

The demand for smart elderly care services and its influencing mechanisms among the elderly in Nanning, Guangxi, based on the theory of planned behavior

Yangbin Wu ^{1*} , Nitipon Putachote ¹ 

¹ Department of Management Science, Institute of Science Innovation and Culture, Rajamangala University of Technology Krungthep, 10120 Bangkok, THAILAND

*Corresponding Author: 69240300311@mail.rmutk.ac.th

Citation: Wu, Y., & Putachote, N. (2026). The demand for smart elderly care services and its influencing mechanisms among the elderly in Nanning, Guangxi, based on the theory of planned behavior. *Pedagogical Research*, 11(3), em0284. <https://doi.org/10.29333/pr/19155>

ARTICLE INFO

Received: 29 Jun. 2026

Accepted: 04 Aug. 2026

ABSTRACT

The study highlights that elderly residents' positive evaluations of service functionality, convenience, and safety, along with multi-level support from family, community, and society, are crucial factors in enhancing the demand for smart elderly care services. A total of 630 participants joined in this study. Structural equation modelling (SEM) was used to examine research hypotheses. Attitudes, subjective norm and perceived behavioral control have a positive effect on Behavioral actual to use smart elderly care services directly and indirectly towards behavioral intention. Smart elderly care services can improve quality of life and foster social connections, providing emotional support and reducing feelings of isolation. Digital literacy is crucial; those with higher skills tend to have more positive attitudes, leading to greater intention to use these services. Perceived behavioral intention, which reflects seniors' beliefs about engaging with technology, is critical. Social support further motivates seniors to adopt these technologies. Understanding these dynamics is essential for stakeholders to promote smart elderly care services, ultimately enhancing the quality of life for older adults.

Keywords: elderly care service delivery, TPB dimensions, social connections and relationships, emotional support, smart elderly care

INTRODUCTION

Population aging is a pressing contemporary issue, as the number and proportion of elderly individuals continue to rise in many countries (Ong, 2022; Thanh Trong et al., 2024). The United Nations defines an aging society as one where individuals aged 60 and above make up at least 10% of the population, or those 65 and older represent 7% or more (WHO, 2023). This demographic shift is largely due to declining fertility rates and increased life expectancy. For example, in China, the proportion of adults aged 60 and over is projected to reach nearly 28% by 2040. The rapid growth of the elderly population brings several challenges, including higher demand for healthcare services, the sustainability of pension systems, and the need for sufficient elder care. Additionally, addressing social isolation among older adults is essential and can be mitigated through stronger intergenerational relationships and community support networks (Demir & Kurtulus, 2024; Díaz et al., 2024). As societies adapt to these changes, the establishment of comprehensive policies is crucial to support healthy aging, enhance healthcare accessibility, encourage active participation among older adults, and implement innovative solutions such as intelligent smart elderly care services (Juma & Fernández-Sainz, 2024).

Intelligent smart elderly care services employ advanced technologies to address challenges faced by seniors, such as safety, health monitoring, and social isolation (Gutiérrez-Domingo, 2024; Zhou et al., 2025). These services enhance the safety and autonomy of older adults through features like automated medication reminders, emergency alerts, and smart home systems (Holloway et al., 2023). Additionally, social media communication platforms and community participation initiatives help reduce isolation and foster social connections. The use of wearable technologies for health monitoring enables proactive management of health conditions, providing caregivers with real-time data for better decision-making (Penninkilampi et al., 2018). While the effectiveness of these services can vary, research points to improvements in health outcomes, user satisfaction, and caregiver burden, highlighting their potential to create a more supportive environment for the elderly. As technology continues to evolve, intelligent geriatric smath care services are poised to make a significant positive impact on the quality of life.

Smart elder care overcomes time and space limitations by maximizing resource integration, optimizing service configuration, and directly addressing seniors' needs in daily life, medical care, entertainment, and leisure (He, 2025). Through the combination of intelligent input devices, a digital smart elderly care service platform, and an offline service network, the delivery of smart

elderly care has become more prompt, efficient, convenient, and adaptable. There is a strong focus on developing service models that elevate care quality, particularly through grassroots healthcare initiatives (Díaz et al., 2024; Zhou et al., 2025). However, challenges in implementing these services often stem from factors like age, poverty, and knowledge gaps among the elderly, which can impact their engagement with technology (Wang et al., 2026). Research further emphasizes the role of community engagement and digital communication platforms in reducing social isolation. The adoption of wearable health monitoring technologies enables proactive health management and gives caregivers real-time insights into patients' conditions (Durak et al., 2025). While the potential benefits of intelligent smart elderly care services are significant, ongoing research is necessary to address barriers to technology adoption and ensure these services meet the diverse needs of the elderly population.

Preliminary studies suggest that nations globally are investigating intelligent elderly care, pinpointing international hubs for innovation (Aimaganbetova et al., 2023; Liu et al., 2025). A primary emphasis is on creating service models that improve care quality via grassroots healthcare initiatives. Implementing these services typically encounters challenges due to characteristics such as age, income, and awareness levels among the elderly, which might influence their interaction with technology. Smart homes integrated with remote healthcare technologies represent a crucial domain of advancement, offering options for health monitoring and everyday support. The array of intelligent aged care goods is expanding, encompassing smart wearable gadgets, remote medical consultation systems, home service robots, intelligent medication management systems, fall detection devices, among others (Moore et al., 2026). These gadgets offer enhanced reassurance and convenience for the elderly and their families by continuously monitoring health status and promptly alerting them to any health threats.

Previous research employing the Theory of Planned Behavior (TPB) in relation to smart senior care services frequently demonstrates many shortcomings (Junaidi et al., 2026). Moreover, there is a propensity to emphasize quantitative metrics while insufficiently examining qualitative insights that could yield a more profound comprehension of older individuals' experiences and motives. Moreover, current research frequently neglects the impact of social influences and community involvement, which are essential in influencing attitudes and perceived behavioral control among the elderly. Finally, there is a significant lack of longitudinal studies that monitor changes in attitudes and actions over time, restricting the capacity to derive strong conclusions regarding the efficacy of treatments designed to enhance smart elderly care services. Addressing these deficiencies is essential for formulating more successful methods that meet the requirements of older individuals and improve their involvement with smart elderly care services.

