Cognitive Walkthrough of a Learning Management System with Gendered Personas

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ABSTRACT

The GenderMag cognitive walkthrough with gendered personas has been developed as an inspection method to improve the usability of software artefacts for diverse user groups. It can be used by design teams to evaluate their software and find usability issues. We studied the effectiveness of this method in 49 sessions with IT professionals and software engineering students. They used the method to find usability issues with a learning management system – some of them working with the persona displaying characteristics that are more commonly found in females ("Sarah"), the others with the persona that had attributes more typical for males ("Tim"). Quantitative and qualitative analyses were conducted and showed the effectiveness of the method when using the persona Sarah, with participants finding more usability issues and invoking the persona more often.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in HCI** • *Applied computing* → *Psychology* • *Human-centered computing* → *HCI theory, concepts and models* • Human-centered computing → User models

KEYWORDS

Personas; usability; cognitive walkthrough; gender; empirical study

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1 INTRODUCTION

Learning Management Systems (LMSs) have become an omnipresent technology and methodology adopted by a large number of educational institutions. These systems are used for both campus-based education and distance education. LMSs used by schools, universities, and other higher educational institutions are often non-commercial. For these systems that do not generate a financial turnover through their users, usability testing is often neglected. As a non-commercial system, the ILIAS learning management system does have immense scope for improvement in terms of usability in both instructors' and students' context of usage.

To identify usability issues without user research, inspection methods that allow the design team themselves to review a system are a viable alternative. One of these methods is the cognitive walkthrough, an analytical method for evaluating software artefacts. In order to consider specifically the diversity of users, personas can be used in combination with the cognitive walkthrough. One method of focusing on differences in users that cluster by gender is GenderMag [7], a review method using a cognitive walkthrough and gendered personas.

Inspection methods with gendered personas could thus be an efficient and effective way to find usability issues in learning management systems, especially since they generally have a diverse user group regarding gender. We contribute to elucidating the role that a cognitive walkthrough with gendered personas could play in this context by finding answers to the following research questions:

- How does the use of a cognitive walkthrough with gendered personas influence the identification of usability issues?
- How do the persona's facets and attributes impact the invocation of the persona and its characteristics in a cognitive walkthrough evaluation?

2 RELATED WORK

2.1 Personas

Personas are fictitious representations that can act as a substitute when real users are not easily available for frequent interaction with product designers. The term 'persona' was coined by Alan Cooper and it was created as a system to channel, clarify and understand users' goals and interests [8]. Since then, the use of

personas has been part of numerous design approaches from goal-directed design to user-centric design approaches like contextual design and human-centered design.

By and large, personas are currently used as tools in the design process, where it helps the product designers and the relevant stakeholders to immerse, extract and make inferences about the users for whom the intended product is designed. Personas present the goals, interests and behaviors that a certain user group has. To create empathy, personas are presented as if they were real people, e.g. with a photograph and a section including hobbies and background skills. This is meant to help the developers and designers adopt the target user groups' perspective more effortlessly. These additional pieces of information also allow designers to adapt personas, e.g. by localizing them in a certain geographic location.

The benefits of persona use in the design process are numerous [27, 28]. The main reasons for these benefits are: a) that the personas focus on issues and goals of the targeted user [17], b) the personas provide uniformity about the description of the target user and their needs [25], so they help solve the right problem, c) conflict reduction in the perception of user's goals [1] and d) summarization of user data in personas is relatable and concise [13], which helps the designers realize that users are different from them.

Many researchers have mentioned and studied the limitations and issues caused by the use of personas. There are two major issues, firstly the approach of I-methodology [2, 23] wherein the persona creators unintentionally use their own tastes, motives, problem-tackling competences and wishes in the user representations. This can be considered a fundamental design error. Secondly, the 'person perception' phenomenon can cause bias – the fact that personas are presented as 'real' people makes them prone to stereotyping [24]. Although stereotyping can be seen in a positive way, as it adds more credence to the data and inculcates more authenticity into the user representation [8], it should be selected carefully to avoid gender, ethnic or status profiling [11]. In general, stereotyping causes a bias in individual judgment [10]. Other shortcomings are that the personas are often ignored during product design, in a study by Erin Friess [12] personas were referenced only 2% of the time in conversations regarding product decisions. Consequently, even if considerable time and effort are spent on creating an accurately representative persona, the rewards are not equal.

