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The Influence Mechanism of the Elderly's Willingness to Use Smart old-age Care Services from the Perspective of Privacy Rights—An Empirical Study Based on 216 Data

Xuanying Liang[1]*, Yuxin Lin[1], Yirui Zhang[2]

[1]South China Agricultural University (College of Humanities and law), Guangzhou 510000, Guangdong, China
[2]South China Agricultural University (College of Artificial Intelligence and Low-Altitude Technology), Guangzhou 510000, Guangdong, China

Abstract: With the rapid development of smart pension services in China, the privacy issues of the elderly have become increasingly prominent. Based on the empirical data of several smart elderly care pilot communities and elderly universities in Beijing, Shanghai, Guangzhou and Shenzhen, this paper systematically discusses the key factors that hinder the popularization of smart elderly care services in the elderly group from the perspective of privacy. The research focuses on the three core variables of privacy self-efficacy, privacy risk perception and privacy awareness, and uses the method of constructing a structural equation model to analyze its impact mechanism on the willingness of the elderly to use smart old-age care services. The results show that privacy self-efficacy has a significant positive impact on the willingness to use ; privacy risk perception has a significant negative impact on the willingness to use ; privacy awareness not only positively affects privacy self-efficacy, but also negatively affects privacy risk perception. Therefore, this paper also proposes to systematically improve the sense of trust and control of the elderly from the aspects of interaction design, data transparency, authority control and privacy education, so as to provide theoretical basis and practical reference for the sustainable promotion of smart elderly care services.

Keywords: Smart pension services; Privacy perspective; Willingness to use; Impact mechanism

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1. Introduction

At present, the aging trend of the whole population continues to strengthen. China ‘s relevant departments predict that by 2035, the ‘ silver-haired economy ‘ may account for 9% of China ‘s GDP, and among them, the field of smart old-age care services has the most development potential.[1-2] Smart old-age care refers to the use of modern advanced information technology to support the life management and services of the elderly, [3] and can significantly improve the happiness and sense of acquisition of the elderly.[4] Therefore, at the national level, smart old-age care has been included in the key strategic deployment of the “15th Five-Year Plan”. The state encourages enterprises and local governments to actively promote smart old-age care to accelerate its integration into the daily life of the elderly and promote the elderly to live a high-quality life in their later years.

Although the field of smart old-age care is developing rapidly, there are many obstacles and challenges due to the weak basic service facilities for old-age care in China, the lack of awareness of high-quality old-age care services, and the shortage of special funds.[5] The issue of privacy is one of the important obstacles that affect the elderly’s choice of smart old-age care services. [6]Therefore, this paper will focus on the analysis of 216 empirical data, explore which specific aspects affect the elderly’s choice of smart old-age care services and their impact from the perspective of privacy, and propose improvement measures.

2. Correlation study

In the past, research on the influencing factors of smart old-age care services, scholars often focused on the actual situation and their own perception of the elderly through big data model analysis and field research. Through the analysis of Kano model and multiple linear regression, Ding Yueying et al. found that age, physical condition, number of children and education level are the main factors affecting the demand for smart elderly care services. [7] Yao Xing ‘an used the structural equation model to find that perceived ease of use, perceived usefulness and subjective norms are the three major factors affecting their adoption.[8] Through the investigation and interview of more than 13,000 elderly users in Jianghan District of Wuhan, Bai Mei et al.found that the age, living conditions, physical conditions and economic conditions of the elderly themselves will affect their willingness to use smart old-age care services to varying degrees.[9] Mao Yu takes the “one key” intelligent pension service launched in Wuhan, Hubei Province as the research object. Through the analysis of UTAUT model, it is also found that the age, living condition, physical condition and economic condition of the elderly are the main influencing factors.[10]

In summary, previous studies often analyze the influencing factors of the adoption of smart old-age care services from the perspective of the elderly’s own situation and the subjective feelings of smart old-age care services, ignoring the privacy rights of the elderly. Therefore, this paper focuses on the analysis of the impact of privacy self-efficacy, privacy risk perception and privacy awareness on the willingness to use smart elderly care services.

3. Theoretical basis and research hypothesis

Self-efficacy generally refers to the confidence in something. When the individual’s self-efficacy is higher, they tend to be more inclined to achieve the purpose of action.[11] In this paper, privacy self-efficacy refers to the confidence of the elderly group to effectively manage their own information and protect their privacy while enjoying the intelligent old-age care service. The elderly with high privacy self-efficacy are more willing to try this new technology because they believe that they can protect their privacy information well and feel that they can

effectively deal with the privacy threats posed by smart pension services. Based on this, this study proposes the following hypothesis:

H1: Privacy self-efficacy has a significant positive impact on the willingness to use smart elderly care services.

