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ANALYZING THE ELDERLY POPULATION IN MALAYSIA FROM THE PERSPECTIVES OF QUALITY OF LIFE, ASSISTIVE TECHNOLOGY, AND AN AGE-FRIENDLY ENVIRONMENT

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Abstract

This paper contributes to the concept of aging in place among older adults in Malaysia by exploring the interconnected roles of assistive technology, quality of life, and age-friendly environments in facilitating this lifestyle. The methodology employed in this study includes quantitative methods and snowball sampling technique. Drawing on survey data collected from 499 participants aged 60 to 75, this research examines the impact of assistive technology on various aspects of older adults' lives, including physical health, psychological well-being, and social engagement. The findings reveal substantial improvements in overall quality of life. Furthermore, age-friendly environments play a crucial role in enhancing autonomy by eliminating environmental obstacles. However, the effectiveness of assistive technology is hindered by several challenges, such as financial constraints and limited technological proficiency among some seniors. This paper underscores the importance of adopting a comprehensive approach that integrates both technological and human support. By providing valuable insights for policymakers, this research offers practical recommendations for developing interventions that uphold the autonomy and dignity of older adults in Malaysia.

Keywords: Assistive Technology, Quality of Life, Age-friendly Environment, Aging in Place, Elderly Studies

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INTRODUCTION

Malaysia is undergoing a notable demographic transformation, with its aging population anticipated to increase swiftly. The Department of Statistics Malaysia (2023) projects that those aged 65 and above will represent 15.3% of the national population by 2030, signifying the nation's transition into an aging society. This trend mirrors extensive global patterns of population aging, primarily influenced by heightened life expectancy, enhanced healthcare, and decreasing birth rates. As Malaysia nears this demographic milestone, there is an imperative requirement for comprehensive initiatives to assist older adults in preserving independence, well-being, and social integration.

A primary policy response to population aging is the advocacy for “aging in place,” which underscores the capacity of older adults to reside in their homes and communities securely, autonomously, and comfortably. To attain this objective, three interconnected elements are essential: quality of life, assistive technology, and an age-friendly environment. Collectively, these dimensions influence how older adults manage daily activities, obtain assistance, and engage in societal participation. Notwithstanding the growing acknowledgment of these elements, research in the Malaysian context is still constrained, especially on the impact of socio-demographic features on the utilization of assistive devices and perceptions of age-friendly surroundings. Bridging this gap is essential for guiding policies and initiatives that are culturally and contextually relevant.

This study seeks to investigate the correlation between quality of life, assistive technology, and age-friendly environments within the demography of older adults in Malaysia. It aims to (1) furnish a comprehensive profile of the respondents' sociodemographic attributes, and (2) analyze the strength of the correlations among the researched variables. The results are anticipated to aid in the formulation of cohesive strategies that promote independent living and improve the quality of life for older adults in Malaysia.

LITERATURE REVIEW

Asia is undergoing a significant demographic change, with increasing life expectancy and lower fertility rates contributing to rapid rise in the elder population (Leung & Chen, 2019; Wong et al., 2018). This transformation necessitates a reconsideration of healthcare, urban development, and social welfare systems to accommodate an older population. Japan, sometimes referred to as a “super-aged” society, exemplifies the importance of adopting sustainable policies as the proportion of people aged 80 and up rises (Elokla & Hirai, 2015). In Malaysia, comparable demographic shifts are evident, with forecasts predicting that 24% of the population would be 65 or older by 2050, qualifying the country as an “aged society” (Ng et al., 2020b). The 1995 National Policy for the Elderly sought to improve the well-being and dignity of Malaysia's elderly

(Ambigga et al., 2011). While demographic development represents higher living conditions, it also requires integrated methods that incorporate social, health, and technology initiatives to maintain older individuals' autonomy and quality of life (Chew et al., 2021).

Malaysia's aging trend has resulted in complicated socioeconomic and health consequences that affect national productivity, family dynamics, and healthcare systems. While the growing older population may boost demand for age-related services, it also creates financial and policy issues that necessitate investment in healthcare and social protection (Taasim, 2020; Tey et al., 2015). Health status, income stability, and family support all influence the quality of life for older Malaysians across ethnic and socioeconomic categories (Lai & Tey, 2021). Urbanization and shifting cultural norms have damaged traditional caregiver systems, increasing dependency on official care services (Makhtar et al., 2023). Furthermore, chronic health issues such as cardiovascular disease and diabetes remain common, exacerbated by lifestyle choices and polypharmacy (Lim et al., 2017). Although these research focus on the social and biological difficulties of aging, few have investigated how environmental and technological treatments can work together to increase older individuals' well-being and independence.

