Exploring Gender Differences in Persona Creation for Citizen-Centric Smart City Web App

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Abstract. This study explores the differences in gender and delves into the pivotal intersection of innovation and inclusivity within the paradigm of smart cities. This study employs a meticulous mixed-method approach, combining surveys and in-depth interviews, to unravel the nuanced needs and aspirations of diverse gender groups within a smart city context. The data analysis, rooted in affinity mapping, illuminates distinctive perspectives held by techno men, techno women, moderate men, moderate women, cautious men, and cautious women. The findings underscore a disparity in technological optimism between genders, with men displaying greater optimism while women focus on non-technological facets, particularly concerning gender representation and harassment anticipation. Building upon these insights, this research pioneers the creation of gender-inclusive personas tailored for a smart city web app named "LAYAR: Layanan Administrasi RT/RW". These personas serve as a profound bridge between data-driven decision-making and human-centered design.

Keywords: gender, persona, smart city

1 Introduction

Smart cities represent a convergence of innovation and urbanization, harnessing cutting-edge technology to optimize urban infrastructure and services. As these cities evolve, the need for gender-inclusive design becomes increasingly apparent. Inclusivity is the cornerstone of a progressive urban society [1], [2], where citizens' unique attributes and identities are acknowledged and integrated into the fabric of urban life. The vision of smart cities goes beyond technological advancement; it envisions a holistic transformation that embraces all citizens, regardless of gender.

The discourse on gender-inclusive design propels smart city services into a realm that transcends mere convenience. Gender-inclusive design acknowledges the diverse ways in which people experience and interact with urban environments [3]–[7]. Gender is not a singular characteristic; it intersects with various aspects of identity, influencing how individuals navigate and perceive

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their surroundings. By incorporating gender-inclusive principles, smart city services can break down barriers, foster inclusivity, and amplify the well-being of all citizens.

In this landscape, gender-focused personas emerge as catalysts for reshaping smart city services. Personas provide a human touch in the realm of data-driven decision-making, allowing designers and policymakers to comprehend the nuanced needs and aspirations of gender-diverse citizens. By weaving gender into the personas, smart city stakeholders gain profound insights that guide the design of urban solutions tailored to individual experiences. Gender-focused personas bridge the gap between technology and humanity, amplifying the voices of often marginalized or overlooked segments of the population.

The primary objective of this investigation is to overcome the gender differences that often hinder the development of user personas for a smart city web app named "LAYAR: Layanan Administrasi RT/RW". By creating a set of gender-inclusive personas, we aim to provide a robust foundation for designing an app that caters to the diverse needs, preferences, and experiences of all individuals within a smart city context.

2 Literature Review

Numerous research endeavors have been dedicated to developing personas tailored for intelligent urban services within the context of smart cities. These studies have concentrated on the construction and utilization of personas to enhance the provision of urban services in a technologically advanced urban environment.

Martin Tomitsch [8] addresses the integration of non-human perspectives into the design process of smart urban interventions, employing a non-human personas framework. The study underscores the potential benefits and challenges of incorporating non-human stakeholders in design decisions, aiming to balance human-centric design practices prevalent in smart city projects. The study offers valuable insights into the application of non-human personas and their role in advocating for non-human species. However, a gap in the study lies in the need for further exploration of the effectiveness and ethical implications of utilizing non-human personas, especially considering potential biases, limitations, and risks associated with their application, as well as the broader context of economic motivations and environmental impact assessment within the design process.

The study by Clémentine Schelings [9] aims to profile citizens' perspectives and behaviors towards smart city development, addressing their perceptions of smart city concepts, intended behaviors towards smart solutions, and preferred participatory methods. It employs a large-scale survey distributed to highly educated citizens in Wallonia, Belgium, to construct five personas based on collected data. These personas represent diverse citizen profiles with different priorities and behaviors in the context of smart cities. The study highlights a lack of comprehensive citizen characterization in the existing literature and offers a methodology for creating tailored personas to aid designers, local governments, and stakeholders in considering citizens' perspectives for more effective smart city design and participatory processes. However, the study focuses on a specific region and demographic group, potentially limiting its generalizability to broader populations and contexts, and there remains a need for further

exploration of younger generations' perspectives and the implementation of participatory approaches in smart city development.