Despite these issues and disadvantages, the use of personas as a tool for minimizing problems is encouraging, since a persona is an effective means of representing and prioritizing user needs and reducing misunderstandings that often occur between product developers and the intended user groups.

2.2 Cognitive Walkthrough

The cognitive walkthrough (CW) is a usability evaluation procedure for a user-interface to test its exploratory learning features, i.e. whether any first-time user can be comfortable understanding and using the interface without any formal training or background knowledge. This is based on the CE+ Theory of Exploratory Learning [20, 29, 32], which describes human-computer interaction in four distinct steps that the user requires to achieve cognition:

- Setting a goal in the system to be accomplished
- Searching for actions available in the system's user-interface
- Selecting the most suitable action that appears to help in progressing towards the goal.
- Performing the selected action and evaluating feedback by the system to get assurance that progress has been made towards reaching the initial set goal.

The focus of CWs is on users who are shown a user interface and need to find out how to use it. This implies that a cognitive walkthrough concentrates on reasoning rather than focusing on the speed and accuracy of users. The cognitive walkthrough is performed in such a manner that the cognitive processes of the user are simulated as and when the user tries to accomplish a task on the system by interacting with its user-interface [29]. This helps evaluate the ease with which the targeted users are able to perform the required actions and accomplish the given task, with little or no formal training or coaching.

This kind of analytical evaluation can be performed in different stages of the software development process and with finished products. The cognitive walkthrough does not need a fully-functional prototype or involve actual users. The cognitive walkthrough helps the product designers view the system from an intended target user's/user-group's perspective and thus identify the problems that might be encountered by them during their interactions with the system. The walkthrough involves specifying the action sequence for a certain scenario or functionality by performing a simulation of user cognition; the reviewers go through each action while conducting the cognitive walkthrough process, considering how the user interface acts and reacts, as well as its effect on the user. Simultaneously, the reviewers also attempt to identify the level of difficulty for each action for the target user-group. Whether the levels are going to be difficult or easy, they must be backed by relevant arguments, supporting data and logical reasoning. The main strengths of the cognitive walkthrough evaluation are: it is relatively quick and robust [19] and it focuses on specific task problems, which helps in finding the specific design issues [21, 32].

The process of finalizing a task and splitting it further into sub goals and actions does impact on the process of identifying the usability issues of a user interface. This is considered a weakness of CW procedure [15, 21, 31, 32]. Another weakness pointed out is the issue of tedium, as an evaluator needs to go through the same set of questions and activities multiple times.

The cognitive walkthrough is a helpful tool in the design and development stages of software for evaluating its learnability. This is a benefit for application development where the users are required to learn and understand an application or a new function through exploration.

2.3 GenderMag Method

The GenderMag method (Gender-specialized Cognitive Walkthrough + Magnifying Persona) [7] combines the two

methods 'cognitive walkthrough' and 'personas' and tries to help developers and designers conducting a cognitive walkthrough keep their users in mind. It does so with a special focus: GenderMag has been developed to use a "Gender Lens" [33], which refers to including a gender perspective in software development practice. Much research has shown that software which is designed to be more gender-inclusive benefits everyone, regardless of what gender the end user is [14, 18, 30].

GenderMag personas represent problem-solving strategies that have been found to cluster by two genders, i.e. either women or men tend to use them more. The method thus tries to alleviate the fundamental design error of trying to introspect and find out what others might do. And with development teams that are dominated by males, it does so with a special focus on the problem-solving strategies of females. This is meant to help to identify the issues related to gender inclusiveness in software, perceive them as issues and consequently become aware of what aspect needs to be changed in order to address the issues.

