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RESEARCH PAPER

Using AI tools for generating proto-personas: An exploration in the design of strategies for promoting ethical awareness on responsible computing

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Abstract
This study investigates the perceptions of higher education stakeholders regarding proto-persona profiles generated manually by experts, automatically by generative AI (GenAI) tools, and via the combination of these methods. Our proto-personas have been devised to support the design of strategies for promoting awareness on responsible computing. We study both their creation processes and their perception by the stakeholders they represent. Our results suggest a great potential of GenAI tools to support the application of the proto-personas technique. Our resulting proto-persona profiles were generally perceived positively by stakeholders, and they also were used effectively to motivate reflection in the intended design context.

Keywords:
Personas; Generative artificial intelligence; Higher education; Ethics; Techno-pedagogical strategies.

1 Introduction
The "Personas" technique is widely used in Human-Computer Interaction (HCI) and User eXperience (UX) fields for the design, development and research of technology products, systems or services. This technique is useful to place the potential users at the center of this process, keeping in mind their goals, needs, skills, among other aspects [6], [8], [9]. In this context, *personas* (or archetypes) are schematic user profiles that represent classes of users. Typically, they include textual user attributes such as name, age, skills and brief descriptions of their experience, attitudes or expectations regarding the specific products or services being designed, as well as graphical depictions (e.g., photos) that portray representative users [6], [9].

A variation of the personas technique, known as *proto-personas*, has also become popular. The basic difference between the Persona and Proto-persona techniques lies in the way in which profiles are created. In the former, user research data from real users is utilized, whereas in the latter, profiles are created based on the design team's experience [4]. Using [4]'s definitions and based upon our professional background as HCI researchers and educators, we see proto-personas as fictitious profiles that facilitate the initial discussion of the characteristics, motivations and needs of our stakeholders.

This study is part of a broader three-year research project on the evaluation of lesson plans, codesigned by higher education (HE) stakeholders, to promote awareness on responsible AI issues. In this context, the motivation of this particular study is to create proto-personas that could represent HE stakeholders as potential codesigners of those lesson plans (with techno-pedagogical strategies as part of their instructional design). The reflective process about these potential stakeholders allows us to broaden our perspective on who would be the most suitable representatives to act as codesigners within our larger project that involves ethical awareness. Our goal is not to create ethical proto-persona profiles.

In order to gather more ideas to enrich our reflective process, we decided to explore how increasingly popular generative AI (GenAI) tools can impact design processes when applied to the generation of proto-personas. Work in this area has been spearheaded by Salminen et al. [11], [13], [14], [15]. These research group's body of work, [11] notes that "automatic persona generation is technically possible and provides advantages compared to manual persona creation regarding the speed and freshness of the personas" (p. 1), in addition to its potential for inclusion of diverse representations that consider globally available data to GenAI tools.

In Salminen's work, automatically generated personas are based on people's real data, collected from online medias. In our

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study, we focus on the notion of proto-personas. Our research context is the design of techno-pedagogical strategies to promote ethical awareness on responsible computing. Thus, we need our proto-personas to represent stakeholders such as students, which will be the basis to reflect on our target strategies.

This paper reports results from research on the perceptions of higher education stakeholders on proto-personas generated through different techniques; expert-created, AI-generated, and two hybrid methods. The research explores how proto-personas produced by using these four methods can aid in the process of reflecting about strategies to promote ethical awareness and responsible computing. By leveraging both human expertise and generative AI tools, we aim to create diverse and representative profiles that encapsulate the perceptions and skills of higher education stakeholders on responsible computing awareness. We then apply a standardized scale to assess the stakeholders' perceptions, as well as ad-hoc instruments to enquire about the quality and usefulness of our proto-persona profiles. This paper addresses two primary research questions (RQ): (RQ1) What is the overall perception of proto-persona profiles considering each of the four creation techniques? and, (RQ2) How can the proposed proto-personas aid in the design of strategies to promote ethical awareness on responsible computing issues?

2 Persona profiles evaluation

In an exploratory literature search, eight related works were found that address the evaluation of persona profiles: [7], [11], [14], [15]. Our exploratory literature search was conducted using a combination of keywords, such as "AI-generated personas", "automatic generated personas", and "personas evaluation". Six of these studies focused on the evaluation of automatically generated persona profiles, whereas [2] and [15] evaluated and compared semi-automated and traditional generation of personas. Only one work [8] addressed the design and evaluation of personas considering different cognitive styles, in addition to using a set of personas that explores gender biases. Five out of nine studies used a quantitative method approach (based, e.g., on eye-tracking and Likert scales), whereas the remaining four relied on a mixed approach (e.g., open-ended questions, Think-Aloud technique). The number of created persona profiles in these studies ranged from 3 to 15, whereas the average number of participants who evaluated persona profiles was around 61 (ranging from 10 to 216 evaluators). Five papers come from the same research group (Salminen and colleagues), which may be an indicator of the novelty of the research area. Three other studies adapted formats of the Persona Perception Scale, developed by this same group.