Although some studies have applied the theory of planned behavior (TPB) to investigate smart senior care services, they have not sufficiently addressed how these services can enhance elderly psychological well-being. Behavioral attitude and intention are spontaneous actions responding to personal experience. Furthermore, prior researchers have also failed to identify the specific obstacles faced by the aging population, such as technology anxiety. Moreover, despite some evidence showing that elderly attitude, subjective norm, and behavioral control exhibit improvisational behavioral intention and actual application of smart elderly services, there appears to be an absence of evidence confirming whether elderly attitude, subjective norm, and behavioral control could affect their behavioral intention and actualization. Another gap is that existing research on the benefits of elderly behavioral intention often lacks sufficient evidence regarding the mediating conditions that could influence the relationship between the TPB dimensions and the actual behavior of adopting elderly smart services. These critical research gaps and questions must be investigated to extend the existing knowledge in this area.

The results from this research are expected to clarify previously incomplete issues in the literature regarding the role of elderly attitude, subjective norm, and behavioral control in both behavioral intention and actual behavior, as well as the potential mediating role of behavioral intention that could influence how aging behavior shapes actual use of smart elderly services. This approach can provide a comprehensive understanding of the factors that enhance the effectiveness of smart elderly service. This study also integrates age-relevant constructs such as technology anxiety, digital literacy, and health risk perception to provide comprehensive theoretical contribution. This comprehensive and differentiated perspective can lead to more effective utilization of smart elderly services and may ultimately promote greater innovative performance within service providers by addressing individual differences and barriers to adoption.

LITERATURE REVIEW

Smart Elderly Care Services

The concept of intelligent smart elderly care was first introduced by the British Life Trust, formerly known as the "fully intelligent elderly system" (Demir & Kurtulus, 2024; Sun et al., 2025). Building on a wide range of domestic and international scholarly perspectives, smart elderly care is defined as the use of advanced information technologies such as the Internet of Things, the Internet, big data, cloud computing, and blockchain to create a comprehensive platform that connects the elderly with communities, care institutions, enterprises, medical facilities, governments, and other stakeholders (Ren & Zhou, 2023). This integrated approach delivers real-time, convenient, efficient, diversified, standardized, and intelligent smart care services that holistically address the needs of seniors, including life assistance, emergency response, medical rehabilitation, and leisure activities, ultimately establishing a high-quality model for elderly care (see [Figure 1](#)).

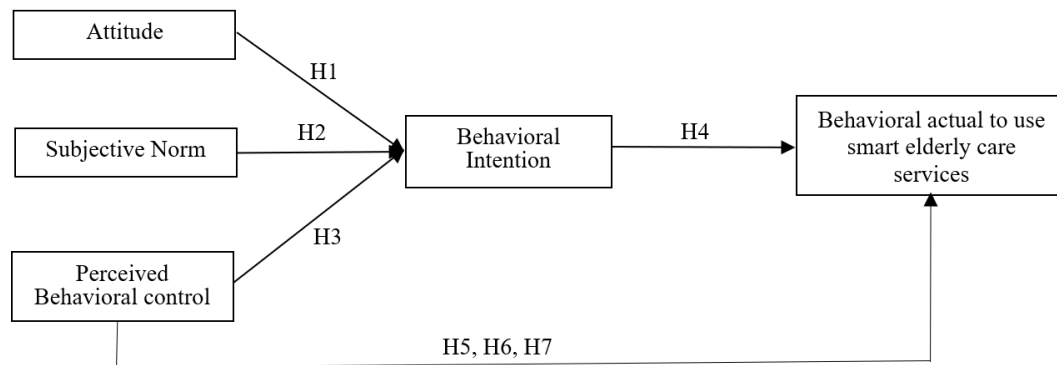


Figure 1. Proposed research model (Source: Authors' own elaboration)

Demand for Smart Elderly Care Services

As living standards improve and self-sufficiency declines, the needs of the elderly for geriatric care services are expected to evolve (Abdi et al., 2019; Liu et al., 2022). Based on Maslow's hierarchy of needs theory, physiological and safety needs are considered lower-level needs and align with seniors' needs for life care, medical care, and safety guardianship. In contrast, emotional belonging, esteem, and self-actualization are higher-level needs that correspond to the pursuit of spiritual comfort (Luo et al., 2025; Sun et al., 2025). The demands of the elderly for intelligent care services into four main groups: life care service needs, medical care service needs, safety monitoring service needs, and spiritual comfort service needs, providing a comprehensive framework for understanding and addressing their evolving expectations.

The personal behavioral attitude is a crucial predictor of behavioral intention, indicating an individual's favorable or negative assessment of a particular behavior (Baguko & Taye, 2026; Juma & Fernández-Sainz, 2024). This assessment includes multiple aspects, such as views of service efficacy, convenience, safety, and cost-effectiveness. When senior folks regard smart elderly care services as effective and convenient, their overall opinion towards these services is generally more positive. This optimistic disposition is essential, as it can markedly affect their readiness to interact with and employ such services (Wang et al., 2026). Conversely, behavioral intention can be defined as the extent of demand that the elderly exhibit for smart elderly care services. It signifies the probability that people will pursue and utilize these services based on their perceptions and assessments (Fischer & Karl, 2025; He et al., 2025). This highlights the necessity of delivering good services while also ensuring that these services are favorably appraised by the target population.

The assessment of smart health devices plays a vital role in shaping the elderly's willingness to adopt new technologies (Zhou et al., 2025). This readiness is critical for the successful implementation of intelligent smart elderly care services, as it directly affects the demand for these innovations (Abdi et al., 2019; Liu et al., 2022). Fostering a positive personal behavioral disposition among older adults is key to enhancing their intention to engage with smart senior care solutions. Stakeholders can encourage broader adoption by highlighting improvements in service efficacy, convenience, safety, and affordability. Ultimately, understanding and addressing the factors that influence seniors' attitudes and intentions will lead to better outcomes in aged care, ensuring that the needs and preferences of this population are effectively met.

H1: Attitude has a positive and significant effect on elderly behavioral intention to use smart elderly care services.