The proposed paper, which aims to explore gender differences in persona creation for smart city services, distinguishes itself from the previous studies conducted by Clémentine Schelings and Martin Tomitsch in several key ways. While both Clémentine Schelings and Martin Tomitsch focused on understanding citizens' perspectives and behaviors in the context of smart cities, the proposed paper specifically targets gender differences. It delves into how gender plays a role in shaping users' needs, preferences, and behaviors within smart city environments. This focus on gender differences provides a unique lens through which to examine persona creation and design processes, addressing a critical aspect of inclusivity and equity.

3 Methodology

This study employed a mixed-methods approach to investigate gender differences in persona creation for smart city services. The methodology was designed to provide a deep understanding of gender-specific perspectives and needs while also capturing broader trends through quantitative analysis. The subsequent persona development phase synthesized insights from both qualitative and quantitative data, yielding gender-inclusive personas that are representative of the diverse spectrum of gender identities.

3.1 Data Collection

The technique used to gather quantitaive data in this study was a survey. The survey was distributed online among citizen of Batam. Additionally, the survey was structured in a way that allowed participants' responses to be directly analyzed to generate their "smart citizen profile" proposed by [9]: techno, cautious, or moderate. Since the objective of this study is to investigate the gender differences that commonly impede the creation of user personas for a smart city web applicationwe designed the survey that comprises four categories of inquiries: (i) demographic questions covering age, gender, living situation, professional status, field of work, and educational level; (ii) assessment of various aspects of smart city concepts; (iii) intended behavior concerning digital and analog solutions; and (iv) preferred participatory methods (online or offline interview).

After the survey was conducted, data collection continued with in-depth interviews. This study analyzes gender differences in creating personas through in-depth interviews using affinity mapping. Affinity mapping involves organizing and categorizing ideas into thematic clusters and groups.

3.2 Sampling

The sampling process was conducted using purposive sampling, wherein the researcher established specific criteria based on the characteristics of the subjects to be included in the sample. This technique involved distributing a questionnaire link via Google Forms, accompanied by instructions intended for residents of Batam City aged at least 17 years. The questionnaire was shared with respondents whom the researcher deemed capable of meeting the research standards.

4 Results and Discussions

4.1 Data Analysis Results

Google Form link were sent to 30 potential participants and distributed online through social media and WhatsApp group during August-September 2022. A total of 306 participants contributed to the online survey. However, only 32 respondents were willing to fully engage in the study through interview. Demographic of the participants is depicted in Table 1.

Table 1. Demographic of participants.

Item		N	Percentage
Age	17-25	8	25%
	26-35	12	37.5%
	36-45	3	9.375%
	46-55	7	21.875%
	56-65	2	6.25%
Gender	Male	17	53.125%
	Female	15	46.875%
Professional status	Worker	9	59.375%
	Unemployed	3	9,375
	Student	8	25%
	Other	2	6.25%
Level of education	Without a degree	-	-
	Primary-junior high school	4	12.5%
	Senior high school	11	34.375%
	Diploma-bachelor	14	43.75%
	Postgraduate	3	9.375

Our survey revealed that 93% of respondents preferred the online interview as a participatory method, citing its convenience in terms of time flexibility. Hence, we conducted an online interview via Zoom with the participants. Based on the affinity mapping technique, Figure 1 depicts the findings obtained from the interview with the respondents regarding their behavior, pain, and expectation from a smart city web app.

From the data analysis process, it was found that participants could be grouped into three basic categories: citizens who are aware of latest technology to access government sites (techno), moderate citizens, and citizens who are skeptical about the technology and services available on government websites (cautious). Each of these groups was further examined based on their gender to explore potential differences that might impact the creation of personas for the smart city web app that will be developed.

Fig. 1. Overview of the affinity mapping

4.2 Results of Persona Creation

In the development of smart city web apps, the pivotal role of user-centric design cannot be overstated. To this end, this study delves into the nuanced requirements of diverse user segments, stratified along the axes of technological familiarity and gender, within the context of a comprehensive smart city application. By examining these personas, ranging from the tech-savvy to the cautious, and discerning the disparities between genders, a profound insight into the multifaceted dimensions of user expectations emerges.

The Tech-Savvy Men or the techno group depicted in Figure 2, exemplified by individuals like Alex, embody an optimistic disposition towards technology, underscored by their keenness to explore innovative features while upholding the quintessence of simplicity. On the other hand, the moderate men, exhibit a cautious yet curious approach, prioritizing user-friendly interfaces and stringent data security. In stark contrast, the cautious men, advocate for minimalism and reliability, eschewing complexity for a streamlined user experience.