GenderMag is meant to be used to evaluate the perspective of gender inclusiveness of any problem-solving software by inspection [22]. The GenderMag encapsulates five facets of gender differences into personas to represent real-world users and, using the cognitive walkthrough procedure, to embed the personas and the facets. Prior research has shown that approaches to problem-solving software can be differentiated by gender and that most software products are not equipped or designed to take these differences into account. The GenderMag method is largely based on five problem-solving facets that were identified as clustering by gender. These facets are:

Motivation: research has shown that the accomplishment of an aim is the major motivation factor for females in their use of technology, while for males it is the enjoyment gained out of using the technology which motivates them [5-7].

Self-efficacy: prior research in the HCI domain has revealed that females have a lower computer self-efficacy than their male counterparts, which might have an impact on their approach to interacting with technology [3-5].

Risk: research shows that statistically, females are likely to be more risk averse when interacting with software than their male counterparts, which might impact decision making [6, 9].

Information-processing style: according to statistical studies, females use a comprehensive style of processing new information, in which they try to gather complete information to grasp background knowledge before they proceed to execute tasks. In stark contrast, males use a selective style, which means they try to work on the first promising option or piece of information that presents itself, and if that doesn't work they backtrack. Both styles have their own advantages, but if the technology used does not support both, problems can arise [16, 26].

Tinkering: research studies on occupations and various age-groups have revealed that males are statistically more likely to experiment ("tinker") playfully or aimlessly with new software features than females. However, studies also revealed that if females do tinker, they tend to reflect more during the process, allowing them to gain more information than males do [4, 16].

The GenderMag method gives life to these facets with four personas, where each persona represents a section of a target system's user base. In recent evaluation of software products, this combination of personas and cognitive walkthrough was used by three different companies in the United States of America and the development teams found about 25% of their features had gender-inclusiveness issues [20].

As for the operational implementation of GenderMag, it is a specialization of the traditional cognitive walkthrough: the developers or designer constantly refer back to the GenderMag personas while carrying out the cognitive walkthrough. GenderMag consists of a kit with four personas that each has a value for the five facets: There are two female and two male personas, representing either the facet values most frequently seen in females or those most frequently seen in males. One persona is chosen per inspection. To identify possible issues with the software, the evaluators (individually or in a team) systematically check if the persona would have known what to do at each point of the sequence that is being walked through, whether they would have set the next sub-goal, etc. If the answers suggest that the persona would struggle at a certain question or step, this struggle is recorded along with the reference to the person's facet that might be relevant for the issue this user might have with the software. The method thus encourages reflection on the facets in the persona at every step of the cognitive walkthrough.

3 THE STUDY

We studied 49 sessions of cognitive walkthroughs with gendered personas of the LMS ILIAS. The sessions were conducted by the first author, they took place in a one-to-one setting, i.e. there was a total of 49 participants. The sample was a convenience sample recruited by the researchers through their networks. Characteristics of the participants were: age 22-36 years, the mean age being 27.4; gender distribution 28 females and 22 males; occupational distribution 31 students and 19 professionals. The study was conducted in English. Students were from various universities in Germany, studying Information Technology and Software Engineering, mostly in programs that are conducted in English. About half of them had a migration background, i.e. they were born outside Germany, and were mostly from the Indian subcontinent and Eastern Europe. The professionals were IT professionals, mainly from companies operating in the Baden-Württemberg region of Germany. All the participants were developers or software engineers, or from other IT jobs or backgrounds. None of them were the actual developers of the LMS that we were studying, so they were conducting the cognitive walkthrough with a system that they had not developed themselves.

We used two personas for this study. 'Persona Sarah' and 'Persona Tim'. These personas are based on the 'Persona Abby' and 'Persona Tim' used for the GenderMag Kit [22]. The modifiable sections of both the personas were changed to accommodate the two target-user groups: a male in his early 20s who is a technology geek and a female in her mid-30s with basic

technology experience. The persona descriptions presented information on the five facets – motivations, computer self-efficacy, risk, information processing styles and tinkering [16, 24] – in line with the way that they are more often found in men or women, i.e. persona Sarah presented the facet values found in women more often than men and persona Tim those found in men more often than in women.