Moreover, Holzinger et al. [7] propose guidelines, templates and other materials to support personas creation, called "Personas for AI toolbox", which takes into account Human-AI Interaction (HAII). Although, in this case, authors do not use GenAI tools in the process, the toolbox can be useful in creating good quality personas who are representative IA tool users.

2.1 Adapting the Persona Perception Scale

Given the exploratory literature results, we chose to use the Persona Perception Scale [13] to get a sense of the quality of proto-persona profiles generated by AI tools, and to compare their results with human-created proto-persona profiles. The validated version of the Persona Perception Scale (PPS) consists of 28 statements that evaluators are requested to rate by using a 7-point Likert scale (ranging from 1=Strongly disagree to 7=Strongly agree). The statements are organized into eight sections or "constructs": Consistency, Completeness, Willingness to use (WTU), Credibility, Clarity, Similarity, Likability, and Empathy. Aiming to reduce the work of the evaluators who would be participating in our study, but keeping the essence of PPS, we opted to apply six of these constructs. In making this decision, we considered that the authors of PPS [13] also recommend using the following constructs (C.): Consistency, Completeness, WTU, Credibility, Clarity, and Empathy, "so that a 'good' persona would be perceived by its user as credible, consistent, complete, clearly presented and empathetic, and decision makers would be willing to use it for their work tasks." (p. 18). These six constructs comprise 20 statements, which are a key part of the evaluation form we used. The resulting adaptation of PPS is shown in Table 1 It should be noted, though, that given our research context, we translated statements into Spanish.

Table 1. The adapted PPS.

Considering the revised proto-persona (<Name>), please indicate your answer for the following 20 statements*. Response options range from 1 (strongly disagree) to 5 (strongly agree):		
C.	**N.**	**Adapted PPS**
Consistency	1	The descriptive word of the persona matches other information shown in the persona profile
	2	The picture of the persona matches other information shown in the persona profile
	3	The persona information seems consistent
	4	The persona's demographic information (age, gender, place of origin) corresponds with other information shown in the persona profile
Completeness	5	The persona profile is detailed enough to make decisions about the profile it describes
	6	The persona profile seems complete
	7	The persona profile provides enough information to understand the people it describes
	8	The persona profile is not missing vital information
WTU	9	I would make use of this persona to codesign strategies to promote ethical awareness on responsible computing issues
	10	I can imagine ways to make use of the persona information to codesign strategies to promote ethical awareness on responsible computing issues
	11	This persona would improve my ability to make decisions about the interested parties it describes
Credibility	12	The persona seems like a real person
	13	I have met people like this persona
	14	The picture of the persona looks authentic
Clarity	15	The information about the persona is well presented
	16	The text in the persona profile is clear enough to read
	17	The information in the persona profile is easy to understand
Empathy	18	I feel like I understand this persona
	19	I feel strong ties to this persona
	20	I can imagine a day in the life of this persona

The following three additional adaptations to the original PPS statements were necessary: (1) We replaced the term persona for proto-persona; (2) we replaced mentions to persona profile attributes for those that more accurately reflect the elements we used in the template we designed for our study. Thus, in statements 1, 4 and 5 of Table 1, "descriptive word", "place of origin" (a city

or state in Mexico), and "profile" are specific to our study; and (3), since the scale allows for adaptations to indicate how it is being applied, we mention "strategies codesign to promote ethical awareness on responsible computing issues", which is our intended use for the proposed proto-personas, in statements 9 and 10 (the original statements referred to the creation of YouTube videos).

As for the use of a 7-point Likert scale, [13] suggest that during data analysis researchers can fit responses into one of three categories: "1-2 = low quality; 3-5 medium quality, and 6-7 high quality personas" (p. 18). We found it more helpful to use a standardized 5-point Likert scale, considering 1-2 as low quality, 3 as medium quality, and 4-5 as high quality proto-personas.

3 Techno-pedagogical strategies to promote ethical awareness on responsible computing

The various existing instructional design models (e.g., ADDIE, A.S.S.U.R.E., etc.) may differ in delivery format (e.g., online, face-to-face or blended), features (e.g., planned course length, technology resources needed, etc.) and number or type of stages (e.g., ADDIE = Analyze, Design, Develop, Implement, and Evaluate). Each of them can be shaped according to a process (e.g., rectilinear, curvilinear, nested or concurrent portrayal) [1]. As per [1], "Instructional design is intended to be an iterative process of planning outcomes, selecting effective strategies for teaching and learning, choosing relevant technologies, identifying educational media, and measuring performance." (p. 77).

In this paper, we focus on reflecting about strategies for teaching and learning mediated by technology, taking into account the HE stakeholders through their proto-personas representation. While ideating towards those strategies, we have kept in mind the promotion of ethical awareness on responsible computing. To define "ethical awareness" we draw on Rest's model of the moral decision-making process [10] composed of three steps: (1) moral awareness followed by moral judgment, establishing moral intent, and moral action. Here, we use moral awareness as synonymous to ethical awareness, which can be defined as the recognition of a potential moral issue of a given situation. Also, supported by [10] and [3]'s, we define responsible computing as the ethical, fair and transparent use, design and development of technology, in which one needs to be aware to recognize (individual or collective) potential negative impacts to interested parties.