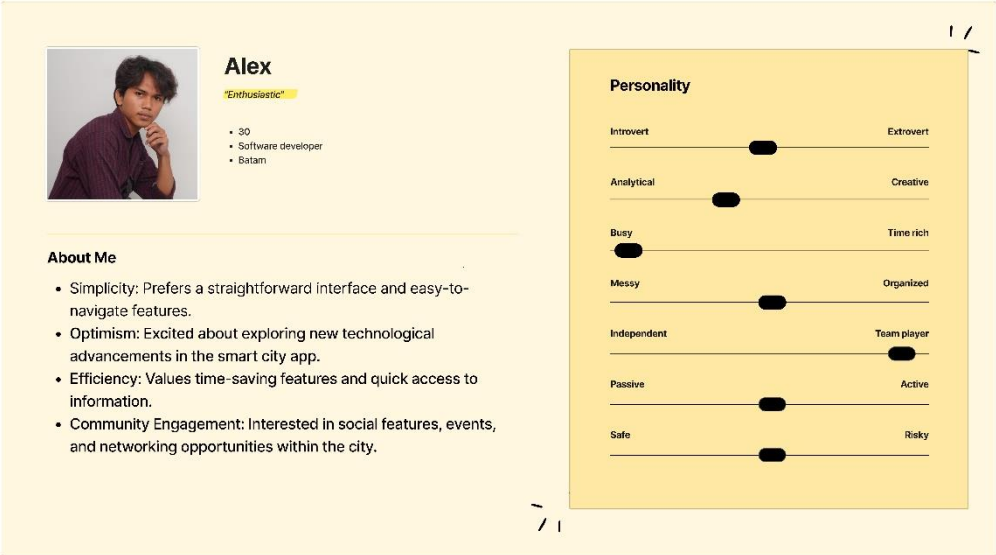

Fig. 2. The techno men persona

On the other hand, the female demographic, as identified in this study, manifests a distinctive set of expectations. Techno women, depicted by Figure 3, emphasize a paramount concern for privacy, inclusivity, and mechanisms to combat harassment, aligning with their optimistic outlook towards technology. Moderate women tend to focus on safety and community engagement, valuing a balance between technological sophistication and societal well-being. Meanwhile cautious women underscore the necessity for robust privacy features, comprehensive user support, and accurate gender representation within the smart city web app.

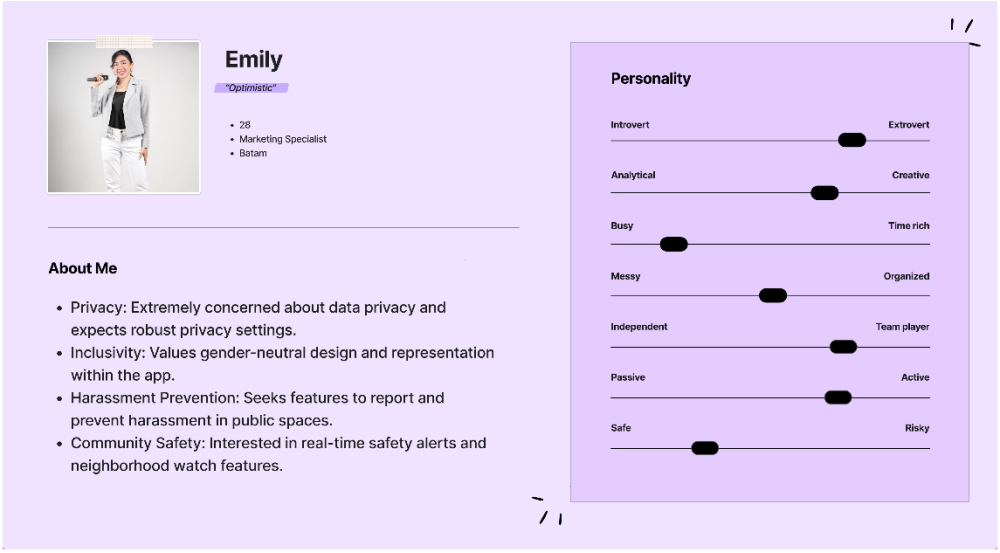

Fig. 3. The techno women persona

4.2 LAYAR and The Persona Creation

The personas crafted in this study are not isolated entities but rather the cornerstone upon which the user experience of the LAYAR platform is built. By aligning the discussed personas with the features and functionalities of LAYAR, a symbiotic relationship emerges, enriching the overall understanding of the smart city application's design and purpose.