The description of the five facets was taken from the GenderMag personas, the information regarding occupation, age, location, hobbies and a daily routine relevant to the scenario of working with the learning management system. The female persona used in our study can be seen in Figure 1. The GenderMag personas are explicitly made to be customized in this way, i.e. use the facet descriptions but customize the background information.



Figure 1: Female Persona used in the current study – based on the GenderMag persona 'Abby', name, socio-demographical and background information adapted to studying the learning management system at the university.

The functions specified in the cognitive walkthrough form had to be executed by the participants; a fully-fledged course was created in ILIAS and participants had to use this course to carry out the cognitive walkthrough. The language setting in Ilias was set to English and links and materials were in English. All the links, folders and other references to the portal mentioned on the cognitive walkthrough form had to be exactly the same in the course so that there were no ambiguity issues during the sessions.

The study was conducted with the aid of personas, cognitive-walkthrough forms and the ILIAS portal. After completing initial set-up procedures, the participant was shown either 'Persona Sarah' or 'Persona Tim' on screen and asked to read through the persona description. Once persona immersion was complete, they were given the cognitive walkthrough forms as well as a logged-in session of ILIAS, where they would be performing the actions and steps mentioned in the cognitive walkthrough form. The forms for the cognitive walkthrough were filled out by the participant and throughout the cognitive walkthrough the researcher entered into a dialogue with the participant, mainly using the verbal techniques of active listening ("so here you said that the persona would not know what to do because of…") and asking for explanations ("could you tell me why you think…?") to make sure the reasoning behind the participants' answers in the cognitive walkthrough were overtly given and open for transcription and analysis.

The scenario used in the cognitive walkthrough was to "enable the notifications when a new post is added to the thread

'Final presentations'". This goal was further split into two sub goals and each sub goal again sliced into actions. Sub-goal#1 was about finding the specific thread and sub-goal#2 was to enable the notification for only that specific thread. Both sub-goals could be achieved only through certain steps and actions, which were laid out in the cognitive walkthrough forms, for example by clicking on the forum name and clicking on the 'bell icon' which showed the user the various notification options available. The detailed sub-goals and the actions associated with them are shown in Table 1.

For each sub-goal and action the participants had to fill in a form, several questions had to be answered before participants could proceed to the next step: For each sub goal, the participants were asked if the persona would have formed this sub goal. Each action had two questions associated with it. The participant had to answer the question 'Will Sarah/Tim know what to do at this step?' before executing the action on the ILIAS portal. The participants expressed their agreement on a three-point scale (1-Yes, 2-Maybe, 3-No). The participant was asked to explain the reasoning for their answer. After completing this section, the participant executed the action on the ILIAS portal. Once this action was complete, the participant had to answer the question whether the persona would know if they had done the right thing or not. They had to explain this answer, e.g. by referring to the feedback given by the system and the facets of the persona. The facilitator had to make sure that the feedback was recorded in some form. The study was conducted in a face-to-face set-up. Each session with a participant took 30 minutes on average. During the sessions, to help the participants think aloud about cognition of the persona, the researcher asked them to think about the personas' background/skills and question how this persona would be tackling each issue, on the basis of its facets. The sessions with the participants were recorded and transcribed verbatim for further analysis.

We used analyses of variance (ANOVAs) with the between-participant factor persona (Sarah vs. Tim), participant's gender (male vs. female), and occupation (student vs. professional) to check the effects on the dependent variables. For the quantitative analysis, there were two groups of dependent variables:

Identification of issues with software: The extent to which the participants identified issues with the scenario in the learning management system that could be improved, was based on the responses regarding sub goals and actions in the cognitive walkthrough. The dependent variable "identification of issues with software" was operationalized as the answer to the questions "Will [persona] have formed this sub goal?", "Will [persona] know what to do at this step?", and "If [persona] does the right thing, will they know that they did the right thing and are they making progress toward their goal?". The extent to which the participants answered these questions with "maybe" or "no" was taken as the degree to which the participants identified issues with the software based on the persona's characteristics.