Privacy risk perception refers to the elderly's expectation of the economic, security and other losses caused by the disclosure of privacy.[12] It also refers to the risk assessment of self-privacy leakage and information leakage when the elderly enjoy the intelligent pension service. The high-risk perception of privacy of the elderly may come from the strangeness of new technologies or the distrust of service providers, thus inhibiting the willingness to use smart elderly care services. [13]Based on this, the study proposes the following hypothesis:

H2 Privacy risk perception has a significant negative impact on the willingness to use smart elderly care services.

Privacy awareness refers to the degree of attention paid by the elderly to their own privacy information, the familiarity with measures to protect privacy information, and the cognition of relevant laws and regulations. [14]The higher the awareness of privacy, the higher the degree of understanding of privacy for the elderly, so they are more confident that they can cope with the privacy threats brought by emerging technologies and reduce the concerns about privacy leakage caused by smart elderly care services. [15]Based on this, this study proposes the following hypothesis:

H3 : Privacy awareness has a significant positive impact on privacy self-efficacy.

H4 : Privacy awareness has a significant negative impact on privacy risk perception.

4. Research methods

4.1. Questionnaire design and distribution

In order to ensure the reliability of the scale, the measurement items are designed and optimized on the basis of the existing papers and the characteristics of the intelligent pension service. The specific measurement questions are shown in **Table 1**.

4.2. Basic information data of the collected objects

This study uses a combination of online and offline methods to collect data. From September to November 2025, 180 paper questionnaires were distributed on-site in 12 smart pension pilot communities and 4 elderly universities in Beijing, Shanghai, Guangzhou and Shenzhen, and 120 electronic questionnaires were distributed through WeChat Moments and elderly interest communities. Finally, 216 valid questionnaires were recovered, of which 53.3% were males and 46.7% were females ; people aged 55-60 years old accounted for 44.4%, and people over 60 years old accounted for 55.6%. At the same time, 16.7% of the elderly think that they are very healthy, 53.3% of the elderly think that they are relatively healthy, and 30.0% of the elderly think that their physical condition is general.[16]

Table 1. Research scales and measurement items.

research variable	Project	Measurement item
Privacy self-efficacy	PSE1	I believe I can independently set up and control smart elderly care devices to protect my privacy
	PSE2	I believe I can independently set up and control smart elderly care devices to protect my privacy
	PSE3	I believe I can independently set up and control smart elderly care devices to protect my privacy
	PSE4	I believe that even if I am not familiar with new technologies, I still have the confidence to learn how to protect my privacy
Privacy Risk Perception	PRP1	I'm worried that smart elderly care service providers might use my personal information for purposes I'm not aware of
	PRP2	I'm worried that my sensitive information such as health and whereabouts might be leaked to strangers
	PRP3	I'm worried that my sensitive information such as health and whereabouts might be leaked to strangers
	PRP4	Overall, I think using smart elderly care services poses a significant risk to my personal privacy
Privacy awareness	PA1	I think I know and have the right to decide what personal information my smart pension service will collect.
	PA2	I believe that smart care providers must obtain my consent before collecting and using my personal information.
	PA3	I clearly know that my health, location and other data belong to personal privacy and are protected by law.
	PA4	I am very concerned about how smart old-age care services will protect my personal privacy.
Intention to Use	ITU1	I think it is a good idea to use smart elderly care services under the premise of privacy protection.
	ITU2	If necessary, I am willing to try to use those smart elderly care services with perfect privacy protection measures.
	ITU3	I plan to understand and possibly use the Smart Pension Service in the future (such as within 1 year).
	ITU4	I will recommend smart elderly care products that focus on privacy protection to friends who care about privacy as much as I do.

5. Data analysis

5.1. Measurement model validation

When using the structural equation model to analyze whether the hypothesis is established, the reliability and validity analysis should be carried out first to test whether the data of the questionnaire has good construct validity. The KMO test and the Bartlett sphericity test are the basic suitability tests before the reliability and validity analysis.