In our study, instead of materializing proto-personas towards technology design (a usual goal), we rely on this technique to take stakeholders ideas to our next research step of instructional codesign (participatory instructional design) of lesson plans.

4 Method

Our study followed a two-stage method, each with its own participants, procedures and data collection and analysis. In the following subsections, we present details on both stages.

4.1 Stage 1

The first stage consisted of the creation of proto-persona profiles by both humans (the authors working collaboratively) and by using GenAI tools. Figure 1 illustrates methods used in this stage.

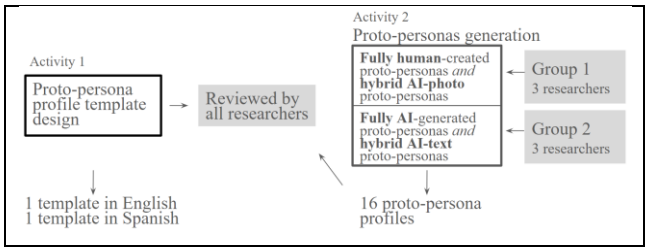

Figure 1. Methods used in Stage 1.

4.1.1 Participants

For Stage 1, the six authors of this paper who collaborated in creating the proto-personas are HCI researchers or educators with an average of 17 years of experience (ranging between 5 and 33 years); all having experience in creating personas (ranging between 3 and over 10 times). Participants were distributed into two groups according to their main interests in comparing their manually created personas with their automated counterparts (Group 1) or in automating the generation of proto-persona profiles using AI tools (Group 2). Group 1 was made up of two women and one man, two from Mexico and one from Brazil, whereas Group 2 consisted of two men and one woman, two from Brazil and one from Mexico. Before moving on to stage 2 and inviting evaluators, two of the generated proto-persona profiles were randomly selected and a pilot test was conducted with external participants to get a sense of the evaluation's time requirements and of whether any questions needed adjustments or refinements.

4.1.2 A template for proto-persona profiles

We decided to create a template for proto-personas so we could generate standardized profiles. The template text was written in English, but it was used in Spanish to collect responses from evaluators. The template, illustrated in Figure 2, has three parts: (1) General information, which includes photo, (neutral) name, age, occupation, field, city of origin, and a descriptive keyword (indifferent, interested, concerned, or activist, referring to the persona's position regarding ethical issues in responsible computing); (2) Perceptions on responsible computing, with five areas, inspired in the empathy map artifact: What this person has (i) **heard or read,** (ii) directly **observed,** (iii) **felt,** (iv) **said,** and (v) **done** about responsible computing; and (3) Skills related to responsible computing, rated on a 5-point scale, where 1 = unskilled, 5 = expert, on the following five statements regarding AI tools: news follower (how this person disseminates information), influencer (in what capacity this person can influence others' decisions), user (to what extent this person relies on these technologies for getting work done), developer (capabilities of this person to adapt or create new tools), and ethics researcher (involvement of this person in conducting research on ethics).

The use of this template, previously reviewed and approved by all profile creators, aimed to produce profiles in a uniform format, regardless of the different techniques used for their creation or generation. The sample profile in Figure 2, corresponds to that of a college student that was fully generated by using AI-Gen tools. In the supplementary material[1], examples of proto-persona profiles created by using all four techniques are included.

[1] Examples of proto-persona profiles created by using all four techniques discussed: https://bit.ly/3XuvToE

4.1.3 Manual, automatic and hybrid generation of proto-personas

In consonance with our broader research project, aimed to design strategies for the promotion of ethical awareness on responsible computing, we defined proto-personas to stand for stakeholders in higher education. Four types of proto-persona profiles were defined: a curriculum design coordinator, an industry professional working in a field related to ethics or artificial intelligence, a college student (CS), and a college faculty member (CFM).

4.1.3.1 Profile creation techniques

As noted in the introduction, proto-personas comprise textual and visual components. Four profiles for each proto-persona type were created, combining four techniques: (1) Fully human-created proto-personas (FH), i.e., human-generated text and human-selected photographs of real people; (2) Hybrid AI-photo proto-personas (AIP), i.e., human-generated text with photographs of AI-generated people, (3) Fully AI-generated proto-personas (AI-gen), i.e., automatically generated text and photographs, both using AI-Gen tools, and (4) Hybrid AI-text proto-personas (AIT), i.e., AI-generated text with human-selected photographs of real people.

This resulted in a total of sixteen proto-persona profiles. The definition of these four profile creation techniques follows those suggested for future work by [15]. Adaptations we made for this study include the consideration of proto-personas instead of personas, and the use of static (image) profiles instead of dynamic (video) profiles (as in [15]).