Subjective norms have a significant positive impact on behavioral intention, indicating that greater perceived social support is linked to a higher likelihood of individuals engaging in certain behaviors (Baguko & Taye, 2026; Lee et al., 2024). These norms refer to the social pressure or support individuals feel from their environment, including the influence of family members, community groups, and social media on the decision-making processes of the elderly (Holloway et al., 2023). Subjective norms are particularly important, as social support strongly shapes the choices and actions of older adults (Peng et al., 2024). Societal expectations and communal values often guide individuals toward behaviors that align with collective standards. For instance, Qin et al. (2024) found that both familial and community support directly increased the elderly's likelihood of choosing integrated medical and nursing care facilities.

The significance of familial and communal support in influencing the healthcare choices of older persons, indicating that when family members endorse specific services, the elderly are more inclined to contemplate and employ them. Park et al. (2025) evidenced that community advocacy for smart senior care services markedly increased the elderly's demand for and readiness to utilize these services. Communities that actively advocate for intelligent senior care solutions establish a social norm that motivates older persons to adopt these innovations, therefore enhancing their overall involvement with available resources (Qin et al., 2024). It demonstrates that subjective norms significantly influence behavioral intentions in the aged population. The impact of perceived social support from family, community, and social networks is significant. Consequently, stakeholders can markedly improve the propensity of older adults to utilize essential services, including integrated medical care and advanced elderly care technologies, by fostering supportive environments, reinforcing social support networks, and promoting favorable community norms (Sadio et al., 2025; Wang et al., 2026). It has a crucial role in enhancing the quality of care and general well-being of the aged population. Comprehending the dynamics of subjective norms might facilitate the development of more effective techniques for promoting healthy habits and increasing the adoption of new care solutions among older individuals.

H2: The subjective norm has a positive and significant effect on elderly behavioral intention to use smart elderly care services.

Perceived behavioral control significantly influences behavioral intention and enhances demand by bolstering individuals' confidence in their capacity to successfully execute a specific behavior (Park et al., 2025; Sarma et al., 2025). This concept denotes an individual's subjective assessment of the ease or difficulty in executing a specific action, encompassing factors such as required resources, including time and financial investment, alongside potential obstacles like necessary skills and technical prerequisites. This is particularly relevant for elderly individuals, who may encounter specific challenges in adopting new behaviors or technologies (Juma & Fernández-Sainz, 2024). Perceived behavioral control holds particular significance for the elderly in the context of adopting smart elderly care services. The senior citizens are more likely to engage with services when they perceive that they possess adequate control over their usage. Improving the behavioral control of the elderly may result in heightened confidence and a greater propensity to engage with smart health services.

Liu et al. (2022) and Ogiemwonyi (2024) demonstrated that increased perceived behavioral control significantly improved individuals' intentions to engage in social activities. This finding demonstrates that confidence in one's ability to engage in a behavior can lead to increased participation and commitment. The studies underscore the extensive relevance of perceived behavioral control in diverse contexts, emphasizing its role in influencing behavioral intentions. Jo et al. (2021) and Wang et al. (2023) indicated that the elderly's perception of the complexity of operating smart health devices significantly influences their willingness to utilize social care services. The perception of complexity or difficulty in managing these devices among older adults negatively impacts their likelihood of adoption. Thus, streamlining the functionalities of these devices and ensuring sufficient technical support can markedly enhance demand. Addressing the barriers that hinder perceived behavioral control can facilitate a smoother transition for the elderly in adopting smart technologies.

H3: The perceived behavioral control has a positive and significant effect on elderly behavioral intention to use smart elderly care services.

Behavioral intention serves as a crucial predictor of actual behavior, significantly shaped by factors such as an individual's attitude toward the behavior, social support, and perceived behavioral control. A stronger demand for smart elderly care services among the elderly is associated with an increased behavioral intention. This relationship is significant, indicating that when older adults identify a need for particular services, their probability of utilizing those services rises. Lee et al. (2025) and Zhang (2023) support this notion, demonstrating that patients with stronger demand intentions for primary healthcare services have a higher probability of actual usage. Luo et al. (2025) highlight that the perceived necessity of these services significantly influences the elderly's readiness to adopt technological solutions aimed at improving their quality of life. This underscores the significance of demand in influencing behavior, especially within healthcare settings. Consequently, a heightened demand for smart elderly care services among the elderly is likely to result in increased actual usage behavior. This relationship is essential for facilitating the adoption and implementation of smart elderly care services.

Behavioral intention is a critical determinant of individual behavior, encompassing an individual's assessment of their capability to effectively execute a particular behavior, which directly affects the manifestation of that behavior (Liu et al., 2022). The core factors influencing an individual's behavioral intention and actual behavior include behavioral attitude, subjective norms, and perceived behavioral control. Lee et al. (2025) examined residents' attitudes toward positive interrelations among behavioral attitude, subjective norms, and perceived behavioral control. There are reciprocal effects between behavioral attitudes and social support among the elderly concerning smart elderly care services. The positive reciprocal relationships among the behavioral attitudes, subjective norms, and perceived behavioral control of the elderly concerning smart elderly care services. Improvements in behavioral attitudes will enhance social support and confidence in technology use, while increased social support and perceived behavioral control subsequently strengthen positive attitudes and behavioral intentions toward smart elderly care services.

H4: Behavioral intention has a positive and significant effect on elderly behavioral actual use smart elderly care services.

H5: Behavioral intention has a positive and significant effect on mediating the relationship between behavioral attitude and elderly behavioral actual use smart elderly care services.

H6: Subjective norm has a positive and significant effect on mediating the relationship between behavioral attitude and elderly behavioral actual use smart elderly care services.

H7: Perceived behavioral control has a positive and significant effect on mediating the relationship between behavioral attitude and elderly behavioral actual use smart elderly care services.