KMO test is used to judge the number of common factors between variables. It is generally believed that when the value of KMO is greater than 0.8, it is very suitable for factor analysis. When the value is less than 0.6, it shows that there is a lack of common factors between variables. The Bartlett sphericity test is used to test whether the variables are independent of each other. Generally speaking, when the p value is less than 0.05, it means that there is a significant correlation between the variables.

Table 2. KMO and Bartlett sphericity tests.

KMO metric	Bartlett sphericity test		
	χ^2	df	p
0.823	1247.568	120	0.0000

From the specific data of the questionnaire, the KMO value and p value are obtained. The specific data are shown in **Table 2**. Since the KMO value is 0.823, greater than 0.6, and $p < 0.001$ in Bartlett's sphericity test, the questionnaire is suitable for factor analysis.

When the specific data of the questionnaire meet the basic suitability test, it is necessary to test the stability and reliability of the questionnaire, that is, Cronbach's Alpha coefficient and composite reliability (CR). Generally speaking, when both are greater than 0.7, the internal consistency of the questionnaire is very high, and the questionnaire data is stable and reliable.

Table 3.

Study variables	Cronbach's Alpha coefficient	Combined reliability (CR)
Privacy self-efficacy (PSE)	0.862	0.889
Privacy Risk Perception (PRP)	0.847	0.875
Privacy awareness (PA)	0.833	0.861
Willingness to Use (ITU)	0.871	0.895

Through the analysis of the specific data of the questionnaire, the Cronbach's Alpha coefficient and the combined reliability (CR) were obtained. The specific data are shown in **Table 3**. Since both are greater than 0.7, it shows that the questionnaire has excellent reliability.

After confirming that the questionnaire has excellent reliability, this study will further test the construct validity of the questionnaire. Construct validity refers to the extent to which the questionnaire can accurately measure the theoretical dimension. From the specific data of the questionnaire, the factor load of each item is between 0.752 and 0.832, which is much higher than the critical value of 0.6, indicating that the item has a strong explanatory power for the corresponding latent variables. And the AVE values of each variable are greater than 0.5, indicating that the item has a good degree of aggregation of latent variables. At the same time, the square root of AVE of each variable is greater than its correlation coefficient with other variables, which shows that the concept boundary between the four latent variables is clear, there is no cross-confusion, and the discriminant validity meets the academic requirements. (See **Table 5** for specific data)

Table 4. Results of convergent validity .

Variables	Load range of factor	Average variance extracted (AVE)
Privacy self-efficacy	0.786~0.821	0.653
Privacy Risk Perception	0.763~0.814	0.631
Privacy awareness	0.752~0.801	0.612
Willingness to use	0.807~0.832	0.668

Table 5. AVE square root and variable correlation coefficient matrix .

Variables	Privacy self-efficacy	Privacy Risk Perception	Privacy awareness	Willingness to use
Privacy self-efficacy	0.816	0.335	0.655	0.602
Privacy Risk Perception	0.335	0.801	-0.290	-0.485
Privacy awareness	0.655	-0.290	0.792	0.525
Willingness to use	0.602	-0.485	0.525	0.822

In summary, the questionnaire of this study has excellent reliability and good construct validity, which confirms that the measurement results are effective and credible.

5.2. Structural equation model analysis

In order to further analyze the specific data to verify the hypothesis, this study used AMOS260.0 software to evaluate the model fitness. The evaluation of model fitness combines absolute fitness index and relative fitness index. However, the fitting results of the initial model (see **Table 6** for specific data) show that it does not match the data well, and many core indicators do not meet the recognized standards. This result usually means that there is a significant gap between the theoretical model's interpretation of real data, which may be due to the omission of some important path relationships in the model or the inclusion of hypothetical paths that are not established.

Table 6. Structural equation model adaptation index before correction.

Adaptation indicators	χ^2	df	χ^2/df	RMSEA	CFI	TLI	SRMR
Actual value	586.327	183	3.204	0.091	0.867	0.852	0.084
Recommended value			1~3	<0.08	>0.9	>0.9	<0.08

In view of the poor fitting of the initial model, this study conducted a systematic theoretical-driven correction. The correction process follows a rigorous sequence : the first is to review the correction index, and allow some error items to be related under the premise of reasonable explanation ; then, the significance test of the model path is carried out, and the relationship without statistical support is deleted. Finally, the measurement model is refined to ensure its reliability and validity. The modified model fitting index shown in **Table 7** confirms that the above optimization strategy is effective, that is, all the core adaptation indicators of the model have entered the recognized recommended values. This establishes a good matching degree between the final model and the sample data, and lays a reliable foundation for the subsequent path coefficient analysis and hypothesis determination.