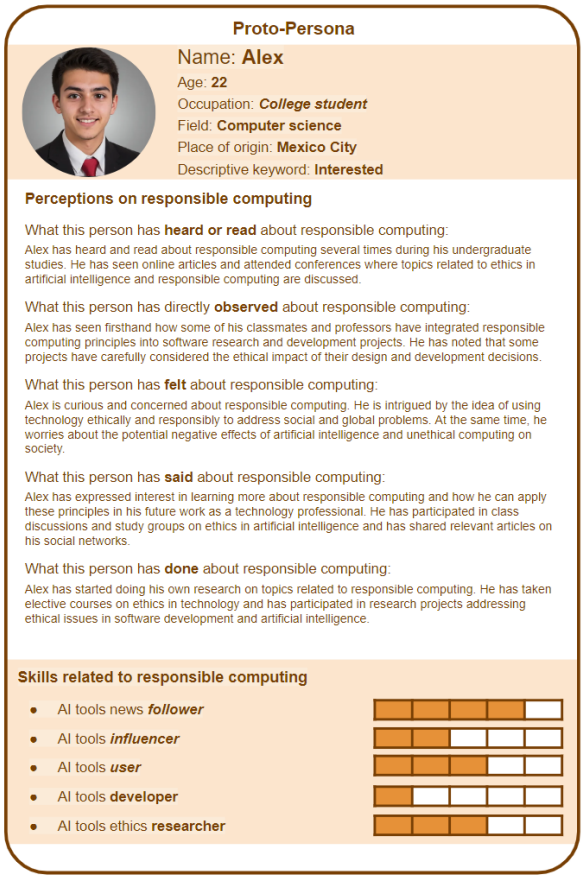

Figure 2. AI-gen proto-persona profile of a college student.

We assigned profile creation techniques to be applied by each group, shared the template we designed for proto-persona profiles, and set a 10-day work calendar. Group 1 was responsible for applying the profile creation techniques 1 (FH) and 2 (AIP), whereas Group 2 was responsible for applying the profile creation techniques 3 (AI-gen) and 4 (AIT). A private folder on the cloud was created for storing the results from each group to enable collaboration within groups, while seeking to avoid influence in decisions between groups.

4.1.3.2 GenAI Tools

A wide range of GenAI tools are available nowadays. For AI-generated proto-persona profiles, the GenAI tools chosen for text generation were: ChatGPT 3.5 and 4.0, Gemini and CoPilot. For image generation, Leonardo, Dall-E, OpenArt and thispersondoesnotexist.com were used. Pictures of real people were downloaded from Freepik and Unsplash. The GenAI tools and websites for downloading pictures were used by both groups.

4.2 Stage 2

In the second stage, proto-persona profiles were evaluated by invited external collaborators. Figure 3 illustrates methods used in this stage.

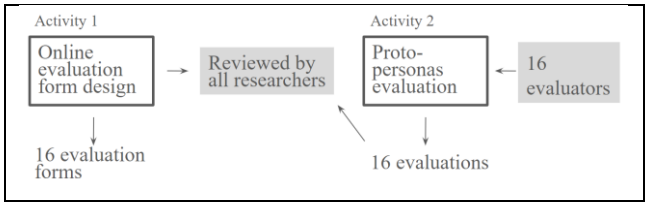

Figure 3. Methods used in Stage 2.

4.2.1 Participants

For Stage 2, evaluators for the entire set of generated proto-persona profiles included former colleagues, students or research collaborators. A total of 16 participants were invited. According to [14], "The predominant counterargument or hesitation against creating more personas is that this may result in an adverse effect where designers and developers face a cognitive overload of all the shown end-user information that hinders, rather than helps, their decision making." (p. 1). Also, few works in the literature report the design of persona sets consisting of more than ten profiles. Thus, to avoid cognitive overload, each of the sixteen external collaborators were assigned one proto-persona profile to evaluate. Out of our 16 evaluators, seven are women and nine men, coming from seven different states of Mexico. Nine identified themselves as industry professionals, seven as educators, six as HCI experts, three as graduate students, two as curricular design coordinators, and other occupations (e.g., computer systems engineer, interaction designer, software engineer, data analyst, strategic design instructor); some evaluators identified themselves with more than one occupation. Twelve invited evaluators were, and five were not, familiar with the concepts of personas or proto-personas before participating in this evaluation.

4.2.2 Evaluation of proto-personas

A standardized online evaluation form was designed, which consisted in three sessions: Persona Perception Scale (PPS), applicability of our proto-personas in the intended design context, and quality of our proto-personas considering the evaluators' accuracy to identify the creation techniques. We had 16 proto-personas and 16 invited evaluators; so, one random proto-persona profile was assigned to each evaluator. An email was sent

individually to evaluators with their corresponding form. A spreadsheet was used to register which proto-persona profile was sent to each evaluator and to keep up with the evaluation process (e.g., who already delivered evaluation, who needed a reminder and so on). Data analysis was carried out after all evaluations were completed.

5 Results

In this section, we present results from Stage 1 and Stage 2.

5.1 Stage 1: Proto-persona profiles generation

The processes of creating or generating proto-personal profiles is worth discussing. We report here methodological and cultural issues that arose along the various sessions, as well as observations on strategies for creation and refinement of proto-persona profiles.

Each group was free to select a work strategy deemed suitable, as described in the subsections below. The resulting proto-persona profiles were shared with the entire group and minor adjustments were made before releasing the evaluation forms to be used in Stage 2. The proto-persona profile shown in Figure 2 is an actual result from work in one of the teams (translated into English).

