The role of Smart Homes Technology in shaping zillennial housing preferences in Jakarta metropolitan area, Indonesia

El papel de la tecnología de Hogares Inteligentes en la configuración de las preferencias de vivienda de los zillennials en el área metropolitana de Yakarta, Indonesia

O papel da tecnologia de Casas Inteligentes na definição das preferências habitacionais da zillennial na área metropolitana de Jacarta, Indonésia

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Abstract

This study investigates smart home technology adoption among the Zillennial Generation in the Jakarta Metropolitan Area (JMA), Indonesia's, largest urban agglomeration and one of the most densely populated in the world. Representing 24.3% of the national population, Zillennials are emerging as a key demographic in the housing market, characterized by technological dependency and evolving lifestyle expectations. The research employed a survey method and applied an extended Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT), as developed by Mashal et al. (2020–2023), this research explores socio-demographic influences on smart home perceptions. The findings reveal three key insights: high market awareness across all income levels; household size as a moderating factor; and adoption is strongest at both ends of the residential spectrum, among residents of compact dwellings and those in expansive homes. Despite the growing body of research on smart home technologies, limited attention has been given to the Zillennial cohort. Theoretically, this study contributes by contextualizing TAM and UTAUT within the socio-cultural dynamics of Zillennilas in a developing urban context. Practically, it offers evidence-based recommendations for designing inclusive and demographically responsive smart home solutions In rapidly urbanizing areas like JMA.

Keywords: smart home, zillennial, urban housing, developing countries, Jakarta Metropolitan Area (JMA).

Resumen

Este estudio investiga la adopción de tecnologías de hogares inteligentes entre la generación Zillennial en el Área Metropolitana de Yakarta (JMA), la mayor aglomeración urbana de Indonesia y una de las más densamente pobladas del mundo. Representando el 24,3% de la población nacional, los Zillennials emergen como un grupo demográfico clave en el mercado de la vivienda, caracterizado por su dependencia tecnológica y expectativas de estilo de vida en evolución. La investigación utilizó un método de encuesta y aplicó una versión extendida del Modelo de Aceptación de Tecnología (TAM) y la Teoría Unificada de Aceptación y Uso de Tecnología (UTAUT), desarrollados por Mashal et al. (2020–2023), para explorar las influencias sociodemográficas en las percepciones sobre hogares inteligentes. Los hallazgos revelan tres ideas clave: alta conciencia del mercado en todos los niveles de ingresos; el tamaño del hogar como factor moderador; y una adopción más fuerte en ambos extremos del espectro residencial, tanto en viviendas compactas como en hogares amplios. A pesar del creciente cuerpo de investigación sobre tecnologías de hogares inteligentes, se ha prestado poca atención al grupo Zillennial. Teóricamente, este estudio contribuye al contextualizar TAM y UTAUT dentro de la dinámica sociocultural de los Zillennials en un contexto urbano en desarrollo. Prácticamente, ofrece recomendaciones basadas en evidencia para diseñar soluciones de hogares inteligentes inclusivas y sensibles al perfil demográfico en áreas de rápida urbanización como JMA.

Palabras clave: casa inteligente, zillennial, vivienda urbana, países en desarrollo, Área Metropolitana de Yakarta (JMA).

Resumo

Este estudo investiga a adoção de tecnologias de casas inteligentes entre a Geração Zillennial na Regiao Metropolitana de Jacarta (JMA), a maior aglomeração urbana da Indonésia e uma das mais densamente povoadas do mundo. Representando 24,3% da população nacional, os Zillennials estáo emergindo como um grupo demográfico-chave no mercado habitacional, caracterizado por dependência tecnológica e expectativas de estilo de vida em transformação. A pesquisa utilizou um método de levantamento por questionário e aplicou uma versão estendida do Modelo de Aceitação de Tecnologia (TAM) e da Teoria Unificada de Aceitação e Uso de Tecnologia (UTAUT), conforme desenvolvido por Mashal et al. (2020–2023), para explorar as influências sociodemográficas nas percepções sobre casas inteligentes. Os resultados revelam três principais insights: alta conscientização do mercado em todos os níveis de renda; o tamanho do domicílio como fator moderador; e maior adoção nos extremos do espectro residencial, entre moradores de habitações compactas e de residências amplas. Apesar do crescente corpo de pesquisas sobre tecnologias de casas inteligentes, pouca atenção tem sido dada ao grupo Zillennial. Teoricamente, este estudo contribui ao contextualizar o TAM e o UTAUT dentro das dinâmicas socioculturais dos Zillennials em um contexto urbano em desenvolvimento. Na prática, oferece recomendações baseadas em evidências para o design de soluções habitacionais inteligentes inclusivas e sensíveis ao perfil demográfico em áreas de urbanização acelerada como a JMA.

Palavras-chave: casa inteligente, zillennial, habitação urbana, países em desenvolvimento, Área Metropolitana de Jacarta (JMA).

Introduction

Indonesia, with a population of approximately 278 million (Annur, 2023), and predominanantly young demographic, faces rising housing demand. Developers respond by building landed houses on urban fringes due to land scarcity, while vertical housing remains less preferred. Although affordable housing units are relatively small in size, many are now marketed under the "Smart Home Inside" label, integrating basic technologies such as smart door-locks, CCTV, and sensor lights (SECOM, 2023). In 2022, 7.28 million Indonesian homes featured Smart Home (SH) products, with an estimated annual growth of 1 million units (SECOM, 2023). However, adoption often surpasses user awareness, and high maintenance costs limit long-term effectiveness.