Table 7. The modified structural equation model adaptation index.

Adaptation indicators	χ^2	df	χ^2/df	RMSEA	CFI	TLI	SRMR
Actual value	412.568	187	2.206	0.065	0.938	0.925	0.056
Recommended value			1~3	<0.08	>0.9	>0.9	<0.08

6. Conclusion analysis and suggestions for improvement

From the statistical results, there are four hypotheses in this study, all of which are valid. The specific analysis

results are shown in **Table 8**.

Table 8. Modified model path coefficient and hypothesis testing .

Hypothesis number	Path relationship	Standardized path coefficient	Result of hypothesis test
H1	Privacy self-efficacy → willingness to use	0.392	support
H2	Privacy risk perception → willingness to use	-0.435	support
H3	Privacy awareness → privacy self-efficacy	0.624	support
H4	Privacy awareness → privacy risk perception	-0.368	support

6.1. Privacy self-efficacy has a significant positive impact on the willingness to use smart pension services (H1 : P = 0.392)

The confidence of the elderly in their own privacy protection ability is one of the key driving forces to promote their use of smart old-age care services. When the elderly believe that they can easily set the privacy limit of smart elderly care equipment, their resistance to it will be greatly reduced. Therefore, in order to enhance the willingness of the elderly to use smart old-age care services, it is necessary to give enough privacy and security to the elderly user groups. [17]First of all, we can reduce the operation threshold by using graphical permission switches and clear 'yes / no' options that are more in line with the cognitive habits of the elderly. Secondly, in the early stage, 'human-machine collaboration' can be used to enable them to get help in time when they encounter problems, thus stabilizing their confidence in their own privacy protection.

6.2. Privacy risk perception has a significant negative impact on the willingness to use smart pension services (H2 : P = -0.435)

The path coefficient shows that the hindrance of privacy risk perception is the most prominent among all the influencing factors. Therefore, the deep concern of the elderly about privacy security is the decisive resistance to their adoption of smart old-age care services. Therefore, service providers must adopt more specific and proactive privacy protection behaviors than conventional disclosure.[18] For example, a clear list is used to inform the user of the scope of information collection, purpose of use and storage period. At the same time, through multiple channels for the elderly, the maintenance record and security certification are actively publicized to users, and the intangible investment is transformed into tangible trust assets. When the elderly group builds up their trust, it can reduce their deep concern for privacy and security, so as to accept the service.

6.3. Privacy awareness has a significant positive impact on privacy self-efficacy (H3 : P = 0.624)

When the elderly have a clear understanding of their own privacy rights, it will give them more confidence to master privacy protection capabilities. Therefore, we should combine the typical application scenarios of smart old-age care, such as remote health monitoring, intelligent access control, vital signs sensing, etc., to make thematic graphic manuals and short videos, and transform privacy rights knowledge into understandable operations. Or you can let the elderly under the guidance of professionals, hands-on practice rights management, data view and delete operations on real products, through the successful experience directly strengthen their self-efficacy. All in all, it enables the elderly to change from passive information protectors to active privacy managers, reducing their psychological barriers to adopting new technologies.

6.4. Privacy awareness has a significant negative impact on privacy risk perception (H4 : P = -0.368).

When the elderly have a clearer understanding of privacy rights and related legal protection, their concerns about potential privacy risks will be significantly reduced. Therefore, the deep integration of privacy education into the whole process of the promotion of smart pension services is a necessary way to reduce the psychological threshold of users and improve the adoption rate. When a user uses a service for the first time and needs to collect relevant information, a concise knowledge prompt should be embedded. At the same time, service providers should publicize their privacy protection measures to users, such as publishing annual transparency reports, or third-party authentication of data protection measures. This active behavior can enhance the privacy awareness of the elderly from all directions and reduce their risk perception of privacy information.

7. Conclusion

As an important way to cope with the aging of the population, the promotion and popularization of smart old-age care services not only depends on the advanced nature of the technology itself, but also on the psychological acceptance and behavioral willingness of users, especially the elderly. The research reveals that the issue of privacy has become a key obstacle to the adoption of smart pension services by the elderly. [19]Privacy self-efficacy, privacy risk perception and privacy awareness together constitute the internal psychological mechanism that affects the willingness to use. In the future, with the continuous development of smart old-age care technology, how to maximize service efficiency under the premise of ensuring privacy and security still needs the cooperation of the government, enterprises and society to build a credible, controllable and sensible smart old-age care ecosystem. [20] Only in this way can we truly make technology serve people and enable the elderly to enjoy a dignified, safe and convenient later life.