Brazilian researchers (one in each of the two groups) were not familiar with Mexican culture, so when creating the proto-persona profiles they felt the need to search common given and family names, as well as to perform an exploration on social media of the country's culture. For places of origin (cities and state names), they used a couple of examples included in our proto-persona profile template or searched the internet to get some examples. Also, for generating AI images, their prompts included the word "Mexican."

5.1.1 Fully human-created proto-personas and hybrid AI-photo proto-personas

Participants in this group distributed tasks for asynchronous individual work to create proto-personas, and then met synchronously for reviewing and adjusting their persona profiles.

For traditional, fully human-generated archetypes, textual descriptions were produced for personas with the four roles mentioned in Section 4.3. Also, each group participant searched for public-domain photographs of real individuals that best suited, in their view, the corresponding textual description.

For the hybrid version of these personas, textual descriptions remained unchanged, but group participants relied on generative AI tools for producing alternative photographs to replace those of real people. Thus, for instance, Leonardo was used for generating photographs of a college faculty member (CFM) and an industry professional (IP). Prompts used in image generation include, respectively: "A 43-year-old female Mexican professor in mechatronics," and "A 35-year-old male Mexican director of logistics in a car industry."

The average time spent to generate each proto-persona profile was: 31 min (ranging from 13 to 60 min) for manual text creation, and 4.25 min (ranging from 1 to 7 min) for image selection or generation. One of the researchers noticed that some of the AI-photographs (using Leonardo), although very realistic, exhibited odd teeth and hands. This was mitigated by choosing the best version out of several generated by the tool.

Interestingly, when reviewing the proposed personas during a synchronous meeting, suggestions were made to reconsider photographs for some of the fully human-generated personas, as not everyone in the group found that the age of the individual in the photograph matched that attribute in the textual description. Other attributes that needed adjustments were the quantitative ratings given to the personas' skills, as group participants did not interpret the characteristics uniformly. Thus, for example, some participants thought the term "influencer" referred to popularity in social networks, whereas others considered a more general capability to exert influence on others, in some cases because of hierarchical relationships or college degrees. After some discussion, consensus was reached, and ratings were adjusted accordingly.

5.1.2 Fully AI-generated proto-personas and hybrid AI-text proto-personas

To accomplish the task of creating proto-personas, Group 2 first agreed on a method to schedule meetings, utilizing web tools to select a suitable date and time for a video call. All participants had prior experience with generative AI for user experience design. This ensured a balanced input of ideas and expertise. The process began with the presentation of the proto-persona template, followed by a discussion on various prompt creation methods to achieve better results. The most experienced member in creating proto-personas was tasked with generating prompts to maintain uniformity across the different user archetypes, and one or two profiles were assigned to each participant. Image creation was left to each member's experience with the profiles.

Since each collaborator worked individually from this meeting on, a documentation script was proposed to guide and standardize the generation of proto-persona profiles with predefined fields: GenAI tool used for text generation, proto-persona occupation, generation technique (fully AI-generated or hybrid AI-text), and prompts used. Documentation also included fields containing a copy the tool's answer text, screenshots of the tool's answers, pictures of the real and AI-generated persona, as well as sources used (tool or website). For each proto-persona, we also recorded the time it took to conduct the generation activity. This approach aimed to provide a consistent context for the generative AI tools, ensuring more homogeneous responses.

On average, the researchers spent around 22 min (ranging from 8 to 38 min) for text generation, and 2 min (ranging from 35 seconds to 5 min) for image selection or generation. No bias was observed towards any persona's aspect or knowledge field. Upon comparison of their results with the GenAI-generated proto-personas, the group noted significant differences in the levels of detail and language used in descriptions.

5.2 Stage 2: Findings from evaluation

5.2.1 Results from applying the PPS

Given our intention to carry out a qualitative analysis, each of our sixteen proto-persona profiles was assigned to only one evaluator. Although the data collected may seem large, a quantitative analysis would not be feasible, as this would require that several participants evaluate each of the distinct profiles. We present some numerical results only to give a sense of the human evaluators' perceptions when they applied the PPS. Data collected with the scale and simplified data synthesis from the PPS can be found in the supplementary material[2].

We organized data as a matrix in which rows correspond to PPS statements, whereas columns refer to each of the evaluator's responses. We grouped responses by construct to obtain a general perspective of the perceived quality of our profiles. For each

[2] Data collected from the application of PPS: https://bit.ly/45uFaPy

construct we summed up responses and normalized them considering the maximum possible totals (a 100% if all responses were 5). Figure 4 shows the resulting overview from the application of PPS. Patently, the evaluators perception is positive (above 70%) for all six PPS constructs included in the evaluation form.

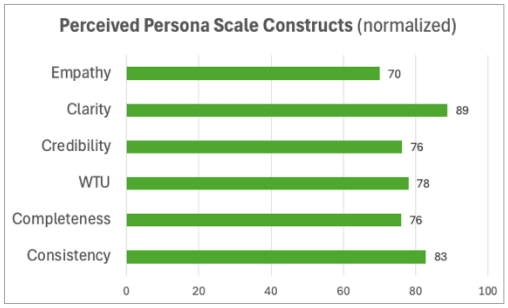

Figure 4. Perception of proto-personas using PPS.