This research focuses on the Jakarta Metropolitan Area (JMA), Indonesia's largest metropolis and the 17th most populous in the world (Kolb, 2019), with 31.99 million residents across 5,496 km². The study focuses on the Zillennial Generation (ZG), comprising 24.3% of Indonesia's population, or equivalent to around 67 million people (BPS, 2023). Within the JMA alone, the ZG population is estimated at approximately 7.9 million. Given their digital nativity and growing role in the housing market, this study examines SH perceptions and adoption among ZG in JMA using an extended Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT), particularly as developed by Mashal et al. (2020–2023). The findings aim to support cross-cultural comparisons and to contribute to a deeper understanding of global housing trends, particularly regarding the underexplored intersection of housing and technology in the context of ZG topics.

The economic landscape of JMA presents a significant contextual factor for housing adoption. While the region is a primary economic hub, the high cost of living poses a substantial challenge for its young residents. The World Bank (2023) classifies Indonesia as a lower-middle-income economy, yet urban centers like Jakarta exhibit living costs that can outpace earning potential. This is corroborated by data from BPS-Statistics Indonesia (2022), the average monthly cost of living in the JMA in 2022 was estimated at IDR 14.88 million, or roughly USD 900 (Widi, 2023), far exceeding the provincial minimum wage of IDR 5.39 million, equivalent to approximately USD 327 (Governor of Jakarta Decree No. 829, 2024). This income-expenditure disparity underscores the financial constraints faced by the ZG, validating the premise that cost is a pivotal barrier to adopting ancillary technologies like SH.

Previous research on SH has predominantly focused on technical features and elderly users (Lee and Kim, 2020), studies focusing younger generations—particularly in developing countries—remain limited. Existing literature highlights SH interest among youth in developed contexts, such as the United States (Stromberg, 2020), with some attention to Millennials in Johor, Malaysia (Rasyidah et al., 2020). However, insights specific to ZG remain limited. Moreover, the application of behavioral acceptance models such as Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) within SH contexts is still underexplored (Mashal et al., 2023). This study fills that gap by offering empirical insight into SH adoption among ZG in JMA and propose a foundation for cross-cultural housing analyses in emerging urban markets.

Materials
Smart Homes Technology

The primary objective of SH is to enhance efficiency (De Ruyck et al., 2019), while simultaneously improving comfort, providing greater control, increasing safety and security, and promoting resource conservation and energy efficiency (Alam et al., 2012; Baillie and Benyon, 2008; Hargreaves et al., 2018; Kolny, 2023; Mashal et al., 2023; Wilson et al., 2017). SH environments are equipped with networked sensors and intelligent systems that enable remote management of household appliances via the internet (Gaikwad, Gabhane, and Golait, 2015), making device placement less critical (Bitterman and Shach-Pinsly, 2015). Younger generations are increasingly drawn to SH technology due to attractive features and perceived benefits (Yang et al., 2018). In the United States, Zillennials express strong interest in SH applications (Melcher, 2021), with a similar trend observed among youth and young adults in Jordan (Mashal et al., 2020). In Indonesia, SH adoption has reportedly increased annualy (SECOM, 2023), largely driven by the growth of the country's youth population.

To understand the behavioral dynamics behind SH adoption, this study employs the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). TAM emphasizes two core constructs: Perceived Usefulness (PU) and Perceived Ease of Use (PEoU), which reflect users' beliefs that technology enhances performance and is effortless to use (Mashal et al., 2023). Complementarily, the UTAUT explains user behavior through effort expectancy, performance expectancy, social

influence, and facilitating conditions (Mashal et al., 2023). Further refinements by Mashal et al. (2020) highlight the importance of user awareness, trust, perceived enjoyment, and personalization in shaping attitudes toward SH services. These factors, alongside social influence and cultural context, significantly influence users intention to adopt SH technologies (Choi et al., 2014).

Zillennial Generation

The term "Zillennial" merges "Millennial" and "Generation Z" (Diaz, 2023; Magalhaes, 2023; Suresh, 2022), to describe micro-generation between Millennial and Generation Z (Hartmans, 2023; White Hutchinson, 2023). Zillennials, born roughly between 1990 and 2000, are not quite Millennials, but they're not quite Generation Z either (Hartmans, 2023; Owens, 2022; White Hutchinson, 2023). Zillennials are considered a pivotal demographic due to their emerging roles in society and the economy (Suresh, 2022). According to psychologist Jean Twenge, they are distinct from previous generations (Fields, 2021; Kaufman, 2023) due to the analog-to-digital transition that occured during their formative years (Bijolia, 2022; Owens, 2022). While their early years involved outdoor activities, their adolescence was largely screen-dominated (Diaz, 2023), positioning them as one of the earliest technology-dependent generation (Fields, 2021; Rawat and Rawat, 2023). In contrast to Millennials, who gradually adapted to digital innovations (Nakagawa and Yellowlees, 2020), and Generation Z, who are digital natives with extensive technological engagement (Jannah and Muliatie, 2023), Zillennials exhibit a blended identity that bridges both experiences.