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References

[1] Zhao Y H, Nie Q, 2022, Supply and demand and structure : the logic of the construction of China ‘s social old-age service system-an empirical investigation based on six urban old-age care institutions. Sociological research, 37(06): 164-179 + 229-230.

[2] Zhang L, Han Y L, 2017, The main mode, existing problems and countermeasures of intelligent old-age care in China. Social Security Research, (02): 30-37.

[3] Zuo M Y, 2014, The connotation, mode and opportunity of smart old-age care. China Public Security, (10): 48-50.

[4] Zhu Q H, Shi Y H, Lu D M, 2022, Analysis of the evolution and theme characteristics of smart old-age care policy-Taking Jiangsu Province as an example. Journal of Beijing Institute of Technology(Social Science Edition), 24(06): 125-133.

[5] Bai W J, Hao J B, 2025, New Productivity of Elderly Care Service : Core Elements, Dilemma Inspection and

Development Strategy. Journal of Northwest University (Philosophy and Social Sciences Edition) 55(04): 141-150.

[6] Sui D C, Peng Q C, 2016, ‘ Internet + Home Care ‘ : Smart Home Care Service Model. Journal of Xinjiang Normal University(Philosophy and Social Sciences Edition), 37(05): 128-135.

[7] Ding Y Y, Liu S Z, Chen X, 2025, The demand for smart care services for the elderly in Zhenjiang City and its influencing factors based on the Kano model. Nursing research, 39(15): 2514-2524.

[8] Yao X A, Su Q, Zhu M J, 2021, Research on the willingness to adopt smart elderly care services and its influencing factors. Hubei Social Sciences, (08): 41-53.

[9] White R, Zhu Q, 2018, Analysis of the influencing factors of elderly users ‘ demand for smart elderly care services and willingness to volunteer-Taking Jianghan District of Wuhan as an example. Modern Intelligence, 38(12): 3-8.

[10] Mao Y, Li D L, 2015, Research on the influencing factors of the use behavior of smart elderly care users based on UTAUT model-Taking Wuhan ‘ Yijiantong’ as an example. E-government, (11): 99-106.

[11] Bright L F, Kleiser S B, Grau S L, 2015, Too Much Facebook?An Exploratory Examination of Social Media Fatigue. Computers in Human Behavior, 44: 148-155.

[12] Xu H, Dinev T, Smith J, Hart P, 2011, Information Privacy Concerns: Linking Individual Perceptions with Institutional Privacy Assurances. Journal of the Association for Information Systems, 12(12): 798–824.

[13] Yan P, Wang J F, Chen Z Z, 2023, The Development Status and Enlightenment of Foreign Intelligent Pension. Research on Intelligent Society, 2(04): 1-18.

[14] Zuo M Y, Yang Y M, 2025, Research on intelligent elderly care service based on dynamic needs analysis of elderly groups of different ages. Journal of Sichuan University(Philosophy and Social Sciences Edition), (03): 15-27 + 226-227.

[15] Yuan J, Liu Z F, Li S T, 2025, Research on the mechanism of user privacy protection behavior in government data opening. Modern Intelligence, 45(04): 136-147.

[16] Lin Z, Ju L, Chen L, 2013, Work-family conflict research and China issues : perspectives, content and design. Managing the world, (09): 154-171.

[17] Han X, Huang J F, Gong Z P, 2024, Bringing services back to adoption : Research on the adoption behavior of intelligent elderly care applications. Journal of Beijing University of Aeronautics and Astronautics(Social Science Edition), 37 (04): 102-112.

[18] Sun C Z, Zhao Y R, Wu C G, 2023, Research on the influencing factors of users ‘ willingness to participate in smart old-age care services based on grounded theory. Journal of Beihua University (Social Science Edition), 24(05): 103-112 + 154.

[19] Wang F, 2021, Research hotspots and trends of the digital divide of the elderly in the new media environment-A literature review based on CNKI. New media research, 7(07): 1-5.

[20] Jiang J, Wang Y, 2025, Digital Intelligence Technology and Silver Economy : Integration Mechanism, Realistic Barriers and Policy Paths. Economic Issues, (10): 28-38.