In response to these demographic and health issues, experts emphasize the need of age-friendly environments that promote active aging and social participation (Lai et al., 2016; Shi Ying et al., 2021). Research in Malaysian cities such as Taiping and Ipoh has identified important aspects of age-friendly settings: safe public spaces, accessible transportation, and accessibility to healthcare, as critical to improving older individuals' inclusion and mobility (Rashid et al., 2021; Rashid et al., 2022). However, many existing housing and urban infrastructures do not follow universal design principles that address the physical and psychological demands of older persons (Ismail et al., 2021). The growing concept of retirement villages in Malaysia represents a hopeful future, combining community living with healthcare and recreational services (Lim et al., 2019; Ng et al., 2020a). However, generations have different preferences for location, design, and social activities (Ismail et al., 2023). Despite this development, insufficient study has integrated the physical environment with digital and assistive technology, leaving a vacuum in understanding how spatial and technical elements work together to support aging in place.

The importance of assistive technology in Malaysia's aging policy has received increased attention due to their potential to improve independence, safety, and well-being. Initiatives like smart towns and home-based monitoring systems demonstrate the government's commitment to incorporating digital innovation into aged care (Huang et al., 2024). Medical warning devices, fall detectors, and medication management systems are examples of products

developed to help people live safely and autonomously. Assistive aids have also been used in educational settings to promote inclusion for people with special needs (Istiyati et al., 2023), and safety features such as smoke and heat monitors safeguard older adults who live independently (Azmi et al., 2021). Despite these advances, Malaysian older individuals' adoption of assistive technologies remains limited, owing to compatibility concerns, smartphone fear, and enabling conditions (Mshali et al., 2018).

Addressing these psychological and social aspects is critical for promoting universal acceptance. As a result, this study creates an integrated framework that connects assistive technology, age-friendly environments, and aging in place, adding to a more comprehensive understanding of how environmental design and digital readiness can work together to improve the quality of life for older Malaysians.

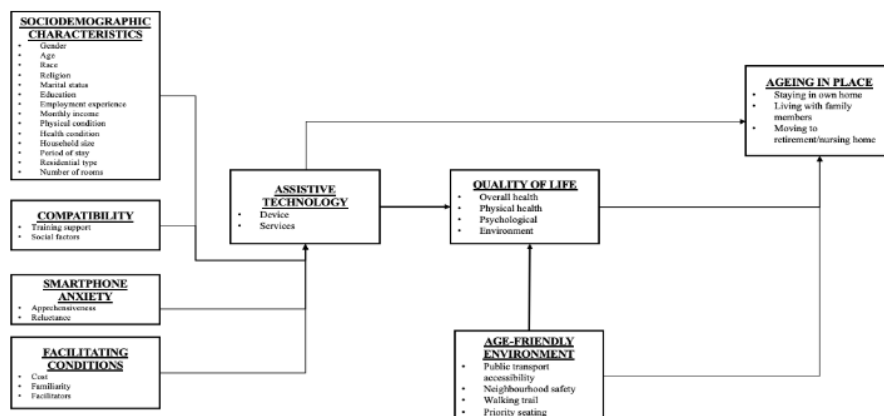


Figure 1: Conceptual framework for Aging in Place

RESEARCH METHODOLOGY

This study utilized a quantitative cross-sectional design, employing structured questionnaires to gather measurable data from older adults. The methodology allowed the researcher to collect data at a singular moment, which is appropriate for examining contemporary actions, perspectives, and circumstances. The questionnaire utilized numerical scales, including the Likert Scale, to evaluate subjective factors such as perceptions and attitudes, while multiple-choice questions were employed to gather demographic and factual data. The study employed a standardized questionnaire to ensure consistency in data collection, facilitating statistical analysis of the correlations among variables pertinent to

assistive technology utilization, quality of life, age-friendly environments, and aging in place among older adults in Malaysia.