Number of invocations: As mentioned above, the participants were asked to explain their answer for each sub goal and action in the cognitive walkthrough. We conducted a content analysis of the transcripts of the session. Categories were the invocation of the persona per se, mentions of the background and skill, and the invocation of each of the five facets used to describe the problem-solving approaches of the persona (motivations, self-efficacy, risk, information processing and tinkering). The dependent variable "number of invocations" was operationalized as the number of mentions of the persona per se and of each of the five facets throughout the cognitive walkthrough.

Additionally, we carried out a qualitative analysis of the transcripts to understand how the persona was invoked, how and what the participants did with the information that was given to them and how the facets influenced the cognition of the persona. The sample excerpts from the transcripts and how they were interpreted are included in the results section.

4 RESULTS

In this section, we present the outcome of the quantitative analysis of the content analysis of the transcripts regarding the dependent variables, i.e. the identification of issues with the software and the number of invocations. In the discussion section, these results are interpreted and enriched with quotes and the outcome of our qualitative analysis.

The analyses of the participants' gender, nationality and occupation did not yield any significant effects on the dependent variables. Regarding the persona (Sarah vs. Tim), there were a number of differences regarding the identification of issues with the software and the invocation of the persona.

Identification of issues with software: Our analyses revealed statistically significant differences between the groups for most of the participants' responses for every sub-goal and actions related to the specific sub-goals, except for a single action. As depicted in the data in Table 1, with the exception of action#2b of sub-goal#2, all the steps revealed statistically significant differences between persona Sarah and persona Tim. For each sub-goal, the table also shows the mean values for the participants' answers (Yes, Maybe, No), which were coded as (1, 2, 3) respectively.

Number of invocations: There were statistically significant differences of persona invocations and mentions of background and skills of the persona as determined by one-way ANOVAs.

Regarding the persona invocation, the ANOVA (n=49) with between-participant factor persona Sarah vs. Tim revealed a significant difference ($F(1, 48)=9.23$, $p=.004$). Participants working with the persona Sarah mentioned the persona more often ($M=12.16$, $SD=4.99$) than people working with the persona Tim ($M=8.36$, $SD=3.77$).

For the background-skills invocation, the ANOVA (n=49) with between-participant factor persona Sarah vs. Tim revealed a significant difference ($F(1, 48)=25.67$ $p=.000$). Participants working with the persona Sarah mentioned the background & skills more often ($M=5.72$, $SD=2.09$) than people working with the persona Tim ($M=3.08$, $SD=1.55$).

There were statistically significant differences of facet mentions between groups as determined by one-way ANOVAs. Regarding the facet "motivation", the ANOVA (n=37) with

between-participant factor persona Sarah vs. Tim revealed a significant difference (F(1,36)=12.240, p=.001): participants conducting the cognitive walkthrough with the Sarah persona referred to the persona's motivation more often (M=3.10, SD=1.41) than participants working with the Tim persona (M=1.71, SD=.92).

Table 1: Responses in cognitive walkthrough for the goal "enable the notifications when a new post is added to the thread 'Final presentations'" between the groups: n=49