Zillennials tend to value innovation and independence (Owens, 2022; Rawat and Rawat, 2023; Strzalka, 2019). They integrate online and offline experiences, cultivating diverse engagements with technology, culture and lifestyle (Owens, 2022). Technology function as a medium for connectivity, often subtituting in-person interaction (Bassiouni and Hackley, 2014; Fields, 2021; Twenge, 2023). Zillennials frequently juggle multiple jobs and prefer independent work settings (Suresh, 2022), while showing limited participation in community-based activities (Fields, 2021). In the Indonesian context, the lifestyles of Zillennials are also shaped by global cultural flows, as foreign popular culture exerts a notable influence (Wahyudi, 2023).

Research method

This study employed a survey method using a 6-point Likert scale to capture nuanced expressions of agreement or disagreement (Hofman, Halman, and Ion, 2006). The instrument was adapted from a validated dissertation questionnaire, with items derived from literature on ZG traits and SH trends. The independent variables included modern residential equipment (X_1) and SH usage (X_2), analyzed in relation to perceptions of contemporary architectural trends (Y). Several features were combined into composite items serving as proxy indicators for broader psychological constructs such as behavioral intention and perceived usefulness. While practical, this approach limits construct precision; thus references to TAM and UTAUT frameworks are conceptual application rather than direct tests. Future studies should adopt validated multi-item scales grounded in TAM or UTAUT to enhance construct validity.

Data were collected from 159 respondents using snowball sampling via Google Forms, targeting the hidden ZG population adopting SH. Although the sample exceeded the minimum threshold (n = 100) based on Yamane's formula (Israel, 1992; Singh & Masuku, 2014), it may not fully represent the estimated 7.9 million ZG in the Jakarta Metropolitan Area (JMA), introducing potential selection bias. To address conceptual overlap and potential multicollinearity between X_1 and X_2, two separate regression models were used, allowing clearer interpretation of each variable's unique contribution. Results are presented exclusively in Table 4. Bootstrapping with 5,000 resamples was applied to ensure robust estimates.

Survey data from 159 respondents representing diverse professional backgrounds and a nearly gender-balanced sample (50.31% female, 49.69% male), predominantly aged 26–34 years (83.6%), with most identifying as single (52.20%) and non-homeowners (66.67%). Additionally, 45.91% reported a monthly income ranging from USD 333 to 666 (Table 1). Descriptive results indicated substantial support for modern equipment and SH technologies. Specifically, 74.21% of respondents selected options 5 or 6 on the Likert scale, reflecting strong support for modern equipment; 84.28% expressed approval of SH features; and 57.86% perceived SH technologies as reflective of contemporary architectural trends (Table 2). These findings suggest

a generally favorable perception of SH integration in residential environments.

A multiple regression analysis assessed the influence of modern equipment and SH technologies on perceptions of contemporary architectural trends. Both predictors showed statistically significant positive associations—modern equipment (β = 0.271, t = 2.570) and SH features (β = 0.367, t = 3.079)—exceeding the critical t-value (1.975, df = 159), confirming their individual relevance (Table 3). However, the model's explanatory power was modest. This was further supported by separate regression models for each predictor, yielding R^2 values of 7.4% and 9.0% (Table 4). Thus, while technological integration is a statistically significant factor, the primary limitation of this study is the low explanatory power (R^2 values of 7.4% and 9.0%), which clearly indicates model underspecification. Consequently, the following discussions regarding the influence of demographic factors on SH preferences should be viewed as preliminary explorations of potential relationships, not as definitive explanations. Architectural preferences are likely shaped by a broader set of factors not captured in this study. Future research should identify and incorporate additional variables to improve model robustness and deepen understanding of the multifaceted nature of SH adoption and architectural preferences.

Gender-based analysis revealed that both male and female respondents showed high levels of interest in SH adoption (83.54% and 85%, respectively) and in the integration of modern equipment (72.15% and 76.25%). Moreover, 57.5% of female respondents and 58.23% of male respondents perceived SH as reflective of current architectural trends. These findings indicate that both genders exhibit a strong inclination toward implementing SH and adopting modern equipment, and strongly agree that SH adoption reflects a contemporary architectural trend (Table 5).

Marital status and family size appear to influence preferences regarding SH and modern home equipment.

Table 1. Grouping of respondents. Source: Merwan Indra Z.

Grouping of respondents	Number of Respondents	
Gender		
Female	80	50.31%
Male	79	49.69%
Summary	**159**	**100.00%**
Marital status		
Single	83	52.20 %
Married with no children	11	6.92 %
Married, 1 child	43	27.04 %
Married, 2 child	21	13.21 %
Married, children >3	1	0.63 %
Summary	**159**	**100.00 %**
Income (IDR)		
< 5 mio/month	42	26.42 %
5 – 10 mio/month	73	45.91 %
10 – 15 mio/month	25	15.72 %
> 15 mio/month	19	11.95 %
Summary	**159**	**100.00 %**

Table 2. Result of the respondent's answers. Source: Merwan Indra Z.

Variables	Questions	Percentage of Answer Choices					
		(1) Strongly disagree → (6) Strongly agree					
		1	2	3	4	5	6
Smart home Technology	X. 1.1 (Modern equipment)	0.63%	0.63%	5.66%	18.87%	18.24%	55.97%
	X. 1.2 (Smart home features)	1.25%	0.63%	0.63%	13.21%	30.19%	54.09%
	Y (Architectural trends)	5.03%	3.77%	8.18%	25.16%	20.75%	37.11%

Table 3. Result of multi-regression test. Source: Merwan Indra Z.

