offer sales management.
"He usually accesses news and video sites" – Technology Experience field	User is familiar with news sites. These sites' features can be leveraged in the application design.
"Supermarket cashiers and desktop applications: the product listing and the automatic sum of the total sale price when inserting a product could be reused elements" – Existing Solutions field	The application must have a product list and update total sale sum when inserting products in the list.
"Controlling cosmetics sales" – *Problems Field*	The application should control the cosmetics sales

From persona P6, we identified 21 possible requirements. From those, four described users'

needs, nine described experiences, six described product functions and two described Technical Solutions. Some of these possible requirements are described in Table 9.

Table 9: Examples of Possible Requirements generated in P6.

Persona's Extract	Possible Requirement
"My professional routine consists in contacting my clients to offer products and if they are interested, I go to their places to sell the products" –Context field	Maintain customers' contacts and addresses. Provide a chat for quick communication.
"Being able to control what you sell, how much you sell, whom you sell to, and how much you sell" – Problems field	The application should manage sales: show product buyer, identify product and respective price.
"The application should allow me to create purchase orders linked to my customers" – Needs field.	Purchase orders must be linked to customers who ordered them.
"I get frustrated when I realize that I lost money due to a lack of control of my sales." – Who field	The application should provide a sales control so that loss of money is avoided minimized.

When analyzing the generated personas, we observed which possible requirements types were described in the personas. The most described type of possible requirement in personas was users' needs (37 possible requirements in total), i.e., most personas provide ideas about what the user needs, but they do not present many references to solutions. The second type of most described possible requirement was Experiences (31 possible requirements), allowing to identify if the user is a newcomer or experienced. The third most described possible requirement was about Product Functions (29 possible requirements), i.e., personas provide information about which features are desired in the product, but no concrete solutions are presented. Finally, the least identified possible requirement was about Technical Solution (16 possible requirements), i.e., these descriptions are not focused on identifying the solution to be used but they present some references that lead to solutions. In the following paragraphs, we summarize which types of possible requirements are generated from each PATHY field. Therefore, we can have a goal overview of the technique fields.

"How" and "Context": Participants described preliminary information about the problem to be solved in these fields. They started to empathize with the users. They described concerns and frustrations able to motivate the development of the application. For example, in SA – P1, in the 'Who' field, the "*Hard paying attention to class*" part can be a motivation for creating the educational Quiz to help attracting students' attention. While in SC – P4, in the 'Who' field, the *"I get frustrated when realize I lost money due to a lack of sales control"* extract can motivate improving sales control with the application to be developed.

"Technology Experience": Experiences lived by the persona (user) and the user interface types that the persona uses, were described in this field, making it possible to have an idea about how the interface design should be done for this persona. Nevertheless, we also found out information about mentioned application features that were not detailed. For example: in SC – P4, one can read that *"he does not like apps with messy navigation…"*. In such extract it is not clear what does it mean to have "*a messy navigation.*" Therefore, some adjustments to guide the questions are still needed, to provide information that is more detailed, and help the application design.

"Problems" and "Needs": Problems that lead to identifying possible functional requirements for the application were described in these fields. For example: in SA – P1, one can read that "*Lack of competitiveness to arouse the interest of being a better student*", which gives an idea that the quiz should generate competitiveness. In some cases, features were also described. For example: *"Automatically sent and generated receipts."*

"Existing Solutions": Similar applications to be used as basis for the application being designed are described in this field. For example: in SA – P1, one can read that "*the 'Perguntados' Game offers a similar quiz."* Examples about how to solve mentioned problems were also presented. For example: in SC – P4, one can read that the "*App communicates with the local database, which has a stock copy to control products sale. This is then updated to the server."* The techniques presented in Table do not have this information in their description. Therefore, using those techniques, it is not possible to compare the application that is being designed with other existing applications.

5.2 Qualitative Analysis

To evaluate the participants' perception about PATHY, we performed a qualitative analysis of the answers provided in the questionnaires. Qualitative methods provide a better understanding of issues

that require more specific and detailed analysis; allowing human behavior and thinking to be considered when understanding the object of study (Seaman, 2008). The qualitative analysis performed in this work is based on Grounded Theory (GT) procedures; mainly coding, i.e., the process of assigning meaning to data (Strauss e Corbin, 1998).

While analyzing the questionaries data, we created codes associated to text fragments (open coding). Another researcher reviewed the codes related to the citations of each transcript of the questionnaire. This researcher verified the codes and categories to audit the coding process in order to mitigate an eventual bias caused by having a single researcher in the coding process.

After the open coding, we started the axial coding phase by creating relationship codes. We identified three main categories: (a) difficulties; (b) lack of users in the creation of personas and (c) usefulness. The categories are described as follows.