METHODS

Research Design

The research object of this subject is the elderly group (≥ 65 years old) in Nanning, Guangxi. The target group of this survey specifically includes all citizens of the People's Republic of China aged 65 years and above living in urban areas of Nanning City. In 2022, the permanent population of Nanning reached 8.8917 million, with 1.36 million people aged 60 and above, accounting for 15.3% of the total population. Among them, 1.0218 million were aged 65 and above, making up 11.49%. This indicates that Nanning is a typical aging city, and the aging degree is gradually deepening, and there is a huge demand market for smart elderly care services. It is of great value and significance to study the consumption behavior of smart pension products for the huge elderly population in Nanning City, which not only helps to understand the consumption habits and influencing factors of smart pension products for the elderly, but also provides a scientific basis for policy formulation and promotes the promotion of the consumption concept of smart pension products. The behavioral attitude, subjective norm and perceived behavioral control was measured

Table 1. Participant's characteristics

Category	Option	Count (People)	Percentage (%)
Gender	Male	284	45.1
	Female	346	54.9
Age	65-69	305	48.4
	70-74	171	27.1
	75-79	117	18.6
	Over 80	37	5.9
Place of residence	Qingxiu District	223	35.4
	Xixiangtang District	204	32.4
	Gangnam District	203	32.2
Marital status	Unmarried	2	0.3
	Married	588	93.3
	Divorce	23	3.7
	Widowed	17	2.7
Annual household income	Less than 50000	2	0.3
	50000 to 100000	59	9.4
	100000 to 500000	389	61.7
	500000 to 1000000	153	24.3
	Over 1 million	27	4.3
Current (or pre retirement) occupation	Civil servant	21	3.3
	Farmers	37	5.9
	Employee	288	45.7
	Worker	84	13.3
	Professional Technicians	41	6.5
	Business/individual private households (6)	93	14.8
	Other	66	10.5
Health status	Poor	58	9.2
	Very poor	144	22.9
	Generally	178	28.3
	Very good	160	25.4
	Very good	90	14.3

using items adapted from Lee et al. (2024), elderly behavioral intention and actual behavior to use smart elderly care service refers to Ren and Zhou (2023) and Sarma et al. (2025).

Considering the actual situation, this survey adopts the non-probability sampling method, which means that some individuals are selected from all the survey objects without probability for investigation, and the characteristics of all the survey objects are inferred from the characteristics of the individuals. The survey results of the sample extraction method can explain the overall nature and characteristics of the survey objects to a certain extent. Random encounter sampling is one of the non-probability sampling methods, which requires the investigator to include sample members in every overall unit encountered under specific conditions.

The data collection process was approved by the ethics committee for research involving human subjects at one of the authors' institutions, as well as by the department chair of the host institution. Informed consent was obtained with approval from the department chair, emphasizing that participation was voluntary, respondents could withdraw at any time, and all data would be kept anonymous and confidential, accessible only to the authors and the research assistant. The study was conducted between 25th July and 31st August 2025. Data were accessed for analysis in September 2025. All responses were anonymized via unique identification codes, ensuring respondents' identities remained untraceable.

This sample sampling method can make it convenient for the investigator to get close to the survey object. The survey samples of the elderly in Qingxiu District, Xixiangtang District and Jiangnan District of Nanning City were selected. The specific sample distribution is shown in **Table 1**. In order to ensure a sufficient sample size, 250 questionnaires are planned to be distributed in each urban area. However, a total of 630 questionnaires returned. This selection is intended to cover older people from different economic backgrounds to obtain more comprehensive and accurate data (see **Table 1**).

The research was approved by the ethics committee of institutional review board, Chiang Mai Rajabhat University, Thailand (letter number COA NO. 328/2025). This research adheres to ethical research standards in 18th July 2025. Following the ethical standards as laid down in the 1964 Declaration of Helsinki and the ethical principles and code of conduct, participation in this study was voluntary. In this study, informed consent was obtained from all participants who agreed to participate in this research and publish their data in publications. This consent was provided through online survey forms. Data collection for this study occurred online between 25th July 2025 to 30th August, 2025.

Data Analysis

This study also applied a critical selection technique, part of the purposive sampling strategy, in the absence of a complete list of Chinese university students who passed the liberal arts course. A pretest and a pilot test were applied before the formal test. The filter questions verified that respondents were in school and had taken a liberal arts course to participate in the poll. This study also utilized common method variance (CMV) to mitigate potential bias issues in anonymous questionnaire distribution and

Table 2. Correlation matrix for measurement scales

Constructs	Mean	SD	BA	SN	PBC	BI	BEH
BA	5.33	1.52	0.836				
SN	5.64	1.35	0.245**	0.833			
PBC	5.73	1.24	0.337**	0.404**	0.765		
BI	5.25	1.63	0.525**	0.398**	0.537**	0.790	
BEH	5.72	1.52	0.576**	0.457**	0.460**	0.490**	0.750

SD: standard Deviation; Diagonal elements are the square roots of the AVE for each construct; Pearson correlations are shown below the diagonal; Significant at *: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$

randomly arranged the measurement items (Podsakoff et al., 2003). The structural equation model (SEM) was additionally used to examine the correlation of research constructs using AMOS and SPSS software.

This study also suggested post-detection methods for the common latent factor (CLF) using Harman's single-factor test. Nonresponse bias shouldn't be a problem as a result. **Table 2** reveals that almost all the correlations between the variables in this study are significant, allowing for further analysis. In addition, the new study followed the advice of Hair Jr et al. (2021) by using a two-step methodology that included confirmatory factor analysis (CFA) and structural equation modelling (SEM) to assess causal relationships between variables and research hypotheses.

Measurement Model

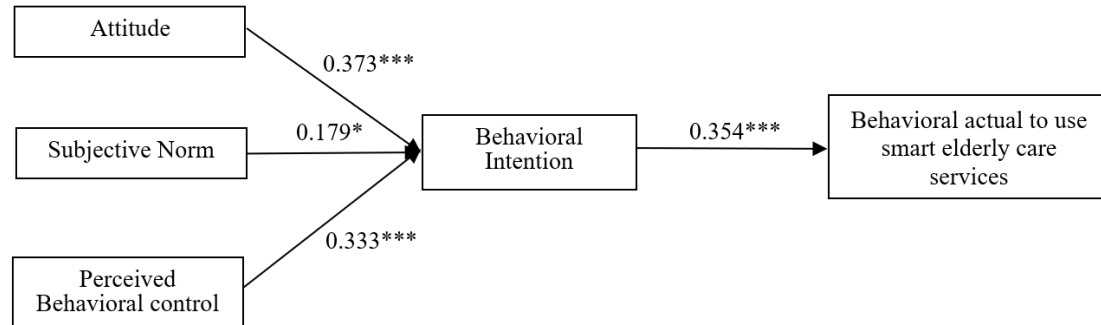
The confirmatory factor analysis (CFA) results (χ^2/df 3.471, TLI = 0.943, RMSEA = 0.043, CFI = 0.946, and IFI = 0.948) showed that the data fit well with the model. The results given in **Table 3** showed that all the items of all the variables loaded significantly, and therefore, no item was deleted. The values of Cronbach's alpha, composite reliability, and average variance extracted (AVE) are significantly above the threshold value, indicating that inter-item reliability exists among the items of each variable in this study.