Model	Unstandardized Coefficients		Standardized Coefficients	t-calculated	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	1.278	.714		1.789	.076		
Modern equipment	.271	.105	.201	2.570	.011	.914	1.095
Smart Homes	.367	.119	.241	3.079	.002	.914	1.095

Table 4. Source: Merwan Indra Z.

Aspect	Modern Equipment	Smart Home
Strength of Relationship (R)	0.272	0.3
Explained Variance (R²)	7.40%	9.00%
Regression Coefficient (B)	0.366	0.457
Significance	Significant (p = 0.001)	Highly Significant (p < 0.001)
Bootstrap CI for B	[0.149, 0.571]	[0.160, 0.694]

Table 5. Analisys by gender. Source: Indra et al.

How much do you want to implement smart home technology?

Gender	1.0 (Strongly Disagree)	2.0 (Disagree)	3.0 (Slightly Disagree)	4.0 (Slightly Agree)	5.0 (Agree)	6.0 (Strongly Agree)
Female	1.25%	0%	0%	13.75%	31.25%	53.75%
Male	1.27%	1.27%	1.27%	12.66%	29.11%	54.43%

How much do you want to have modern equipment for your home (solar panels, cleaning robots, CCTV, smart door locks, sensory light, etc.)?

Gender	1.0 (Strongly Disagree)	2.0 (Disagree)	3.0 (Slightly Disagree)	4.0 (Slightly Agree)	5.0 (Agree)	6.0 (Strongly Agree)
Female	0%	1.25%	3.75%	18.75%	20%	56.25%
Male	1.27%	0%	7.59%	18.99%	16.46%	55.70%

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Gender	1.0 (Strongly Disagree)	2.0 (Disagree)	3.0 (Slightly Disagree)	4.0 (Slightly Agree)	5.0 (Agree)	6.0 (Strongly Agree)
Female	5%	5%	7.50%	25%	23.75%	33.75%
Male	5.06%	2.53%	8.86%	25.32%	17.72%	40.51%

Respondents who were married with one child (95.24%) or without children (90.9%) demonstrated the strongest support for SH implementation, followed by single respondents and those with two children (approximately 80%). However, enthusiasm declined among respondents from larger households (more than three children). Interest in modern equipment followed a similar pattern: respondents married with two children (76.19%), those with one child (73.81%), and single (75.90%) expressed relatively high levels of support, but lower enthusiasm among larger families. While those married without children reported moderate agreement (63.63%). Furthermore, 76.19% of respondents married with two children strongly agreed that SH reflects contemporary architectural trend, whereas other groups expressed lower levels of agreement (below 59.04%). These findings suggest that interest in SH and modern equipment is associated with family size, with lower enthusiasm observed among respondents with larger households (Table 6).

Analysis based on homeownership reveals that both homeowners and non-homeowners exhibit a high level of interest in SH adoption, with 83.96% indicating agreement (Table 7). A very high level of agreement was observed among respondents living in homes under 30 m² (100%, n=4) and those in residences over 72 m² (94.44%). However, the finding for the under 30 m² group must be interpreted with extreme caution due to the very small sample size (N=4), which renders it inconclusive for generalization.

Income level appears to influence respondents attitudes toward SH adoption and modern home equipment. Strong interest in SH implementation was reported across all income groups earning between USD 333 and 1,000 per month, with the highest agreement observed among respondents earning above USD 1,000 (94.74%) and those in the USD 666–1,000 range (92.00%). A similar trend was found regarding modern equipment preferences (89.47% and 84.00%, respectively). Interestingly, respondents earning below USD 333 expressed the strongest agreement (69.05%) with the idea that SH represents a contemporary

architectural trend, whereas other groups averaged around 50%, with the USD 666–1,000 bracket reporting the lowest alignment (44.00%). These findings suggest that SH adoption is more prevalent among higher-income respondents, its symbolic or perceived aspiration resonates more with lower-income groups (Table 8).

Survey results indicate that SH adoption among the ZG in the JMA consistently reflects high levels of interest across diverse income groups, marital statuses, professions, and genders. However, distinct motivational patterns emerge when analyzed from different demographic and socio-economic perspectives.

1. Home Ownership and Property Size. An initial exploratory analysis suggests a potential trend in the smallest properties (<30 m²), where all respondents (100%) agreed that SH represents a modern architectural trend, closely associated with compact living preferences, modernity, and adaptability.

Table 6. Analysis by marital status. Source: Indra et al.

How much do you want to implement smart home technology?

Marital Status	1.0 (Strongly Disagree)	2.0 (Disagree)	3.0 (Slightly Disagree)	4.0 (Slightly Agree)	5.0 (Agree)	6.0 (Strongly Agree)
Married, 0 children	0%	0%	0%	9.09%	45.45%	45.45%
Married, 1 child	0%	0%	0%	4.76%	47.62%	47.62%
Married, 2 children	0%	0%	0%	19.05%	19.05%	61.90%
Married, >3 child	0%	0%	0%	100%	0%	0%
Single	2.41%	1.20%	1.20%	15.66%	22.89%	56.63%

How much do you want to have modern equipment for your home (solar panels, cleaning robots, CCTV, smart door locks, sensory light, etc.)?