Remarkably, the chart shows that evaluators considered that our proposed proto-persona profiles are **clear (Clarity)** (89%) and **consistent (Consistency)** (83%), and that they would be **willing to use (WTU)** (78%) them in the intended context (the design of strategies for promoting ethical awareness on responsible computing). These results can also be corroborated visually by observing the data collected in the supplementary material. Overall, evaluators assigned significantly more high-quality (4-5) than low-quality answers (1-2).

When comparing the ratings for the four creation techniques across different proto-persona profiles, we can observe that fully human-created, hybrid AI-text and fully AI-generated proto-persona profiles all have predominantly positive responses for statements across different evaluators. This shows that, in general, collaborators evaluating profiles independently considered them of high quality. Interestingly, AI-generated profiles received fewer negative responses than fully human-created and hybrid AI-photo proto-persona profiles. These results coincide with the evaluators' perceived inconsistencies, such as "*I think that the text does not coincide with the reasoning of a 24-year-old, who more than a student, could be a professional or a graduate student*" and "*It seems strange to me that this person is an influencer but his skills do not include being a user of AI tools*". Overall, all profile types had more positive than negative responses from evaluators.

5.2.2 Applicability of the proposed proto-personas in the intended design context

We wanted to evaluate the suitability of our proposed proto-persona profiles for their intended use, which is to support the design of strategies for promoting ethical awareness on responsible computing issues. Evaluators were asked to revisit the profile and to provide suggestions in that regard, thinking about the specific proto-persona being evaluated (keeping it in mind, materializing it). When analyzing their suggestions thematically for each category of proto-persona profiles[3], we identified seven topics in total, noting that within a single answer we could identify one or more topics. The first three most recurring topics were suggested for all four profile categories. This is the list of topics ordered from most to least recurring: (1) **Conferences, forums and talks** (9 suggestions), with three evaluators emphasizing that practical examples should be given in these situations; (2) **Workshops and hands-on activities** (8 suggestions), including bootcamp, classes, courses, integrative projects and collaborative work as examples; (3) **Informative resources** (6 suggestions), including readings, visual information materials, movies and documentary film recommendations as examples; (4) **Policies and strategies** (4 suggestions), including institutional policies, action plans, and evaluation strategies as examples. This suggestion was given for the curriculum designer coordinator (CDC), industry professional (IP) and college faculty member (CFM) profiles; (5) **Campaigns** (2 suggestions), for which evaluators mentioned awareness campaigns and campaigns in social media, for CDC and CFM profiles; (6) **Mentoring and consulting** (2 suggestions), with mentoring program suggested to an IP profile, whereas consulting and advice to companies was suggested to a CFM profile; and (7) **Responsible computing as a transversal topic** (1 suggestion), specifically oriented to all levels of Computer Science programs. This suggestion was given for a CFM profile.

This exercise attests to the quality and usefulness of the proposed proto-persona profiles, as participants were able to come up with a rich set of recommendations in responsible computing awareness. Their recommendations are based on profiles created by using all four techniques explored in our work.

5.2.3 Identification accuracy by evaluators

As part of our enquire on our stakeholders' perceptions, we were interested in learning whether they would detect how proto-personas were created. Four out of sixteen evaluators answered accurately when asked about the creation techniques used for proto-persona profiles. Among them, three responded *"it was completely generated (text and photo) by an AI tool"* (AI-gen), and one responded that *"it was created by a human and the photo is of a real human"* (FH). Justifications for these correct cases were as follows: (1) AI-gen technique identification: **(CDC)** *"The photo part is what made me hesitate at first. I don't know what I detected but he didn't seem like a real person to me. Something bothers me. It's possible that it's a real person, but it doesn't make a good photo for me. Regarding the text, what makes me think that it is generated by AI is the fact that it deals a lot with the topic of responsible computing over and over again, but it never goes into great depth. I do not detect profound findings that can be seen in the proto-persona. It's like what I've gotten when I ask an AI for something. For this reason, in the previous questions I stated that I do not find it at all related to a person I know or that it resembles something that I am feeling. It needs to be enriched. It feels generic."*; **(IP)** *"The photograph looks very real but has some slightly strange features. The text is congruent and consistent but has a repetitive appearance in some sentences.*"; and **(CFM)** *"The photo does seem AI-generated, I am a little unsure about the text, but I also know the capacity of generative AI tools and I could say it is AI-generated."*; and (2) FH technique identification: **(CFM** *"I believe that the text was written by a person, I consider that it has features of cases that could be true for a teacher. I think the image is of a real person, but I wouldn't say he is originally from Mexico. It may as well be a photo taken from the internet."*

Taking our enquire further, we uploaded to ChatGPT-4o, separately, four batches of each proto-persona profiles category (CS, CDC, CFM, and IP) and prompted it with a quest to analyze the uploaded images of the proto-persona profiles and report which of them it considered AI-generated and justify its answer. For context, first the GenAI tool printed out three criteria used to

[3] Original suggestions and topics generation: https://t.ly/Fz2Xw

analyze the uploaded images: visual consistency, textual content, and design elements. After analyzing each batch according to its criteria, ChatGPT delivered its analysis. For the CDC category, it suggests that "all profiles might have been generated or assisted by a generative AI tool using a consistent template". For the IP and CFM categories, the profiles of FH and AIP present high similarity, indicating AI-generated photos of the personas. Lastly, for the CS category, the profiles for FH and AIT were identified as AI-generated. These results show that the differences among the various proposed profiles were subtle, making it hard for the GenAI tool to identify what was human-created.