Table 3. Measurement results

Constructs	Squared multiple correlation (SMC)	Composite reliability (CR)	Average of variance extracted (AVE)	Cronbach's α
Behavioral attitude		0.877	0.723	0.854
BA1: I think smart elderly care service is more convenient than traditional elderly care service.	0.815			
BA2: I think smart elderly care services can better meet individual needs than traditional elderly care services.	0.824			
BA3: I think smart elderly care services can more effectively deal with the problem of insufficient elderly care resources.	0.728			
BA4: I think smart elderly care services can provide more accurate and scientific health monitoring.	0.775			
Subjective Norm		0.795	0.661	0.762
SN1: My family members (including children, spouse, etc.) support me to accept smart elderly care services	0.757			
SN2: My friend supports me to accept the smart aged care service	0.745			
SN3: I feel that the society generally believes that smart elderly care service is a pension model worth promoting.	0.751			
SN4: Professionals in the field of health management and elderly care recommended that I receive smart elderly care services.	0.704			
Perceived Behavioral control				
PB1: I have enough income to receive smart care services.	0.769			
PB2: I can get familiar with using (or my family can help me use) smart care services.	0.783			
PB3: My home has installed a network environment suitable for the operation of smart elderly care services.	0.765			
PB4: There are plenty of smart aged care providers in my area.	0.807			
Behavioral intention		0.862	0.635	0.772
BI1: I am willing to meet my physiological needs such as dietary assistance through smart elderly care service	0.823			
BI2: I am willing to meet my safety needs such as safety monitoring through smart elderly care service	0.774			
BI3: I am willing to meet my social needs such as emotional companionship through smart elderly care services	0.743			
BI4: I am willing to meet my respect needs such as intelligent escort through intelligent elderly care services	0.769			
BI5: I am willing to meet my self-actualization needs such as exerting waste heat through smart elderly care services	0.792			

Table 3 (Continued). Measurement results

Constructs	Squared multiple correlation (SMC)	Composite reliability (CR)	Average of variance extracted (AVE)	Cronbach's α
Actual Behavior		0.772	0.611	0.721
AB1: I have used the smart aged care service	0.759			
AB2: I take the initiative to learn how to operate smart elderly care equipment	0.737			
AB3: I share the experience and feelings of using smart elderly care services through social media or communication with others	0.748			
AB4: I once mobilized people around me to choose smart elderly care services	0.814			

**Figure 2.** Structural model result (Source: Authors' own elaboration)

Model fit: $\chi^2/df = 3.793$, GFI = 0.961, NFI = 0.962, CFI = 0.961, IFI = 0.962, and RMSEA = 0.043.

Table 4. Mediation result

Direct effect				θ	t	95% CI
Attitude	→	Behavioral intention		0.373	14.571***	(0.362, 0.457)
Subjective norm	→	Behavioral intention		0.179	11.813***	(0.157, 0.341)
Behavioral control	→	Behavioral intention		0.333	7.391***	(0.244, 0.348)
Behavioral intention	→	Behavioral actual		0.354	5.489**	(0.315, 0.357)
Indirect effect				θ	SE	95% CI
Attitude	→	Behavioral intention	→ Behavioral actual	0.132***	0.021	(0.110, 0.178)
Subjective norm	→	Behavioral intention	→ Behavioral actual	0.063*	0.027	(0.049, 0.135)
Behavioral control	→	Behavioral intention	→ Behavioral actual	0.117***	0.025	(0.089, 0.139)

Significant at *: $p < 0.05$. **: $p < 0.01$. ***: $p < 0.001$

Structural Model

The behavioral attitude, subjective norm and perceived behavioral control have a significant and positive effect on people's behavioral intention ($\gamma_{11} = 0.373$, $p < 0.001$; $\gamma_{12} = 0.179$, $p < 0.05$; $\gamma_{13} = 0.333$, $p < 0.001$), hence supporting H1, H2 and H3. Furthermore, perceived behavioral control and behavioral intention have a crucial role to elderly people behavior ($\beta_{21} = 0.354$, $p < 0.001$), which supports H4 (see **Figure 2**).

Mediating Effect

To test the direct effects and proposed mediating effects in the proposed model, the Hayes PROCESS model 4 was performed (see **Table 4**). The results indicated that all of the direct and indirect effects of the proposed hypothesis were supported. The indirect results showed that the relationship between attitude, subjective norm and behavioral control have a positive and significant effect on behavioral actual were mediated by behavioral intention ($\beta = 0.373 \times 0.354 = 0.132$, CI = (0.110, 0.178); $\beta = 0.179 \times 0.354 = 0.063$, CI = (0.049, 0.135); $\beta = 0.333 \times 0.354 = 0.117$, CI = (0.089, 0.139), supporting H5, H6 and H7.

DISCUSSION

Behavioral attitudes significantly influence elderly individuals' intentions to use smart elderly care services such as ability to learn and operate new technologies plays a crucial role. Positive attitudes, shaped by perceived ease of use, trust in technology, and perceived benefits, can enhance their willingness to adopt these services. It demonstrates that elderly users often evaluate technology based on past experiences and the perceived relevance to daily activities. Furthermore, smart care services also can improve quality of life to lead express a favorable intention to elderly service. Elderly people also build social connections, which can provide emotional support and mitigate feelings of isolation often linked to their stress. This result aligns with preliminary

studies that found that behavioral attitudes embedded people intention to use a service (Baelen et al., 2025; Zhang, 2023). Hence, the service providers can implement clear guidelines and provide ongoing feedback, helping elderly people navigate challenges effectively to alleviate their stress. In addition, smart elderly care services has the potential to enhance elderly people psychological well-being through increased engagement and support; careful implementation is essential to ensure that it valuable to daily activities.