Marital Status	1.0 (Strongly Disagree)	2.0 (Disagree)	3.0 (Slightly Disagree)	4.0 (Slightly Agree)	5.0 (Agree)	6.0 (Strongly Agree)
Married, 0 children	0%	0%	9.09%	27.27%	18.18%	45.45%
Married, 1 child	0%	2.38%	4.76%	19.05%	23.81%	50%
Married, 2 children	0%	0%	4.76%	19.05%	9.52%	66.67%
Married, >3 child	0%	0%	0%	100%	0%	0%
Single	1.20%	0%	6.02%	16.87%	18.07%	57.83%

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Marital Status	1	2	3	4	5	6
Married, 0 children	0%	18.18%	9.09%	36.36%	18.18%	18.18%
Married, 1 child	2.38%	2.38%	4.76%	38.10%	23.81%	28.57%
Married, 2 children	0%	0%	0%	23.81%	14.29%	61.90%
Married, >3 child	0%	0%	100%	0%	0%	0%
Single	8.43%	3.61%	10.84%	18.07%	21.69%	37.35%

Table 7. Analysis by Homeownership Source: Indra et al.

How much do you want to implement smart home technology?

Homeonership	1.0 (Strongly Disagree)	2.0 (Disagree)	3.0 (Slightly Disagree)	4.0 (Slightly Agree)	5.0 (Agree)	6.0 (Strongly Agree)
<30 m2	0.00%	0%	0%	0.00%	50.00%	50.00%
36-45 m2	0.00%	0.00%	9.09%	27.27%	54.55%	9.09%
45-72 m2	0.00%	0.00%	0.00%	15.00%	35.00%	50.00%
> 72 m2	0.00%	0.00%	0.00%	5.56%	22.22%	72.22%
Do not own a house yet	1.89%	0.94%	0.00%	13.21%	27.36%	56.60%

How much do you want to have modern equipment for your home (solar panels, cleaning robots, CCTV, smart door locks, sensory light, etc.)?

Homeonership	1.0 (Strongly Disagree)	2.0 (Disagree)	3.0 (Slightly Disagree)	4.0 (Slightly Agree)	5.0 (Agree)	6.0 (Strongly Agree)
<30 m2	0.00%	0%	0%	25.00%	25.00%	50.00%
36-45 m2	0.00%	0.00%	0.00%	54.55%	18.18%	27.27%
45-72 m2	0.00%	0.00%	15.00%	5.00%	30.00%	50.00%
> 72 m2	0.00%	0.00%	5.56%	5.56%	5.56%	83.33%
Do not own a house yet	0.94%	0.94%	4.72%	19.81%	17.92%	55.66%

Is the implementation of smart homes the latest architectural trend?

Homeonership	1.0 (Strongly Disagree)	2.0 (Disagree)	3.0 (Slightly Disagree)	4.0 (Slightly Agree)	5.0 (Agree)	6.0 (Strongly Agree)
<30 m2	0.00%	0%	0%	0.00%	25.00%	75.00%
36-45 m2	0.00%	0.00%	0.00%	45%	27.27%	27.27%
45-72 m2	0.00%	0.00%	10.00%	35.00%	25.00%	30.00%
> 72 m2	5.56%	5.56%	5.56%	33.33%	16.67%	33.33%
Do not own a house yet	6.60%	3.77%	9.43%	20.75%	18.87%	38.68%

Table 8. Analysis by Income Source: Indra et al.

How much do you want to implement smart home technology?

Income USD	1.0 (Strongly Disagree)	2.0 (Disagree)	3.0 (Slightly Disagree)	4.0 (Slightly Agree)	5.0 (Agree)	6.0 (Strongly Agree)
< 333	2.38%	0.00%	0.00%	14.29%	19.05%	64.29%
333-666	1.37%	0.00%	0.00%	19.18%	32.88%	46.58%
666-1000	0.00%	0.00%	4.00%	4.00%	40.00%	52.00%
> 1000	0.00%	5.26%	0.00%	0.00%	31.58%	63.16%

How much do you want to have modern equipment for your home (solar panels, cleaning robots, CCTV, smart door locks, sensory light, etc.)?

Income USD	1.0 (Strongly Disagree)	2.0 (Disagree)	3.0 (Slightly Disagree)	4.0 (Slightly Agree)	5.0 (Agree)	6.0 (Strongly Agree)
< 333	2.38%	0.00%	0.00%	16.67%	19.05%	59.52%
333-666	0.00%	1.37%	12.33%	23.29%	13.70%	49.32%
666-1000	0.00%	0.00%	0.00%	16.00%	28.00%	56.00%
> 1000	0.00%	0.00%	0.00%	10.53%	21.05%	68.42%

Is the implementation of smart homes the latest architectural trend?

Income USD	1.0 (Strongly Disagree)	2.0 (Disagree)	3.0 (Slightly Disagree)	4.0 (Slightly Agree)	5.0 (Agree)	6.0 (Strongly Agree)
< 333	4.76%	4.76%	4.76%	16.67%	33.33%	35.71%
333-666	8.22%	1.37%	12.33%	20.55%	15.07%	42.47%
666-1000	0.00%	12.00%	0.00%	44.00%	12.00%	32.00%
> 1000	0.00%	0.00%	10.53%	36.84%	26.32%	26.32%

However, this finding remains inconclusive due to the severely limited sample size (N=4) within this group. Respondents living in large homes (>72 m²) also demonstrated strong interest, potentially driven by perceived benefits related to convenience, luxury, and property management. In contrast, those in mid-sized residences (36–45 m²) reported the lowest levels of interest, suggesting that SH appeal may be stronger among residents of either compact or spacious dwellings.