Further interesting observations, related to profile completeness and consistency, can be derived from the evaluators' responses to open-ended questions. Regarding completeness, for example, an evaluator suggested to consider adding information to the profiles: (a) *"more detailed description of the occupation"*; (b) *"his needs, frustrations, motivations and what he wants to achieve"*; and (c) "*what type of relationships he has in his work setting, what these relationships say about him, who is pushing or motivating him, what are his triggers, and what kind of phrases he is saying about the topic*". As for consistency, sample comments from evaluators include: (a) *"It seems strange to me that this person is an influencer, but his skills do not include being a user of AI tools"*; (b) "*[he] is a very formal university professor, wearing a jacket and tie. He is the first activist I know who uses that type of outfit*", and "*I think that the text does not coincide with the reasoning of a 24-year-old person, who is more than a student, a professional, or a master degree's student"*; (c) *"From the physical features he does not look like a person from Mexico"*, or *"The image gives me the feeling that she is not Mexican.*"

6 Discussion Personas for AI

In this section we address our two research questions and other lessons learned. We also discuss limitations of the work.

6.1 Research question 1

Since this a qualitative study, we conducted a simplified data synthesis of evaluations based on the responses to the Persona Perception Scale. In this synthesis, we considered three dimensions: (1) vertical observation, referring to the evaluators' responses across different statements; (2) horizontal observation referring to the statements across different evaluators; and (3) comparing the evaluation of the four creation techniques across different proto-persona profiles. In both vertical and horizontal observations, we found a tendency towards a perceived high quality of the proto-persona profiles. In horizontal observation, three constructs from the Persona Perception Scale were more evident: Clarity, Consistency and Willingness to use, regardless of the evaluators' certainty on the creation technique that was used.

Neither in the invitation nor in the introduction text for joining the proto-persona profiles evaluation did we mention the use GenAI tools or the creation techniques process. Thus, evaluators only had this information when explicitly asked which of the four creation techniques they believed "their" proto-persona was created. We found a higher number of positive answers for creation techniques that relied more on AI-generated content, namely, AIT and AI-gen, followed by human-created (FH) proto-persona profiles. AIP received lower ratings in general. These results lead us to believe that GenAI assistance can enrich human expertise in significant ways, and that a hybrid approach may even outperform fully human creation of proto-personas. AI-generated images, however, have been less convincing than their textual counterparts.

With respect to identifying the creation techniques used and the evaluators' reasoning about this, only four out of sixteen evaluators identified them correctly. AI-gen was best identified, followed by FH. Out of these four participants, one evaluator was unsure about how the photo was created, whereas another was unsure about the text. Repetitive or superficial and generic sentences made them suspect that the profiles were AI-generated. Some of the remaining twelve evaluators (who could not identify which creation technique was used), expressed they were unsure even though they commented on some aspects that could be evidence for AI-gen or FH. This result is small evidence (still much study is needed on the topic) that it is already a hard task (not a futuristic one) for humans to distinguish proto-persona profiles created by humans from AI-generated or by hybrid techniques. Comparing this result with the analysis made by a GenAI tool, the tool presented three criteria used for its analysis: visual consistency, textual content, and design elements. Even though we did not give human evaluators specific criteria for their creation technique analysis, the two first criteria were used by them in a natural way. The third criterion might not be used, since they could not compare one profile to another as we gave the GenAI the opportunity to do. The ChatGPT analysis result may be evidence that it is still a hard task (a futuristic one maybe) for GenAI tool to distinguish proto-persona profiles created by humans, AI tools or hybrid techniques.

6.2 Research question 2

To answer RQ2, we rely on three qualitative indicators, one taken from Stage 1 (profiles generation) and two from Stage 2 (profiles evaluation). The indicator from Stage 1 refers to the opportunity to collaborate among six higher education and HCI experts to focus on the context of designing strategies for promoting ethical awareness, identify stakeholders and create their proto-persona profiles with the goal of positioning them at the center of the design process. While creating proto-personas, natural questions came to our mind, such as: What strategies could support Alex to become a responsible AI developer or CEO (chief executive officer) upon graduation? According to the AI-generated text on Alex's profile, "Alex has seen firsthand how some of his classmates and instructors have integrated responsible computing principles into software research and development projects. He has noted that some projects have carefully considered the ethical impact of their design and development decisions." Interestingly, even though from what we have seen in our context in Mexico this is not happening yet, the evaluator of this profile did not question its content.

One indicator from Stage 2 refers to responses to the "Willingness to use (WTU)" construct of the PPS (statements 9-11 in Table 1). Respectively, eleven and thirteen evaluators strongly agreed with statement 9 ("I would make use of this persona to codesign strategies to promote ethical awareness on responsible computing issues") and 11 ("This persona would improve my ability to make decisions about the interested parties it describes"). Statement 10 ("I can imagine ways to make use of the persona information in my task of strategies codesign to promote ethical awareness on responsible computing issues") did not receive negative answers for any proto-persona profile evaluated. These perceptions of higher education stakeholders suggest that these profiles could support their strategies' design process by materializing potential interested parties.