Social influences, such as encouragement from family and peers, can also impact their attitudes. When elderly individuals see others successfully using smart technologies, it can reduce anxiety and foster a more positive outlook. Conversely, negative attitudes stemming from fear of technology or concerns about privacy can hinder their willingness to engage with these services. Moreover, digital literacy is a critical factor. Those with higher digital skills tend to have more positive attitudes towards technology, which translates into a greater intention to use smart elderly care services. Programs aimed at improving digital literacy among seniors can thus be beneficial in promoting acceptance. This positivity often stems from recognizing the potential benefits these services can provide, such as improved health monitoring and enhanced independence. This service significantly influences the service users' attitudes by fostering deeper understanding and retention of knowledge (Luo et al., 2025; Ren & Zhou, 2023; Sun et al., 2025). It demonstrates, unlike traditional learning methods that often emphasize memorization, smart Elderly care Services encourages people to engage with real-world problems, promoting critical thinking.

Perceived behavioral intention is a critical factor influencing elderly individuals' willingness to adopt smart elderly care services. This concept refers to the degree to which seniors believe they will engage in a specific behavior, in this case, using technology designed to assist with their care and daily activities. Several elements contribute to this perception, including perceived ease of use, perceived usefulness, and personal motivation. This perception can be enhanced through user-friendly designs, clear instructions, and supportive training programs that cater to their specific needs and perceived usefulness. High levels of stress can lead to anxiety, decreased motivation, and impaired cognitive functioning, which negatively impact students' ability to concentrate. This supports preliminary studies by Liu et al. (2022) and Luo et al. (2024), perceived behavioral intention has a strong correlation to service usage intention. Stakeholders can create targeted interventions that encourage older adults to engage with these technologies towards understanding and addressing the factors that drive demand for elderly smart care service. Ultimately, fostering a strong demand for smart elderly care services not only enhances behavioral intention but also leads to improved health outcomes and greater independence for the elderly population. This underscores the importance of developing services that resonate with the needs and preferences of older adults, ensuring that they feel empowered to take advantage of the benefits that smart technologies can offer.

Behavioral intention is a crucial predictor of actual behavior, particularly in the context of adopting smart elderly care services. It reflects an individual's readiness to perform a specific behavior, which, in this case, is the use of technology designed to assist elderly individuals in managing their health and daily activities. Several factors contribute to how behavioral intention influences the actual usage of these services such as direct correlation with usage (Durak et al., 2025; Liu et al., 2025). When elderly individuals express a strong intention to use smart elderly care services, they are more likely to engage with these technologies. This intention often stems from positive attitudes towards the perceived benefits, such as enhanced safety, improved health monitoring, and increased independence. The stronger the intention, the more likely they are to overcome barriers to adoption, such as technological apprehension or lack of familiarity. Furthermore, social support such as family and social circles to use smart elderly care services. This support can manifest in various forms, such as assistance in learning how to use the technology or sharing positive experiences, which can further motivate seniors to follow through on their intentions.

The role of the elderly services has been significantly transformed under the technology development combined with the modern apprenticeship care model. Furthermore, behavioral attitudes significantly shape elderly individuals' intentions to adopt smart elderly care services (Junaidi et al., 2026). Positive attitudes towards technology, influenced by perceived benefits like safety and independence, enhance their willingness to engage with these services. Furthermore, social support from family and friends further reinforces these intentions, facilitating successful adoption. This study also demonstrates that psychological factors, particularly effectiveness perception and emotional attitudes, play a significant role in shaping the behavioral intentions of older adults towards smart elderly care services. However, cost perception also impacts behavioral intention. Older people who view the costs associated with care services as reasonable are more likely to express a willingness to adopt these technologies. Conversely, high perceived costs can discourage them from engaging with these services.

Subjective norms, or the perceived social pressure to use these services, significantly affect usage intentions. When family members and peers advocate for the use of smart elderly care services, it positively influences elderly people willingness to adopt the care service. This social support can manifest through encouragement and shared experiences, making the technology feel more accessible (Moore et al., 2026). However, this study found that risk perception moderates the relationship between cost perception and emotional attitudes. Elderly people with a heightened awareness of fall risks or health issues are more likely to view the benefits of smart elderly care services. Hence, in order to encourage positive behavioral intentions among older persons, programs can be created that address financial concerns, improve perceived efficacy, and make use of social support. This strategy has the potential to increase adoption rates and enhance seniors' quality of life.

CONCLUSIONS

Positive behavioral intentions, driven by the perceived benefits of these technologies such as enhanced safety, improved health monitoring, and increased independence play a crucial role in determining whether the senior citizen will engage with these services. Furthermore, social support from family, friends, and caregivers further reinforces these intentions, creating an

environment where older adults feel encouraged and validated in their choices. When elderly people perceive that their social circles advocate for the use of smart elderly care services, they are more likely to overcome apprehensions and embrace technology. Moreover, addressing concerns related to cost and risk perception is essential for promoting adoption. The service care members who view the costs as reasonable and recognize the potential risks associated with aging are more inclined to adopt these services. Stakeholders must focus on fostering positive attitudes, providing education, and leveraging social support networks. Hence, the stakeholders can facilitate a smoother transition for older adults into the digital age of care, ultimately improving quality of life and well-being.

Academic Implications

While the Theory of Planned Behavior (TPB) has commonly been used to explain technology adoption, this manuscript makes a significant contribution by focusing on older adults in Nanning, Guangxi, a region with unique socio-cultural and economic characteristics that are often absent from previous TPB studies. The research extends the TPB framework by integrating age-relevant constructs such as technology anxiety, digital literacy, and health risk perception factors particularly pertinent to the elderly but typically omitted in mainstream TPB applications thereby offering a more holistic and context-sensitive understanding of technology use among older adults. Additionally, the study provides differentiated insights by analyzing which specific dimensions of smart elderly care services are more or less influenced by these constructs, revealing new adoption and resistance patterns unique to the Nanning context. The empirical evidence gathered challenges the notion of uniform technology adoption among older adults, demonstrating that local culture, technology confidence, and health perceptions play significant roles in shaping actual use. Ultimately, the manuscript offers actionable recommendations for developing culturally and contextually appropriate interventions, thereby advancing both theoretical understanding and practical strategies in the field of smart elderly care beyond simply confirming established TPB relationships.