The Tech-Savvy Men, represented by individuals like Alex, wants resonance in LAYAR's intuitive interface. For Alex, the app should provide a seamless playground to explore his technological curiosity while appreciating the simplicity and efficiency that aligns with his preferences. Moderate Men, like David, wants a balance between technological sophistication and user-friendliness in the app. David's cautious yet open-minded approach wants solace in the app's clear instructions and personalized recommendations. So LAYAR's development should address his concerns, ensuring that he can explore the app's features without feeling overwhelmed, fostering a sense of confidence and trust in its functionality.

Moreover, the concerns of the female user personas were facilitated by implementing gender-inclusive design and privacy features. Tech-Savvy Women's concern, such as Emily, were facilitated by robust privacy settings and gender-neutral design, fostering a sense of security and inclusivity.

Conclusion and Future Works

This study has unveiled a significant disparity in technological optimism between genders in the context of smart city web app. Men tend to exhibit greater enthusiasm for technological advancements, while women express concern about non-technological aspects, specifically focusing on gender representation and control over the technology such as anticipation of harassment.

While this research has illuminated critical facets of gender-specific user preferences in smart city applications, several areas warrant further exploration for a comprehensive understanding. Future studies could be conducted to enrich the discourse on gender-inclusive smart city design by considering cross-cultural analysis. Extending the study to different cultural contexts can unravel how gender perceptions and technological expectations vary across diverse societies. A comparative analysis could offer nuanced insights into region-specific needs. Furthermore, investigating how age intersects with gender in shaping technological attitudes could also provide a deeper understanding. Younger and older demographics might exhibit distinct preferences, necessitating tailored approaches for age-specific inclusivity.

References

[1] J. Fegert: Towards Inclusive Digital Democracy : A Conceptual Framework For Digital Citizen Participation. (2023)

[2] B. Nemeth: Balancing Between Smart and Inclusive: Learning Cities for Sustainable Urban Communities in Re-thinking Adult Education Research. Beyond the Pandemic. pp. 25–51 (2021)

[3] P. Jayashree, F. Hamza, M. El Barachi, and G. Gholami: Inclusion as an Enabler to Sustainable Innovations in Smart Cities: A Multi-Level Framework. 2019 4th Int. Conf. Smart Sustain. Technol. Split doi: 10.23919/SpliTech.2019.8783013 (2019)

[4] S. Stumpf et al.: Gender-inclusive HCI research and design: A conceptual review. Vol. 13 No. 1 (2020)

[5] D. Hassett, A. Bennaceur, and B. Nuseibeh: Feel It, Code It: Emotional Goal Modelling for Gender-Inclusive Design. Iin The 29th International Working Conference on Requirement Engineering: Foundation for Software Quality. Vol. 13975 LNCS, pp. 324–336, doi: 10.1007/978-3-031-29786-1_23 (2023)

[6] K. Rampaul and H. Magidimisha-Chipungu: Gender mainstreaming in the urban space to promote inclusive cities. J. Transdiscipl. Res. South. Africa. Vol. 18, No. 1, pp. 1–9, doi: 10.4102/td.v18i1.1163 (2022)

[7] D. Metaxa-Kakavouli, K. Wang, J. A. Landay, and J. Hancock: Gender-inclusive design: Sense of belonging and bias in web interfaces. Conf. Hum. Factors Comput. Syst. - Proc. Vol. 2018-April, pp. 1–6, doi: 10.1145/3173574.3174188 (2018)

[8] M. Tomitsch, J. Fredericks, D. Vo, J. Frawley, and M. Foth: Non-human Personas: Including Nature in the Participatory Design of Smart Cities. Interact. Des. Archit., no. 50, pp. 102–130, doi: 10.55612/s-5002-050-007 (2021)

[9] C. Schelings, A. Defays, and C. Elsen: Profiling Citizens in the Smart City: A Quantitative Study in Wallonia. Smart Cities, vol. 6, no. 4, pp. 2125–2149, doi: 10.3390/smartcities6040098 (2023)