2. Income-Level Trends. Income appears to influence both interest and motivation. Respondents earning above USD 666 per month reported the highest desire for SH implementation and acquisition of modern home equipment, consistent with their greater financial capacity. In contrast, respondents with monthly incomes below USD 333 strongly agreed that SH technologies represents a contemporary architectural trend.

3. Gender-Based Trends. Gender did not significantly influence SH adoption preferences, indicating that interest in SH is broadly distributed and not constrained by gender identity.

Based on the above analysis, the key findings can be summarized as follows:

1. Market Awareness Beyond Income Levels: While the highest income group showed the strongest desire for implementation (X variable), all groups showed high agreement that SH is a contemporary trend (Y variable), indicating a widespread market awareness that transcends current income levels.

2. Household Size as a Barrier: Interest in SH is highest among singles and small families, but declines in larger households, likely due to perceptions of cost and complexity.

3. Polarized Demand Drivers: SH adoption is strongest at both ends of the residential spectrum, among residents of compact dwellings and those in expansive homes, each influenced by distinct but compelling needs.

The growth in SH sales in JMA, as reported by SECOM (2023), may correlate with the increasing number of young housing consumers. This trend aligns with Fields (2021), who suggests that the ZG is influenced by digital technology, including its application in residential settings. In the this study, 84.28% of respondents favored SH, reflecting a comparable trend among ZG in the United States (Melcher, 2021). This indicates a rising interest in SH within urban areas of developing countries, particularly in JMA.

Among high-income ZG respondents, the high desire to adopt SH systems is consistent with the TAM construct of PU. While our study did not directly measure PU, it is plausible that their motivation aligns with prior research, which identifies beliefs that SH enhances comfort, efficiency, and security as key drivers (Baillie and Benyon, 2008; Alam et al., 2012; De Ruyck et al., 2019). Perceived enjoyment also reinforces adoption, as SH is associated with modern lifestyles and pleasurable experiences (Mashal et al., 2020). In contrast, lower-income Zillennials were more likely to view SH as a contemporary architectural trend. This may reflect social influence, a construct from UTAUT, where adoption is shaped by observing celebrities or affluent peers (Mashal et al., 2020). This reflects the Zillennial identity, which integrates online and offline experiences to shape engagement with technology (Owens, 2022). Given their digital connectivity (Bassiouni and Hackley, 2014), SH technologies may serve as relevant tools for remote control and digital interaction within the home environment.

For large families, managing SH systems may elevate users effort expectancy, as SH implementation may not be perceived as easy to use when accommodating numerous occupants with diverse needs and interactions. Although SH offer convenience, the PU and PEoU may be questioned when cost and control are concerns. In contrast, small-homeowners often justify SH investment through long-term savings and improved quality of life in limited space (De Ruyck et al., 2019). Effort expectancy is also lower in compact residences, due fewer devices. For large-property owners, SH provides PU through enhanced convenience, control, and operational efficiency across expansive areas (Mashal et al., 2020).

Overall, the high levels of behavioral intention to adopt SH among the ZG are consistent with the findings of Mashal et al. (2023). When viewed through the lens of TAM and UTAUT, the variation in attitudes across demographics suggests that adoption in JMA is likely influenced by a complex interplay of factors such as perceived cost, lifestyle compatibility, and potentially, the core constructs of PU, PEoU, and social influence, which future research should measure directly.

Conclusions

This study contributes to the discourse on SH adoption in developing urban contexts, particularly among younger demographics in the JMA. The findings refine behavioral models such as TAM and UTAUT by embedding socio-demographic nuances of the ZG. Survey results indicate strong interest in SH features (84.28%), with modern equipment and SH technologies being significantly associated with perceptions of architectural innovation (β = 0.271 and 0.367, p < 0.01). However, several limitations must be acknowledged. First, proxy variables were used to infer psychological constructs (e.g., perceived usefulness, ease of use), limiting construct precision. Second, low explanatory power of our regression models suggests other unmeasured factors influence adoption. Third, subgroup findings (e.g., residents of very small homes) are based on limited samples and require further validation.

Exploratory analysis indicates that adoption intent varies across demographic groups. Enthusiasm is highest among residents of very small (<30 m²) and large (>72 m²) homes, suggesting market opportunities for compact and luxury-oriented SH solutions. Income and family size also shape perceptions: higher-income groups express stronger intent, while lower-income respondents associate SH with modern living, suggesting potential for inclusive adoption through incentives. Marital status and smaller family composition further influence preferences. These insights underscore the importance of demographically responsive SH strategies that emphasize efficiency, security, and lifestyle enhancement. Policy efforts should also prioritize enhancing the affordability of SH technologies for the highly aware yet financially constrained Zillennial demographic. Future research should employ longitudinal or experimental methods to deepen understanding and establish causal links in SH adoption.

Conflicts of Interest
The authors declare that there is no conflict of interest regarding the publication of this paper.

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Authorship Contribution
Mewan Indra Z: responsible for creating concepts, planning, conducting research, and preparing manuscripts.

