

Factors Influencing Smart Aged Care Services Acceptance of Elderly in Nursing Homes: A Perspective of Perceived Quality

Chuhui Liao^{1,a} and Juan Chen^{2,b,*}

¹ School of Public Affairs & Law, Southwest Jiaotong University, No. 111, North 1st Section of Second Ring Road, Jinniu District, Chengdu City, Sichuan Province, China

² School of Economics and Management, Southwest Jiaotong University, No. 111, North 1st Section of Second Ring Road, Jinniu District, Chengdu City, Sichuan Province, China

^achswjtu2015@163.com, ^bchenjuan@my.swjtu.edu.cn

*Corresponding author

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Abstract. The acceptance of services by the elderly determines the market prospects of the smart aged care industry. Through the results of pre-study, the perceived quality factors affecting the acceptance of smart aged services are divided into six dimensions: terminal equipment performance, information quality, system platform quality, service interaction quality, service guarantee, and resource support. Based on the existing research and perceived service quality theory, relevant research hypotheses and theoretical models are proposed. The model was validated using the structural equation model method. This study identifies the key factors affecting the elderly's acceptance of smart aged care services, and the mechanism and impact effects of various influencing factors were analyzed. The conclusions of the study will help to provide a scientific basis for formulating a more scientific pension policy and promoting the development of the smart aged care service industry.

Introduction

Since the 1990s, modern information technology has been widely applied in various fields of smart city construction. The integration of traditional pension services and modern information technology has led to the emergence of the concept and mode of smart aged care. Many nursing homes use modern information technology such as Internet of Things, cloud computing, and big data to serve the elderly. This service method makes up for the shortcomings of traditional nursing home services, such as closed management and lack of humanization [1]. Moreover, it is also possible to optimize resource allocation, save management and service costs, and effectively improve service quality [2]. However, due to the lack of recognition of information technology, and quality of service cannot meet the demand [3], lower proportion of older people who are willing to participate in and receive smart aged care services [4]. Moreover, the satisfaction of services for the elderly after receiving services is also to be improved [5]. It indicates that smart aged care services are not really accepted by the elderly. This dilemma is not conducive to the marketing of smart aged care services. Therefore, it is particularly important to identify the key factors that influence the acceptance of smart aged services. Based on the perspective of perceived quality, this paper establishes a model of the influence factors of smart pension service acceptance. The hypothesis was verified by the structural equation model, and the magnitude and mechanism of the effects of each factor were analyzed. Finally, it puts forward targeted countermeasures and suggestions to provide a certain reference for promoting the intelligent development of old-age services.

Literature Review and Research Hypothesis

Literature Review

The biggest difference between smart aged care services and traditional aged care services is that smart aged care services use a large amount of information technology, emphasizing the “intelligence” of the way to meet the needs of aged care services. Therefore, the user's acceptance of smart care services depends largely on their acceptance and use of information technology. Studies have shown that there are many factors that affect the acceptance of smart ageing information technology among the elderly. Using the technology acceptance model, Pal et al. [6] analyzed the impact of perceived usefulness and perceived ease of use on the attitudes of older people using smart ageing information technology. Further, some researchers found that the user's perceived usefulness and perceived ease of use are affected by some perceived quality factors, such as: perceived ease of use is affected by compatibility, served system reliability, controlled control, etc., perceived usefulness is received by connectedness, enjoyment the impact [7]. The unified theory of acceptance and use of technology (UTAUT) proposed by Venkatesh et al. [8] shows that the behavior of user acceptance and application technology is influenced by four key factors: performance expectation, hard work expectation, social influence and convenience. Mao Yu et al. [4] used the UTAUT model to analyze the influencing factors of the acceptance behavior of smart old-age users. It was found that in addition to the four key factors proposed by the UTAUT model, perceived trust and perceived security directly affect the elderly's willingness to accept smart old-age services.

The specific application of information technology in the aged care service is mainly manifested in the use of various information systems and intelligent terminal devices. With the support of information technology, all kinds of information systems and intelligent terminal devices can realize information collection, management, analysis and sharing, and then provide data support for the entire smart aged care service process. Therefore, whether the elderly use and accept information systems and intelligent terminal devices directly affects the acceptance of smart elderly services by the elderly. DeLone et al. [9] proposed the DeLone and McLean Model of IS Success (D&M Model), pointing out that system quality and information quality directly affect users' acceptance and satisfaction with information systems. The model is constantly being improved, and the new D&M model takes into account the significant impact of service quality on user acceptance and satisfaction [10]. Zhang Ling et al. [11] shows that in addition to system quality, information quality and service quality, external variables such as social support and social propaganda also affect the elderly's willingness to accept electronic services.