The questionnaire comprised five principal sections, each aligned with a distinct study purpose. The items were modified from previously validated instruments outlined in pilot test, guaranteeing both relevance and reliability. Moreover, content authenticity was preserved via meticulous item selection, translation into the local language, and contextual modifications to align with the Malaysian environment. Section 1 concentrated on sociodemographic data, consisting of 15 items derived from sources like Dikken et al. (2020); Elokla and Hirai (2015); Liao et al. (2018); Ma et al. (2015); Musa and Sim (2010). This part gathered information on gender, age, race, religion, marital status, educational attainment, employment status, work experience, income, physical and health problems, residential location, household size, and duration of residence. Section 2 examined the utilization of assistive technology via 20 items derived from the CTAILS Survey by Petrovčič et al. (2019) and the QUEST 2.0 instrument. This section measured constructs such as compatibility, smartphone anxiety, enabling situations, and device usage frequency.

Section 3 examined quality of life with 26 measures derived from the WHOQOL-BREF framework (World Health Organization, 1999), supported by research conducted by Hasanah et al. (2003); Iqbal et al. (2020); Khan and Tahir (2014). The four assessed domains encompassed physical health, psychological well-being, social interactions, and environmental factors. Section 4 evaluated perceptions of the age-friendly environment using six questions derived from the Gibney et al. (2020); Hau (2017); Shiau and Huang (2014); the World Health Organization (2010); World Health Organization (2007). This part highlighted the accessibility of public transit, neighborhood safety, walkability, and the provision of priority seats for senior citizens. Ultimately, Section 5 assessed attitudes regarding aging in situ with three measures modified from Robinson-Lane et al. (2022). This discussion centered on issues of self-empowerment and autonomy about the preservation of one's residence and community during the aging process.

The researcher utilized a non-probability snowball sampling technique, which was particularly suitable due to the sensitivity of the topic and the challenges in reaching older adults. Snowball sampling is advocated for research involving hard-to-reach or marginalized populations, as it facilitates participant recruitment via referrals from current subjects (Cohen & Arieli, 2011; Gierczyk et al., 2024). This approach fosters engagement by establishing trust, particularly when respondents are suggested by others within their own social networks (Noy, 2008). The researcher employed snowball sampling for numerous justifications. Initially, it facilitated access to older adults who may be socially isolated or inadequately represented in conventional sample techniques (O'Quin et al., 2015;

Sadler et al., 2010). Secondly, the peer-referral method fostered a sense of trust and comfort among participants, which is crucial when addressing sensitive topics such as personal health and technology utilization. Ultimately, the method proved to be economical and feasible for data collection over an extensive geographical region, especially considering the scarcity of centralized databases for the older adults (Kubiciel - Łodzińska, 2021).

Participants were chosen according to two criteria. The primary criterion was age, stipulating that eligible participants must be 60 years or older, as delineated by the World Health Organization and other research (Deorari et al., 2017; Tiraphat et al., 2021; Tiraphat et al., 2017). The second condition required individuals to have utilized a smartphone at least once in the preceding year (Takahashi et al., 2011). Initial participants were discovered via the researcher's personal network, comprising relatives and friends, who were subsequently requested to suggest other older adults meeting the inclusion criteria. The recruitment process persisted until the requisite sample size was attained.

The data gathering occurred during a five-month duration, spanning from January to May 2023. The researcher employed self-administered, paper-based questionnaires that were physically disseminated among individuals. Before participating, each respondent received a permission form detailing the study's purpose and their rights as participants. Participants were allotted one day to complete the questionnaire at their own pace and leisure. To guarantee precision and integrity, the researcher carefully collected all completed questionnaires. This individualized collection method mitigated the danger of data loss or incompleteness and ensured the confidentiality of responses. A total of 499 valid responses were obtained, surpassing the minimum sample size required for this investigation. The substantial sample size enhanced the reliability and generalizability of the results.

The research was executed in compliance with ethical guidelines pertinent to studies involving human participants. Participation was wholly voluntary, and informed consent was secured from all participants prior to the commencement of the survey. All participants were explicitly apprised of the study's objectives, their right to refuse participation, and their liberty to withdraw at any moment without repercussions. No personally identifiable information was collected to ensure confidentiality. All replies were anonymized, and data were managed with rigorous confidentiality to safeguard privacy. The paper-based questionnaires were securely maintained and viewed solely by the researcher. Ethical protections were particularly essential due to the potentially sensitive nature of inquiries concerning aging, health state, and personal technology utilization.

Consistent with current literature, snowball sampling within older demographics necessitates ethical diligence and a respectful methodology for participant involvement (Noy, 2008; Sadler et al., 2010). By following the ethical principles established in research by Gierczyk et al. (2024) and Cohen and Arieli (2011), the researcher guaranteed that participants were treated with dignity and respect during the data gathering process. The study adhered to institutional and academic standards for ethical research and responsibly advanced scholarly knowledge on aging in Malaysia.