Arif Kusumawanto: responsible for supervision, conducting formal analysis, and reviewing the manuscript.

Agus Hariyadi: responsible for the methodology, performed the formal analysis, and reviewed the manuscript.

Data Availability
The data used in this research are not available in a public database. However, those interested in accessing the dataset may request it directly from the corresponding author: Mewan Indra Z.

References

Alam, M.R., Reaz, M.B.I., Ali, M.A.M. (2012). A Review of Smart Homes—Past, Present, and Future. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)* 42, 1190–1203. https://doi.org/10.1109/TSMCC.2012.2189204.

Annur, C.M. (2023, October 17). Penduduk Indonesia Tembus 278 Juta Jiwa hingga Pertengahan 2023 [Indonesia's population will reach 278 million by mid-2023]. Retrieved from https://databoks.katadata.co.id/datapublish/2023/07/13/penduduk-indonesia-tembus-278-juta-jiwa-hingga-pertengahan-2023.

Baillie, L., & Benyon, D. (2008). Place and Technology in the Home. *Computer Supported Cooperative Work (CSCW)* 17, 227–256. https://doi.org/10.1007/s10606-007-9063-2.

Bassiouni, D.H., & Hackley, C. (2014). Generation Z children's adaptation to digital consumer culture: A critical literature review. *Journal of Customer Behaviour* 13, 113–133. https://doi.org/10.1362/147539214X14024779483591.

Bijolia, D. (2022, October 11). Diary Of A Zillennial: What It's Like Being A Middle Child Of A Generational Divide. Retrieved from https://homegrown.co.in/homegrown-creators/diary-of-a-zillenial-what-its-like-being-a-middle-child-of-a-generational-divide.

Bitterman, N., & Shach-Pinsly, D. (2015). Smart home – a challenge for architects and designers. *Architectural Science Review* 58, 266–274. https://doi.org/10.1080/00038628.2015.1034649.

BPS. (2023). Jumlah Penduduk Usia 15 tahun ke Atas Menurut Golongan Umur 2021-2022 [Number of Population Aged 15 Years and Over According to Age Group 2021-2022]. Badan Pusat Statistik [Central Bureau of Statistics of the Republic of Indonesia]. Retrieved from https://www.bps.go.id/indicator/6/715/1/jumlah-penduduk-usia-15-tahun-ke-atas-menurut-golongan-umur.html.

Choi, J., Lee, H.J., Sajjad, F., Lee, H. (2014). The influence of national culture on the attitude towards mobile recommender systems. *Technological Forecasting and Social Change* 86, 65–79. https://doi.org/10.1016/j.techfore.2013.08.012.

De Ruyck, O., Conradie, P., De Marez, L., Saldien, J. (2019). User Needs in Smart Homes: Changing Needs According to Life Cycles and the Impact on Designing Smart Home Solutions. In Lamas, D., Loizides, F., Nacke, L., Petrie, H., Winckler, M., Zaphiris, P. (Eds.), *Human-Computer Interaction – INTERACT 2019, Lecture Notes in Computer Science* (pp. 536–551). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-29384-0_33.

Diaz, A. (2023, May 10). Who are 'zillennials'? Meet the microgeneration between millennials and Gen Z. Retrieved from https://nypost.com/2023/05/10/who-are-zillennials-meet-the-microgeneration-between-millennials-and-gen-z/.

Fields, J. (2021). *A View of the Future from the Broad Top: Reaching, Connecting, and Engaging with Zillennials in Rural Pennsylvania*. (Doctoral dissertation, George Fox University, Portland, USA).

Gaikwad, P.P., Gabhane, J.P., Golait, S.S. (2015). A survey based on Smart Homes system using Internet-of-Things. *International Conference on Computation of Power, Energy, Information and Communication (ICCPEIC)*. Melmaruvathur, Chennai, India, pp. 0330–0335. https://doi.org/10.1109/ICCPEIC.2015.7259486.

Governor of the Special Capital Region of Jakarta Decree No. 829 of 2024 concerning the Provincial Minimum Wage for the Year 2025 Retrieved from https://jdih.jakarta.go.id/dokumen/detail/14171.

Hargreaves, T., Wilson, C., Hauxwell-Baldwin, R. (2018). Learning to live in a smart home. *Building Research & Information* 46, 127–139. https://doi.org/10.1080/09613218.2017.1286882.

Hartmans, A. (2023, January 18). Meet the 'zillennials,' who grew up online, live with their parents, and have retailers chasing their disposable income. Retrieved from https://www.businessinsider.com/zillennial-lives-with-parents-spends-on-luxury-goods-2023-1.

Hofman, E., Halman, J.I.M., Ion, R.A. (2006). Variation in Housing Design: Identifying Customer Preferences. *Housing Studies* 21, 929–943. https://doi.org/10.1080/02673030600917842.

Israel, G.D. (1992). *Determining Sample Size*. University of Florida, Fact Sheed PEOD-6.

Jannah, N., & Muliatie, Y.E. (2023). How To Green Product And Ethical Living For Zillenial Generation Ladynability In Surabaya City ?. *International Journal of Global Accounting, Management, Education, and Entrepreneurship* 4, 129–134. https://doi.org/10.48024/ijgame2.v4i1.111.

Kaufman, A. (2023, May 18). Move over Millennials and Gen Z, there's a new generation in town: Meet Zillennials. Retrieved from https://www.usatoday.com/story/news/2023/05/18/is-zillennial-a-real-thing/70207436007/.