Steps (sub-goals and actions) & Questions in Cognitive Walkthrough		Sarah (M)	Tim (M)	p
Sub goal #1	**Login to "Final Presentations" thread**	**1.96**	**1.16**	**.000**
Action #1	**Click "Communications Folder" link**			
Action #1a	Will [persona] know what to do at this step?	1.84	1.20	.001
Action #1b	If [persona] does the right thing, will they know that they did the right thing and is making progress toward their goal?	2.24	1.08	.000
Action #2	**Click "Student's Forum" link**			
Action #2a	Will [persona] know what to do at this step?	2.04	1.16	.000
Action #2b	If [persona] does the right thing, will they know that they did the right thing and is making progress toward their goal?	1.84	1.08	.000
Action #3	**Click "Final Presentations" thread line**			
Action #3a	Will [persona] know what to do at this step?	1.84	1.04	.000
Action #3b	If [persona] does the right thing, will they know that they did the right thing and is making progress toward their goal?	2.72	1.72	.000
Sub goal #2	**Enable Notification for this thread**	**2.36**	**1.08**	**.000**
Action#1	**Click "Actions" link on top right corner**			
Action #1a	Will [persona] know what to do at this step?	3.00	1.76	.000
Action #1b	If [persona] does the right thing, will they know that they did the right thing and is making progress toward their goal?	1.44	1.00	.000
Action#2	**Click "Enable Notification for this thread"**			
Action #2a	Will [persona] know what to do at this step?	1.48	1.00	.000
Action #2b	If [persona] does the right thing, will they know that they did the right thing and is making progress toward their goal?	1.12	1.00	.077

For the facet "self-efficacy", the ANOVA (n=49) with between-participant factor persona Sarah vs. Tim revealed a significant difference (F(1,48)=9.21, p=.004): participants conducting the cognitive walkthrough with the Tim persona referred to the persona's self-efficacy more often (M=5.84, SD=1.55) than participants working with the Sarah persona (M=4.28, SD=2.05).

Regarding the facet "risk", the ANOVA (n=44) with between-participant factor persona Sarah vs. Tim revealed a significant difference ($F(1,43)=15.55$, $p=.000$): participants conducting the cognitive walkthrough with the Sarah persona referred to the persona's risk more often (M=3.79, SD=2.41) than participants working with the Tim persona (M=1.62, SD=.81).

Regarding the facets "information processing" and "tinkering" the results of the facet mentions between the groups did not yield any significant differences.

5 DISCUSSION

The study and analysis of the data collected through the cognitive walkthrough suggest that the use of gendered personas in the cognitive walkthrough does help identify usability issues in ILIAS. The results revealed that the responses for the participants working with the different personas differed significantly regarding the identification of issues with the software and the number of invocations. Specifically, the female persona (Sarah) helped in the identification of issues with the learning management system: the cognitive walkthrough with the persona Sarah was more likely to allow the participants to recognize sub-goals and actions that might be difficult for the users. Sarah and her characteristics were invoked more frequently than the male persona, which can be interpreted as the reference to the persona and her characteristics having a direct influence on the identification of usability issues.

These evaluation results provide an opportunity for the user-interface development team to redesign this targeted action and reduce the usability issues pertaining to it. This solution could be achieved by adding either relevant feedback or signs from the interface to the user, particularly in those actions where a subsequent action is part of a new sub-goal. This would ensure that the continuity of user cognition is maintained. Alternatively, the user interface could be redesigned so that this user action is eliminated entirely from the hands of the user and/or the system allowed to take care of this action in the background.

The study also suggests that the use of personas that are different from oneself (as the participants all were IT students or professionals and can thus be assumed to have higher computer self-efficacy, etc.) can enhance perspective taking and generate a

stronger understanding in LMS design development teams for users different from the designers themselves. This can also increase the effectiveness of the personas and finally drive the cognitive walkthrough evaluation method successfully. The identification of issues was apparently related to the attributes and facets each persona possessed. The participants were effectively able to work through the actions based on the facets of the persona and select the issues the persona might face, on the basis of 'background', 'tinkering' and 'self-efficacy', as shown in the transcript samples below.

> *"Maybe Sarah will know what to do at this step as of all the possible features, it looks most promising and familiar for her considering her experiences and tinkering motivation."* – participant 13 on Sarah's background & tinkering

> *"Maybe he will know because he can't find the next step towards the goal, he will blame the software. He expects the functionality to be present somewhere, waiting to be found out."* – Participant 22 on Tim's self-efficacy

The excerpts below show how the participants are so immersed in the personas' facets that they almost paraphrase the facet during the evaluations. This trend was noted in the majority of the transcript we coded.