ANALYSIS AND DISCUSSION

After a comprehensive analysis, the table below presents a detailed breakdown of critical sociodemographic variables for the 499 respondents. These factors encompass essential demographics such as gender distribution, age range, racial and ethnic composition, religious affiliation, educational background, employment status, and other pertinent characteristics. Each attribute is meticulously detailed to reflect the diversity and representativeness of the sample, offering insights into how these sociodemographic parameters may influence or correlate with the study outcomes.

The study included 499 elderly respondents, the majority of whom were male and aged 60-64 years (51.9%). The majority were Malay (84.0%), Muslim (84.8%), and married (83.6%), indicating a nationwide trend of elderly persons in Malaysia with robust family support systems. More than half (55.7%) had secondary education, and 13.6% had higher education levels, indicating moderate digital literacy that may influence technology adoption. Respondents were virtually evenly split between public (48.9%) and private (47.7%) job histories, with 70.5% falling under the B40 income bracket, showing a low financial capacity to acquire assistive devices without subsidies. The majority of participants (74.3%) lived in multigenerational homes with more than three members, 43.5% in kampung houses, and 74.3% had stayed in the same home for more than a decade, indicating high place attachment. However, 11.4% claimed physical limitations and 47.5% had chronic illnesses, highlighting the need for accessible infrastructure and healthcare services.

Overall, the findings emphasize major socioeconomic and environmental factors that influence the adoption of assistive technology among Malaysia's elderly. Financial constraints, cultural lifestyles, and health concerns need solutions that are cost-effective, adaptive, and culturally sensitive. The results give critical insights for developing gender- and age-responsive strategies to improve aging in place and quality of life through assistive technologies and age-friendly settings.

A complete correlation study was performed to investigate the relationships between assistive technology, quality of life, an age-friendly

environment, and aging in place. Pearson correlation analysis, a statistical method well-known for its ability to measure the strength and direction of linear correlations between variables, was used. This method is particularly well-suited for continuous data and provides a reliable metric for determining if there are positive, negative, or no correlations between the variables of interest. By employing this method, the researchers hoped to uncover the extent to which these critical aspects impact one another, resulting in a more sophisticated understanding.

Table 1: Correlation analysis of the variables

	Assistive technology	Quality of life	Age-friendly environment	Aging in place
Assistive technology		0.562**	0.266**	0.202**
Quality of life	0.562**		0.306**	0.427**
Age-friendly environment	0.266*	0.306**		0.288**
Aging in place	0.202**	0.427**	0.288**	

**0. Correlation is significant at the 0.01 level (2-tailed).

The findings reveal a strong positive correlation between assistive technology (AT) and quality of life (QoL) ($r = 0.562$), indicating that increased use of devices like mobility aids, home safety tools, and health-related smartphone apps is associated with better perceived well-being among older adults. This supports earlier studies by Chen & Chan (2014) and Liu et al. (2020), which found that AT enhances independence, reduces reliance on caregivers, and promotes social engagement. A moderate correlation was also observed between AT and age-friendly environment (AFE) ($r = 0.266$), suggesting that older adults living in supportive physical and social settings—such as barrier-free homes, accessible transport, and community services—are more likely to adopt assistive technologies. This aligns with the World Health Organization’s (2007) age-friendly framework. However, the correlation between AT and aging in place (AIP) is relatively weak ($r = 0.202$), implying that while AT contributes to independent living, other elements such as emotional ties to home, caregiver support, and community involvement are also critical, as highlighted by Lawton & Nahemow’s (1973) Person–Environment Fit theory and Sixsmith & Sixsmith (2008).

In contrast, a moderately strong correlation between QoL and AIP ($r = 0.427$) underscores that older adults with greater autonomy, life satisfaction, and good health are more likely to remain in their homes as they age—echoing findings from van Hoof et al. (2011) and Oswald et al. (2007). This highlights QoL not just as an outcome of aging in place, but also as a necessary precondition.

Furthermore, a moderate association between QoL and AFE ($r = 0.306$) suggests that a well-designed, safe, and socially engaging environment significantly boosts the well-being of older adults, consistent with Menec et al. (2011). Finally, the positive relationship between AFE and AIP ($r = 0.288$) confirms that accessible, age-friendly physical spaces play a vital role in supporting aging in place, as supported by Buffel et al. (2012), who emphasized the importance of aligning the built environment with the evolving needs of older adults. The correlation results underscore the interrelationship of technology, environment, and personal well-being in promoting aging in place. The most robust association was observed between AT and QoL, highlighting that AT can substantially improve health outcomes, safety, and autonomy. Nonetheless, its comparatively modest direct link with AIP indicates that technology alone is inadequate to assist older adults in remaining in their residences.