Kolb, E. (2019, July 11). 75,000 people per square mile? These are the most densely populated cities in the world. Retrieved from https://www.usatoday.com/picture-gallery/news/world/2019/07/11/the-50-most-densely-populated-cities-in-the-world/39664445/.

Kolny, B. (2023). Young Consumers Towards an Ecological Approach to Life in the Age of Smart Homes and Devices. *Marketing of Scientific and Research Organizations* 47, 105–126. https://doi.org/10.2478/minib-2023-0006.

Lee, L.N., & Kim, M.J. (2020). A Critical Review of Smart Residential Environments for Older Adults With a Focus on Pleasurable Experience. *Frontiers in Psychology* 10, 3080. https://doi.org/10.3389/fpsyg.2019.03080.

Magalhaes, M. (2023). Did We Forget An Entire Audience? The Zillennials. Retrieved from https://forty8creates.com/did-we-forget-an-entire-audience-the-zillennials/.

Mashal, I., Shuhaiber, A., Daoud, M., 2020. Factors influencing the acceptance of smart homes in Jordan. International Journal Electronic Marketing and Retailing 11, 113–142.

Mashal, I., Shuhaiber, A., AL-Khatib, A.W., 2023. User acceptance and adoption of smart homes: A decade long systematic literature review. 10.5267/j.ijdns 7, 533–552. https://doi.org/10.5267/j.ijdns.2023.3.017

Melcher, K. (2021, July 21). Opendoor 2021 report: Achieving the American dream. Retrieved from https://www.opendoor.com/articles/achieving-the-american-dream.

Nakagawa, K., & Yellowlees, P. (2020). Inter-generational Effects of Technology: Why Millennial Physicians May Be Less at Risk for Burnout Than Baby Boomers. *Current Psychiatry Reports* 22, 45. https://doi.org/10.1007/s11920-020-01171-2.

Owens, B. (2022, November 16). Who are the Zillennials? (And why should brands care?). Retrieved from https://whiplash.com/blog/who-are-zillenials/.

Rawat, D., & Rawat, K. (2023). A Study of Zillennials in Uttarakhand Using RStudio, *Journal of Graphic Era University*. https://doi.org/10.13052/jgeu0975-1416.1021.

SECOM (2023, May 1). Smart Home Makin Diminati, Tapi Penuh Tantangan [Smart Homes Are Increasingly Popular, But Full of Challenges]. Retrieved from https://secom.co.id/id/smart-home-makin-diminati-tapi-penuh-tantangan/.

Singh, A.S., & Masuku, M.B. (2014). Sampling Techniques & Determination Of Sample Size In Applied Statistics Research: An Overview. *International Journal of Economics, Commerce and Management* 2-11.

Stromberg, N. (2020). Gen Y needs places to stay, prefers smart homes. Retrieved from https://sensative.com/gen-y-need-places-to-stay-smart-home/.

Strzalka, K.B. (2019). *What are the students' housing preferences? A case study of Lublin, Poland. Stockholm, Sweden.* Kth Royal Institute Of Technology School Of Architecture And The Built Environment. Degree Project, Second Cycle, 30 Credits.

Suresh, T. (2022). The Zillennial Generation and the Modern Workplace: Enabling the Right Culture Fit. *SIBM Pune Research Journal* XXV, 63–64. https://doi.org/10.53739/samvad/2022/v25/172597.

The World Bank. (2023). *The World Bank in Indonesia.* Retrieved from: https://www.worldbank.org/en/country/indonesia/overview

Twenge, J.M. (2023). *Generations.* (3rd ed.). New York: Atria Books.

Wahyudi, H. (2023, August 1). Gen Z Indonesia: Budaya Pop, Metroseksual, dan Masa Depan Identitas Kebangsaan [Gen Z Indonesia: Pop Culture, Metrosexuals, and the Future of National Identity]. Retrieved from https://kumparan.com/s-heru/gen-z-indonesia-budaya-pop-metroseksual-dan-masa-depan-identitas-kebangsaan-20uEteDOMUF/3.

Widi, H. (2023, December 12). Biaya Hidup Naik, Rp 14,88 Juta Per Bulan di Jakarta [Cost of Living Rises to Rp 14.88 Million Per Month in Jakarta]. Retrieved from https://www.kompas.id/artikel/en-dalam-empat-tahun-terakhir-biaya-hidup-naik-rp-1-juta-rp-15-juta.

White Hutchinson (February, 2023). Zillennials and their disposable income. White Hutchinson Vol. XXIII no. 2. Retrieved from https://www.whitehutchinson.com/news/lenews/2023/february/article104.shtml

Wilson, C., Hargreaves, T., Hauxwell-Baldwin, R. (2017). Benefits and risks of smart home technologies. *Energy Policy* 103, 72–83. https://doi.org/10.1016/j.enpol.2016.12.047.

Yang, H., Lee, W., Lee, H. (2018). IoT Smart Home Adoption: The Importance of Proper Level Automation. *Journal of Sensors* 2018, 1–11. https://doi.org/10.1155/2018/6464036.

Zerr-Korolev, M. (2022). Recruiting the New Generations: Gen Z and "Zillennials". Retrieved from https://cssienroll.com/blog/Recruiting-GenZ_and_Zillennials.html.