Practical Implications

Beyond confirming the established relationships proposed by the Theory of Planned Behavior (TPB), this manuscript makes an important theoretical and empirical contribution by investigating the unique context of older adults in Nanning, Guangxi a region with distinct socio-cultural, economic, and technological characteristics that set it apart from settings typically studied in TPB research. This research delivers fresh insights into how local cultural norms, community dynamics, and individual technology confidence shape acceptance and use of Smart Elderly Care Services in Nanning, uncovering differentiated patterns of adoption and resistance not previously documented. The manuscript also identifies which dimensions of smart elderly services are most affected by these factors, offering a novel, granular perspective that informs the design of targeted interventions. These findings guide stakeholders including healthcare providers, technology developers, policymakers, and community organizations in developing educational initiatives, peer support networks, and culturally sensitive strategies that address the specific needs of Nanning's older adults, ultimately supporting more inclusive and effective smart elderly care adoption beyond the predictive scope of traditional TPB applications.

Limitations and Future Study Directions

This study has three limitations. The findings may not be generalizable to all regions or educational contexts within the country. Hence, future research needs to confirm the role of smart elderly care services across diverse cultures and regions, as well as incorporate additional variables such as socioeconomic status, educational background, and institutional support to obtain more comprehensive results. The political sensitivity in China may have influenced my informants' willingness to answer the questionnaires and interview questions openly. This limitation could lead to biased responses and a lack of depth in the data collected. Future studies should consider incorporating local wisdom and perspectives to gain a more nuanced understanding of elderly people experiences with other social care programs. Engaging with a broader range of participants, including those from different educational backgrounds and regions, will enrich the findings and provide valuable insights into the effectiveness of social care in various contexts. Lastly, longitudinal studies could be beneficial to assess the long-term impacts of social care on elderly people to enhance the sampling quality and bias issue.

Author contributions: YW & NP: conceptualization, investigation, writing - original draft, writing - review & editing; YW: methodology, validation, formal analysis, resources, data curation, project administration; NP: software. All authors agreed with the results and conclusions.

Funding: No funding source is reported for this study.

Ethical statement: The authors stated that the study was approved by the institutional ethics committee of University of Technology Krungthep on July 18, 2025 (Approval code: 328/2025). Written informed consent was obtained from all individuals included in the research. The authors further stated that all procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

AI statement: The authors stated that Quillbot was used during the manuscript preparation to check grammar.

Declaration of interest: No conflict of interest is declared by the authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

REFERENCES

- Abdi, S., Spann, A., Borilovic, J., de Witte, L., & Hawley, M. (2019). Understanding the care and support needs of older people: A scoping review and categorisation using the WHO international classification of functioning, disability and health framework (ICF). *BMC Geriatrics*, 19, Article 195. <https://doi.org/10.1186/s12877-019-1189-9>
- Aimaganbetova, O., Lashkova, Y., Madaliyeva, Z., Zakaryanova, S., Sadvakassova, Z., & Kassen, G. (2023). Youth's disposition of radicalism in a poly-ethnic and poly-confessional society from the perspective of tolerance/intolerance. *Journal of Ethnic and Cultural Studies*, 10(1), 141-164. <https://doi.org/10.29333/ejecs/1155>
- Baelen, F. V., Regge, M. D., Larivière, B., Verleye, K., & Eeckloo, K. (2025). The impact of family members on aging persons' technology use intentions. *Heliyon*, 11(3), Article e42252. <https://doi.org/10.1016/j.heliyon.2025.e42252>
- Baguko, S. B., & Taye, B. A. (2026). English language teachers' self-efficacy and teaching practice in Ethiopian secondary schools: A mixed-method study design of language teaching skills and instructional strategies. *Pedagogical Research*, 11(3), Article em0279. <https://doi.org/10.29333/pr/19014>
- Demir, Z. G., & Kurtulus, E. (2024). The effect of an intergenerational interaction program on the life satisfaction, social support and loneliness of the elderly. *Ageing international*, 49(3), 621-641. <https://doi.org/10.1007/s12126-024-09563-y>
- Díaz, M., Gil, R. M., Cabeza, L. F., Cerezo, E., & Teixidó, M. (2024). Enhancing active aging through IRAGE: Mitigating social isolation with intergenerational gaming. *Heliyon*, 10(12), Article e32979. <https://doi.org/10.1016/j.heliyon.2024.e32979>
- Durak, H., Çelik, E. G., & Çelik, B. (2025). New insights into the correlation between secondary traumatic stress and cognitive flexibility in mental health therapists and counselors. *Journal of Ethnic and Cultural Studies*, 12(4), 20-47. <https://doi.org/10.29333/ejecs/2349>
- Fischer, R., & Karl, J. A. (2025). What predicts intentions and behavior? A cultural exploration of attitude, belief, and norm effects across 55 countries. *Cross-Cultural Research*, 59(5), 615-650. <https://doi.org/10.1177/10693971251338204>
- Hair Jr, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning EMEA.
- He, J., Sui, D., Li, L., & Lv, X. (2025). Fueling the development of elderly care services in China with digital technology: A provincial panel data analysis. *Heliyon*, 11(3), Article e41490. <https://doi.org/10.1016/j.heliyon.2024.e41490>
- Holloway, J., Sayeed, O., & Jurivich, D. (2023). Tellegacy: An intergenerational wellness and health promotion project to reduce social isolation and loneliness in older adults: A feasibility study. *International Journal of Environmental Research and Public Health*, 20, Article 7094. <https://doi.org/10.3390/ijerph20237094>
- Jo, T. H., Ma, J. H., & Cha, S. H. (2021). Elderly perception on the Internet of Things-based integrated smart-home system. *Sensors*, 21(4), Article 1284. <https://doi.org/10.3390/s21041284>
- Juma, F., & Fernández-Sainz, A. (2024). Social exclusion among older adults: A multilevel analysis for 10 European countries. *Social Indicators Research*, 174, 525-551. <https://doi.org/10.1007/s11205-024-03369-w>
- Junaidi, J., Dewi, R., & Rahmawati, R. (2026). Religiosity's role in Islamic bank consumers' ethics, materialism and social responsibility (CnSR): a divine command theory (DCT) perspective. *Journal of Islamic Marketing*, 17(1), 303-323. <https://doi.org/10.1108/JIMA-01-2024-0001>
- Lee, S., Kim, B., & Ivan, U. V. (2024). The effect of motivation on the behavioral intention to protect industrial techniques of high-tech firms' employees. *Administrative Sciences*, 14(8), Article 176. <https://doi.org/10.3390/admsci14080176>
- Lee, V., Cheng, D. Y. Y., Lit, K. K. D., Buaton, H., & Lam, E. (2025). Active ageing in the digital era: the role of new technologies in promoting the wellbeing of older people in Hong Kong. *Asia Pacific Journal of Social Work and Development*, 35(4), 360-379. <https://doi.org/10.1080/29949769.2025.2457363>
- Liu, J., Liu, L., & Pei, M. (2022). Analysis of older people's walking behavioral intention with the extended theory of planned behavior. *Journal of Transport & Health*, 26, Article 101462. <https://doi.org/10.1016/j.jth.2022.101462>
- Liu, X., Chau, K.Y., Liu, X., & Wan, Y. (2025). Synergistic evaluation system of "technology and service" in smart elderly care institutions in China. *Digital Health*, 11. <https://doi.org/10.1177/20552076251326681>
- Luo, J., Zhang, K., Huang, Q., Jiang, S., & Pan, Y. (2025). From acceptance to dependence: Exploring influences of smart healthcare on continuous use intention of mobile health services among older adults with chronic illnesses in China. *Behavioral Sciences*, 15(1), Article 19. <https://doi.org/10.3390/bs15010019>
- Moore, S., BrintzenhofeSzoc, Archuleta, Ami Moore, Sedaghatshoar, S., Varikkodan, S., & Rowe, J. (2026). Black immigrant women in the United States: Social determinants of health and data harmonization. *Journal of Ethnic and Cultural Studies*, 13(3), 153-178. <https://doi.org/10.66815/ejecs/2539>
- Ogiemwonyi, O. (2024). Determinants of green behavior (Revisited): A comparative study. *Resources, Conservation & Recycling Advances*, 22, Article 200214. <https://doi.org/10.1016/j.rcradv.2024.200214>
- Park, B., Kim, P.-M., Kim, C.-M., Choi, C.-J., & Shin, H.-Y. (2025). The act on integrated support for community care including medical and nursing services: Implications for the role of tertiary hospitals in the Republic of Korea. *Healthcare*, 13(10), Article 1156. <https://doi.org/10.3390/healthcare13101156>
- Peng, J., Qi, H., Fan, Z., Zhou, Q., & Lin, Y. (2024). Social support and health behaviors of older adults during the COVID-19 pandemic in China: A moderated mediation model of loneliness and economic income. *BMC Public Health*, 24, Article 2780. <https://doi.org/10.1186/s12889-024-20272-8>