The difficulties found during PATHY usage were the following:

Some participants considered that the technique generates doubts regarding if they should describe the personas' feelings or the characteristics for an application:

"(...) sometimes I kept thinking during the questions about the characteristics of the personas if I should report the feeling regarding the application or my personal feeling."– P4

Another encountered difficulty was regarding the reporting of what the persona disliked (see quotation from participant 1 - P1) and that the lack of knowledge about similar applications turns it harder to fill (see quotation from participant 3 - P3):

"I only had difficulty in the items which discuss what the persona does not like because I had to hypothetically remember." – P1

"Lack of knowledge about similar applications and about more popular ones turn filling the tables even harder." – P3

These difficulties are regarding the guiding questions that support the creator of the persona in describing the characteristics of other applications. On the other hand, some participants mentioned that thinking about similar applications helps them identify requirements:

"(...) the vision of similar solutions helps to see how requirements can be improved, which simplifies the usage of the technique." – P2

"In this technique we developed information regarding the application and we addressed positive and negative points of similar applications, making it possible to compare them." – P3

"Searching for similar solutions help us to find issues in other applications and how to make our application become unique." – P2

Another identified category was the user absence in the process of creating personas. The participants mentioned that if the elicitation was performed with real users, it would generate information that is more precise.

"I think that if the elicitation *was directly conducted with end users, it would generate more precise data about what they want from our product."* – P1

"Imagining a persona and creating his/her preferences may not reflect most users' reality. It would be more interesting to have a direct elicitation *with users."* – P3

Regarding not having the user during the creation of personas, the participants mentioned:

"The most striking negative aspect is to make sure that the created persona will intentionally use the application" – P2

"Even if the information is creatively inserted, it may not be compatible and may be against real information." – P3

One participant was not sure if PATHY could help with user/customer interaction:

"A negative aspect (...) is to be sure (...) whether the customer interaction would be facilitated because of having the imagined user (persona)." – P2

Despite the participants discussing the lack of users during the creation of personas, they mentioned some features that turn PATHY useful. The identified aspects regarding the usefulness of PATHY are described as follows:

PATHY can help to identify aspects in order to improve the user experience with the application:

"The view of similar solutions helped verifying how requirements could be (…). For example: using simple colors, such as blue and white, reflect the Facebook interface (…), then a user can feel more comfortable using the application, as it is similar to something popular." – P2

"(...) It is easy to identify requirements (…), since besides identifying others aspects about the users' behavior (technological expertise level, references of other applications they like or unlike, others). – P4

The PATHY technique helps the developer to empathize with the users: *"(…) it allows an immersion in the user's thoughts and in his life.* – P2

The participants also mention that PATHY was useful to help understanding the problem to be solved:

"When trying to deal with the problem from a user's perspective, you can better see how your product solves a problem and have an idea about the environment in which your product will be embedded (for example, this allows me to think about integrations with other applications). This is very positive." – P5

They also considered PATHY useful to elicit requirements:

"The requirements of the application were easily identified as the personas' needs were arrising" – P2

Some participants mentioned requirements they identified using PATHY:

"(...) add chat feature for users"– P6

"The social interaction is an important aspect to be considered because it can define the interest of end users (students) in our application." – P1

"(...) the technique helped me think about possible integrations with other applications" – P6

6 CONCLUSIONS

This paper presents a study to verify how PATHY 2.0 describes personas and to collect the participants' feedback about the technique. PATHY uses guiding questions to help describing personas to focus in finding characteristics for the application. From this study results, we identified that the PATHY technique generates relevant characteristics for the development of an application, for example: functional requirements, characteristics of other application which users are familiar with, and motivations for them to use the application. Furthermore, participants considered the technique useful in order to learn about the user for whom the application will be designed. Also, they indicated that the technique was helpful for the requirements identification.

Despite its advantages, the PATHY technique stills needs some improvements. The guiding questions should be modified so software engineers can be able to describe characteristics that are more detailed about the applications that the persona likes or does not like and similar applications. Furthermore, one of the criticisms for the PATHY technique is the lack of users during the development of personas. However, the PATHY technique can also be used when there are users to performer searches. When there are not available users, software engineers should perform internet searches or searches in app stores in order to understand users by using the guiding questions from the technique. In this study, we did not used information about real users because we perform the study in the class.

As future work, we will improve the guiding questions to generate possible requirements that are more detailed. Therefore, we will perform a study in an industry context with an improved version of the PATHY technique and compare the technique with other traditional requirements elicitation method such as the GORE approach (Anwer and Ikram, 2006).

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