In terms of the use of smart terminal devices, Demiris et al. [12] found that the design of smart homes, the ease of use of devices, and the humanization of devices have affected the acceptance of smart aged care services for the elderly. From the perspective of the application and market acceptance of smart home technology, the quality of smart aged care services platform and government support (such as financial subsidies, market regulation, laws, etc.) are important factors influencing the acceptance of smart aged services [13].

In addition, the smart aged care services perceived quality is also an important factor that directly affects their service acceptance intentions [14]. Perceived service quality consists of multiple dimensions. According to different perceived service quality theories, scholars have formed different conclusions. For example, according to the SERVQUAL model proposed by Parasuraman et al. [15], Yang Bo et al. [7] divided the perceived quality of smart home care services into five dimensions: tangibility, reliability, timeliness, empathy and ease of use, and analyzed different perceived service quality dimensions. According to the perceived quality of service theory proposed by Brady et al. [16], Neuhuettler et al. [17] divided the quality of smart home care services into three dimensions: potential quality, process quality and overall quality. Luo Yan et al. [18] considered the differences in the service characteristics of the aged care service institutions and the information service centers, and divided the different perceived service quality dimensions. It can be seen that there is no consensus on the quality of perceived quality of service for smart aged care services.

Variables and Hypotheses

Although many researchers have summarized and validated the factors affecting the acceptance of smart aged care services, they have all been examined from a certain aspect of smart aged care services. There is no systematic research model for influencing factors, nor is there a correlation between these influencing factors and the mechanism of action. Based on the existing literature, and the situation of field investigation, this paper considers the influencing factors of the acceptance of smart old-age care service from the aspects of information technology application, service quality, terminal equipment usage and other perceived quality, and design related indicator measurement items. Through the pre-study method, the dimension of the factors affecting the acceptance of smart aged care services is determined. Through the analysis of the pre-survey questionnaire, a total of six influencing factors of the acceptance of smart home care services are identified, which constitute the research variables of this paper. The six influencing factors are: terminal equipment performance (5 items), information quality (4 items), system platform quality (5 items), service interaction quality (5 items), service guarantee (6 items), resource support (7 items).

Terminal equipment performance refers to the perceived quality of the elderly using smart devices, such as wearable devices, health monitoring devices, smart aged devices, etc. These devices should be technologically advanced, reliable, easy to use, and safe. Equal quality characteristics. Information quality refers to the quality of information provided by the smart pension system in the process of smart aged care, including the usefulness, integrity and standardization of information. system platform quality refers to the perceived quality of intelligent aged care service systems, including system security, stability, functional integrity, ease of use, and compatibility. There are many literatures showing that the better the performance of intelligent elderly smart terminal devices, the easier it is for older people to accept smart aged care services [4, 7, 12]. The higher the quality of information, the higher the satisfaction of the elderly with intelligent aged care services [17]. The quality of information systems has a positive impact on the acceptance of smart aged care services for the elderly [10,13].

The use of intelligent terminal equipment and the acquisition of information are based on information systems. Therefore, information systems are at the core of smart pension information technology applications. The quality of the information system directly affects the normal use of intelligent terminal equipment. The quality of information must also be collected, analyzed and processed by the information system to serve the elderly. Studies have shown that the quality of information systems is positively affecting the quality of information and the effects of smart terminal devices [6,11]. Based on this, the following research hypotheses are proposed:

H1: Perceptions of terminal equipment performance is positively related to smart aged care services acceptance.

H2: Perceptions of information quality is positively related to smart aged care services acceptance.

H3: Perceptions of system platform quality is positively related to smart aged care services acceptance.

H4: Perceptions of system platform quality directly contribute to terminal equipment performance perceptions.

H5: Perceptions of system platform quality directly contribute to information quality perceptions.

Service interaction quality refers to the way and process of providing services, as well as the responsibilities, attitudes, and reliability of service personnel. Service guarantee refers to how the nursing home can remedy the quality of service expected by the elderly in the nursing home, when the service is wrong or the quality of service does not meet the promised standards. The service process is an important part of the quality management of institutional aged care services. Good quality of service processes has a positive impact on consumer sentiment and behavior [5, 18]. As a smart aged care services customer, the elderly have a good experience in the service process, which is conducive to improving their satisfaction with the quality of smart care services in nursing homes, making them more accessible to smart aged services. The level of service assurance positively affects customers' willingness to use and satisfaction with services [15,19,20]. In order to attract the elderly to use smart care services, service providers usually provide a series of service guarantees, enhance the confidence

and trust of the elderly in the smart care service, and improve the acceptance of pension services by the aged care institutions. Based on this, the following research hypotheses are proposed:

H6: Perceptions of Service interaction quality is positively related to smart aged care services acceptance.