- Penninkilampi, R., Casey, A. N., Singh, M. F., & Brodaty, H. (2018). The association between social engagement, loneliness, and risk of dementia: A systematic review and meta-analysis. *Journal of Alzheimer's Disease*, 66(4), 1619-1633. <https://doi.org/10.3233/JAD-180439>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Qin, S., Zhou, M., Cheng, Y., Zhao, J., & Ding Y. (2024). Choice preference of middle-aged and elderly people on integrated medical services and elderly care model: A cross-sectional study. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, 61. <https://doi.org/10.1177/00469580231224345>
- Ren, Z., & Zhou, G. (2023). Analysis of driving factors in the intention to use the virtual nursing home for the elderly: A modified utaut model in the Chinese context. *Healthcare*, 11(16), Article 2329. <https://doi.org/10.3390/healthcare11162329>
- Sadio, R., Henriques, A., Nogueira, P., & Costa, A. (2025). Barriers and facilitators to older adults' engagement in social prescribing: A qualitative study using focus groups. *Journal of Clinical Medicine*, 14(13), Article 4780. <https://doi.org/10.3390/jcm14134780>
- Sarma, P. K., Alam, M. J., Rabbani, G., Begum, I. A., Ahmed, J. U., & McKenzie, A. M. (2025). Farmers' behavioral intentions to adopt livestock interventions for food security: a theory of planned behaviour approach. *Discover Sustainability*, 6, Article 190. <https://doi.org/10.1007/s43621-025-00960-0>
- Sun, S., Lyu, X., & Chen, J. (2025). Technology readiness and smart healthcare device usage intentions among Chinese elderly: A moderated mediation model of technology interactivity and subjective norms. *Health Informatics Journal*, 31(2). <https://doi.org/10.1177/14604582251344828>
- Wang, X., She, S., & Junaidi, J. (2026). The impact of school support on international students cross-cultural adaptability, psychological resilience and satisfaction. *Journal of Ethnic and Cultural Studies*, 13(3), 252-273. <https://doi.org/10.66815/ejecs/2989>
- Wang, Y., Lu, L., Zhang, R., Zhao, S., & Liang, C. (2023). The willingness to continue using wearable devices among the elderly: SEM and FsQCA analysis. *BMC Medical Informatics and Decision Making*, 23, Article 218. <https://doi.org/10.1186/s12911-023-02336-8>
- World Health Organization [WHO] (2023). *Se necesitan medidas urgentes para desencallar la falta de avances en los Objetivos de Desarrollo Sostenible relacionados con la salud* [Urgent action is needed to break the deadlock on the health-related Sustainable Development Goals]. <https://www.who.int/es/news/item/19-05-2023-urgent-action-needed-to-tackle-stalled-progress-on-health-related-sustainable-development-goals>
- Zhang, M. (2023). Older people's attitudes towards emerging technologies: A systematic literature review. *Public Understanding of Science*, 32(8), 948-968. <https://doi.org/10.1177/09636625231171677>
- Zhou, J., Salvendy, G., Boot, W. R., Charness, N., Czaja, S., Gao, Q., Holzinger, A., Ntoa, S., Rau, P.-L. P., Rogers, W. A., Stephanidis, C., Wahl, H.-W., & Ziefle, M. (2025). Grand Challenges of Smart Technology for Older Adults. *International Journal of Human-Computer Interaction*, 41(7), 4439-4481. <https://doi.org/10.1080/10447318.2025.2457003>