Another indicator from this stage are the evaluators' suggestions of strategies for ethical awareness promotion on responsible computing issues while having the proto-persona profiles in mind. As mentioned in Section 6.2, we already identified seven helpful topics for our broader research context. In fact, we

are already planning and running research activities related to four of those topics and we are assessing how all of them can be made part of our methodology.

6.3 Other lessons learned from the study

Accepting that GenAI tools came to stay, we have derived four recommendations from our study for those who intend to navigate this wave departing from here: (1) Generate as many (proto-) persona profiles as possible, using a well-defined template and method. Then, define criteria to select a smaller set of persona profiles from the larger set. By doing so, a diverse larger set is more likely to produce more suitable profiles [15]. (2) Balance and evaluate the amount of data to be included in the persona profile against the number of questions in your evaluation, so as to avoid cognitive overload for evaluators. Pilot testing is always a good practice. Evaluators of this study provided a few suggestions for improving proto-persona profiles that we did not consider at the beginning. (3) Consider the cost-benefit of using existing scales in qualitative studies. The Persona Perception Scale is a validated research instrument that has been used by its proponents and by other HCI researchers. We wanted to use it, so we devised a way of analyzing results qualitatively and we have been able to learn a lot about our proto-personas through its use. It is important to note, however, that PPS is lengthy, so its application may imply a significant amount of work and time from the evaluators. Even with our adapted, 20-statement version of PPS, we opted to request our participants to evaluate only one profile each. An alternative to consider might be an interesting open-ended question similar to the one we gave to the GenAI tool when comparing the four proto-persona profiles by category. A similar study, but with a quantitative approach would be feasible (yet more costly) by relying on crowdsourcing platforms (e.g., Prolific, CloudResearch). (4) Finally, consider providing the various proto-persona profiles to evaluators so as to allow them to compare, observe and perceive differences between distinct creation techniques or between categories of personas.

6.4 Limitations of the work

Research instrument translation is never an easy task to accomplish, difficulties ranging from word choices to cultural or contextual setting of application. At an initial phase, the use of the word "persona" in Spanish (meaning *person*) can be confused with "persona" as a technique. The use of the term "proto-persona" helped us, besides being more truthful to the technique we used. Another recommendation is to adopt the term "user persona" instead. Still, an authoritative, widely accepted translation of PPS into Spanish (and Portuguese) is a pending task.

Admittedly, having AI-generated proto-persona profiles with higher positive perceptions among evaluators (using the Persona Perception Scale) does not conclusively prove the prevalence of one technique over another. Rigorous quantitative studies would be helpful in obtaining more evidence in this direction.

Not knowing the origin of data used by GenAI tools to generate content (proto-personas' photos or text) is a real concern and, for this reason, a careful review of their generated content must always be carried out. To this task, expert knowledge, specialized literature comparison, and many-eyes evaluation can be applied.

Finally, as we mentioned earlier, evaluators of proto-persona profiles included former colleagues, students and research collaborators. In some cases, this might introduce bias towards positive results. We tried to mitigate bias by asking collaborators to be as sincere as possible during evaluation and by not revealing the techniques used for the generation of proto-personas. In a future study, collaborators could be invited randomly in advance.

7 Conclusions

In this paper, our main goal was to explore means to create diverse and representative profiles that encapsulate the perceptions and skills of higher education stakeholders on responsible computing awareness. In the process, we wanted to experiment with GenAI tools and blend them with human expertise for creating and generating proto-persona profiles. We aimed to determine how this blend could impact our design work. We achieved our goals and discussed results and their implications. Summing up what we learned, we produced evidence of new possible ways in which human experts can be assisted by the collaboration of GenAI tools in the application of the Personas technique. An additional interesting result was the qualitative analysis of data collected through the Persona Perception Scale (especially regarding its constructs), which was enriched and confirmed by comments from evaluators. Moreover, suggestions from evaluators for promoting awareness on responsible computing and for improving proto-persona profiles will be taken into account.

This type of study also can trigger philosophical thinking when perceiving that human and GenAI tool evaluators are not able to distinguish whether a human or GenAI tool created proto-persona profiles. From this, questions that came to mind include: Which are the current limits of GenAI tools and human collaboration? Is there a way of identifying each part's outcomes or are they already so blended that we cannot tell? Can we imagine what is to come knowing this is only "stage 1 of the game"?

Moreover, from literature presented in Section 2 and our experience in this study, we view a current state of research (e.g., [15]) and teaching (e.g., [5]) activities applying data-driven and GenAI tools to support the creation process of personas. This means that it is possible to conduct collaborative work with AI, but what literature and research show us is that we need to plan for it, meaning that we need to have our motivations clear, to define our goal, methodology and evaluation indicators. This way of thinking and acting can provide transparent work environments, once it is free of prohibitions, disclosure of what is done is part of the process, and open to collectively expand knowledge.

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