H7: Perceptions of service guarantee is positively related to smart aged care services acceptance.

Resource support factors refer to the resources and capabilities of nursing homes providing intelligent aged care services, including government policy support, funding, human resources, facility construction, and environmental conditions. The government's help to promote smart home care services is conducive to increasing residents' trust in service projects. By establishing laws and regulations, the smart pension service market can be restrained and managed, which is conducive to protecting the rights and interests of the elderly and improving the market acceptance of service projects [13]. Studies have shown that the government regulates the market, sets standards, and guarantees security privacy. Support for financial subsidies and other aspects has a positive impact on the acceptance of smart home service technology [13,21]. The richer the resources of infrastructure, financial subsidies, and employees, the better the quality of services and the willingness of older people to receive services. There is a positive correlation with the satisfaction of elderly care services. In addition, resource support is a prerequisite for providing services. Providing intelligent aged care services for nursing homes requires a lot of manpower, financial resources and material resources to provide foundations and guarantees for all aspects of services. For example, the construction of smart retirement information systems and the purchase of smart terminal devices require a large amount of policy, financial and technical support resources. The nursing homes require a lot of human resources, which is conducive to providing professional, humanized and high-quality services for the elderly and better fulfilling the promise of service guarantee. Therefore, the following hypotheses are proposed:

H8: Perceptions of resource support is positively related to smart aged care services acceptance.

H9: Perceptions of resource support directly contribute to system platform quality perceptions.

H10: Perceptions of resource support directly contribute to terminal equipment performance.

H11: Perceptions of Resource support directly contribute to service interaction quality perceptions.

H12: Perceptions of resource support directly contribute to service guarantee perceptions.

Research Model

Based on the research variables and hypotheses proposed in the above analysis, the theoretical model of this paper is constructed, as shown in Figure 1.

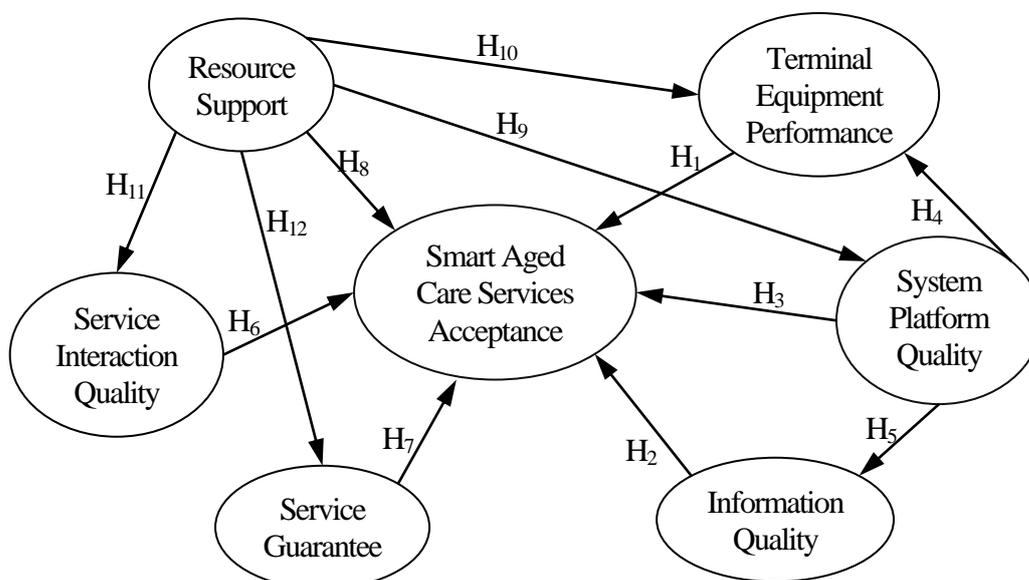


Fig. 1 The research model

Method

The data collection was conducted through a survey that was distributed to elderly people who were employed in nursing homes (Chengdu city, Sichuan province, China) and who used smart aged care services. Based on the scale determined by the pre-survey results, the scale contains 32 items, and the elderly are asked to mark the answers to each item. Using 5-point Likert scales ranging from 1 = strongly disagree to 5 = strongly agree. In this survey, 380 questionnaires were distributed and 366 were recovered. The recovery rate was 96.3%. After deleting 37 invalid questionnaires, 329 valid questionnaires were collected. The effective recovery rate was 86.6%. Demographic profile of respondents are shown in Table 1.