> *"…No, because she is risk aversive about tinkering with unfamiliar features as it requires more time and I don't see any features which might be familiar for her."* – Participant 21 on Sarah's risk aversion and tinkering

> *"…His incremental style of info processing and tinkering into depth might give him a promising option to try first. If he can't find it, he probably will blame the system."* – Participant 28 on Tim's information processing

This "facet mentioning" further supports the point that the personas inspired the participants to understand Sarah/Tim's point-of-view and empathize with them. Both quantitative and qualitative results for the invocation of the persona suggest that persona Sarah and persona Tim had a different impact on participants during the cognitive walkthrough for these facet-mentions. The differences in the facet-mentions suggests that the participants' referencing of facets, as depicted in previous excerpts from the transcript, follows a pattern of how the facets were described on their specific personas. The high frequency of facet-mention 'risk aversion' for Sarah as compared to Tim suggests that this facet is something that is particularly salient in the participants' minds when referring to the personas. As such a prominent attribute that Sarah has (and Tim does not) it helps the participants to take Sarah's perspective into consideration more easily than Tim's.

In our study we found no influence of the gender, nationality and occupation of the participants on the identification of issues with the software and the number of invocations. This suggests that the participants' responses to the cognitive walkthrough procedure in this scenario were not driven by male/female, national or student/professional factors. This shows that the personas were effective, irrespective of gender, nationality or occupation of the participants.

This result that the female persona let the participants find more usability issues and was referred to more often can be interpreted in different ways: In our study the facets of the persona were conjoint with the gender of the persona, i.e. we did not present the facet values that are more frequently found in females with a male persona. This means that we cannot pinpoint whether it was the facets or the gender that led to this result. The fact that the majority of our participants were female and that this did not make a difference in our study, points to the interpretation that the facets themselves played an important role. But ultimately, the presentation of the facets we used is congruent with prevailing stereotypes and thus might enhance one of the factors that make personas effective, i.e. letting them seem plausible or "authentic". The combination of otherness with regard to the facets – the participants were all in IT and software engineering and might thus perceive the female persona's facet as different from themselves – and plausibility of the persona might thus be an important factor. It could help in eliciting usability issues because the need to actively take the persona's perspective becomes more obvious.

The format of the cognitive walkthrough might further add to producing our results: self-anchoring and I-methodology are often automatic processes that are effortlessly applied without reflection. The structure of the cognitive walkthrough imposed contemplation and explicit consideration of the persona's attributes on the participants. Our results regarding the female persona could then be explained by adding a persona that is dissimilar but plausible to a process that is highly structured and induces reflection: this amalgamation might be responsible for making the need for perspective-taking salient und thus alleviating an I-methodological approach.

6 CONCLUSION

Our study showed that the use of a persona displaying characteristics that are more commonly found in females can help to identify usability issues in a learning management system. It also suggests that a persona different from the developer gets referred to more often in the cognitive walkthrough than a persona that is similar to the developer, stimulating perspective taking and the identification of issues with the software.

The core part of this study was the cognitive walkthrough procedure with gendered personas, in which the evaluators were software engineers and information technology students. Two personas, Sarah and Tim, were represented and the functionality evaluated was enabling notifications for a thread or subscribing to it for new posts in a learning management system. The research shows the impact personas had on participants during the cognitive walkthrough procedure due to their facets and other attributes, which inspired the participants to generate more empathy and immerse with the target-user group. The study proposes that using the prescribed method with the fine-grained cognitive walkthrough and the gendered personas would

allow a user-interface development team to acquire input about redesigning the usability around the evaluated action and reduce the usability issues pertaining to it.

There are limitations to our study, e.g. the participants were not the actual developers of the learning management system that was evaluated. Yet on the basis of our results, it seems promising to use GenderMag [7] as a method for usability evaluation. Its detailed cognitive walkthrough and the persona displaying the characteristics more common in females can help identify usability issues. Further research could look into the cognitive and emotional processes that are relevant in this context – both with regard to perspective-taking with the persona and with the role that the cognitive walkthrough and its structure play in inducing reflection.

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