The path analysis yielded a p-value of 0.000 for the path between Assistive Technology and Quality of Life, indicating a highly statistically significant relationship between the two constructs. A p-value of this magnitude suggests that the probability of the observed relationship occurring by chance is virtually zero. Given that the p-value is well below the significance threshold of 0.05, the null hypothesis, which assumes no relationship between Assistive Technology and Quality of Life, can be confidently rejected. These findings provide robust statistical evidence that Assistive Technology significantly impacts Quality of Life. This result underscores the importance of Assistive Technology as a strong predictor of Quality of Life within the proposed research model. The data provide compelling evidence for the positive influence of assistive technologies in enhancing individuals' quality of life, particularly in contexts related to aging or disabilities. Assistive technologies can mitigate challenges faced by individuals, thereby improving their overall well-being and ability to function effectively within their environments.

The implications of this highly significant relationship are substantial. The findings emphasize the critical role of Assistive Technology in programs, interventions, and policy development aimed at promoting better Quality of Life outcomes, especially for older adult or disabled populations. By enhancing mobility, communication, and daily living activities, assistive tools can substantially improve the lives of those who rely on them. Future research could further explore the specific aspects or categories of Assistive Technology that contribute most significantly to Quality of Life, offering insights for more targeted and effective applications. These findings highlight the transformative potential of Assistive Technology in fostering improved living conditions and overall well-being for vulnerable populations. Finally, the analysis revealed a p-value of 0.039 for the path between Quality of Life and Aging in Place, indicating a statistically significant relationship between these two constructs. A P-value

below the threshold of 0.05 suggests that the observed relationship is unlikely to be due to random chance, thereby providing robust statistical evidence that Quality of Life has a meaningful influence on Aging in Place. This finding underscores the relevance of Quality of Life as a critical factor in the ability of individuals to successfully age in place. Since the p-value is less than 0.05, the null hypothesis, which posits no relationship between Quality of Life and Aging in Place, can be rejected with confidence. The results suggest that individuals who experience an enhanced Quality of Life are more likely to age in place successfully. This outcome aligns with the broader understanding that a supportive and fulfilling quality of life facilitates the capacity of aging individuals to remain at home or in familiar environments, even as their needs evolve over time.

The implications of this relationship are significant for both research and practice. From a policy perspective, the findings reinforce the need to prioritize initiatives that enhance Quality of Life among aging populations. Measures such as improving access to healthcare, fostering social engagement, and providing necessary resources can positively contribute to the ability of older adult individuals to age in place. For practitioners, this result highlights the importance of integrating quality-of-life considerations into older adult care and support systems. Future research could delve deeper into the specific dimensions of Quality of Life, such as emotional well-being, physical health, and social relationships, to identify targeted strategies for promoting Aging in Place effectively.

CONCLUSION

This study highlights the complex interplay among economic, social, and policy factors in facilitating the use of assistive technology, improving quality of life, and enabling aging in place for older adults. The results indicate that financial limitations specifically low income, with more than 70% of participants earning less than RM4,360 restrict access to assistive devices. This necessitates specific governmental measures, including subsidies and cost-reduction initiatives, to enhance affordability. The high incidence of communal living (74.3% of individuals living in households with more than three occupants) and *kampung*-style dwelling indicates that assistive technologies must be culturally relevant and suitable for traditional, shared living environments. Family members are crucial in caregiving and initiatives that inform and involve them are necessary to provide assistance for the older adults. Furthermore, most respondents have resided in the same home for over a decade, substantiating the need for age-friendly home improvements. Government incentives for retrofitting existing dwellings can facilitate the safe and independent aging of older individuals in familiar surroundings.

The disparities in education and employment experience noted across numerous respondents may impede their capacity to engage with contemporary technologies. Initiatives for lifelong learning and digital literacy programs designed for older individuals are essential to enhance confidence and usability of assistive technologies. These educational initiatives should be conveyed through accessible, community-oriented platforms. Collectively, these findings necessitate a comprehensive and inclusive policy strategy that encompasses affordability, infrastructural adaptation, familial engagement, and technological empowerment. By matching these strategies with Malaysia's demographic and cultural contexts, stakeholders can formulate sustainable solutions that facilitate aging in place and enhance the overall quality of life for the aged population.

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