Table 1. Demographic profile of respondents (N = 329)

Item	Classification	N	Percent	Item	Classification	N	Percent
Gender	Female	147	44.7	Self-care ability	No dependence	48	14.6
	Male	182	55.3		Light dependence	139	42.2
Age	60-69	145	44.1		Moderate dependence	118	35.9
	70—79	125	38		Heavy dependence	24	7.3
	80—89	48	14.6	Monthly income level (¥)	2000 or below	32	9.7
	Above 90	11	3.3		2001-3000	145	44.1
Education level	Primary school or below	77	23.4		3001-4000	127	38.6
	Middle school	218	66.3		4001-5000	16	4.9
	College or above	34	10.3		Above 5000	9	2.7

Results

Tests of Validity

This study used SPSS 22.0 and AMOS 24.0 software to verify the model. Firstly, the Validation factor analysis (CFA) is performed on the measurement model, and the structural model is verified by structural equation modeling (SEM), and the path is analyzed. Results of inflammatory factor analysis showed that the normalized factor load values of each measured variable are all greater than 0.7, and the combined reliability is greater than 0.8. Indicates that the reliability of the measurement model meets the requirements. The average variance extraction value AVE of the latent variables is higher than 0.5, indicating that the measurement models have good convergence validity. The correlation coefficient between all variables is smaller than the square root of the absolute value of AVE. The P values are all less than 0.001, which satisfies the recommended values. Indicates that the convergence validity of the measurement model reaches the standard. The confirmatory factor analysis results of the measurement model are shown in table 2.

Table 2. Confirmatory factor analysis results of the measurement model

Factor	Item	loadings	Reliability	AVE	Factor	Item	loadings	Reliability	AVE
Terminal Equipment Performance	TEP1	0.848	0.897	0.636	Information Quality	IQ1	0.862	0.876	0.640
	TEP2	0.766				IQ2	0.745		
	TEP3	0.725				IQ3	0.713		
	TEP4	0.829				IQ4	0.867		
	TEP5	0.812			Service Interaction Quality	SIQ1	0.756	0.893	0.626
System Platform Quality	SPQ1	0.763	SIQ2	0.861					
	SPQ2	0.869	SIQ3	0.783					
	SPQ3	0.882	SIQ4	0.826					
	SPQ4	0.743	SIQ5	0.724					
	SPQ5	0.726	Resource Support	RS1	0.767	0.923	0.631		
Service Guarantee	SG1	0.715		RS2	0.856				
	SG2	0.832		RS3	0.775				
	SG3	0.863		RS4	0.832				
	SG4	0.780		RS5	0.771				
	SG5	0.725		RS6	0.704				
	SG6	0.774		RS7	0.846				
		0.905	0.614						

The structural equation model is constructed by AMOS 24.0 software, and the maximum likelihood method is used for parameter estimation. The model can be smoothly converged and identified without negative error variation, indicating that there is no problem in the definition of the model. The fitting results of the structural equation model are shown : GFI=0.904(>0.9), RMSEA=0.078(<0.08), IFI=0.908(>0.9), NFI=0.904(>0.9), CFI=0.908(>0.9), SRMR=0.057(<0.08). Indicates that all fitting indicators related to the structural model meet relevant standards.

Hypothesis Testing Results

The test results show (in table 3) that all path coefficients is significant at the level of P < 0.001, and the C.R values are all greater than 1.96, indicating that the path coefficients of the 12 direct effects are significant. All research hypotheses have been verified. The factor that directly affects the most effect is terminal equipment performance, the path coefficient is 0.423. The second is the service guarantee, the path coefficient is 0.372, the third place is the smart pension system platform, the path coefficient is 0.346, which indicates that the intelligent terminal is improved. The level of equipment, service guarantee and smart pension system platform factors will be the most direct and most effective to enhance the acceptance of smart aged care services. In addition, the study found that resource support factors have an indirect positive impact on the acceptance of smart aged services through several other potential variables, and the indirect impact effect is 0.586. System platform quality factors produce indirect positive impact through information quality and terminal equipment performance, the indirectly impact effect is 0.301. Therefore, from the perspective of the total impact effect, resource support (0.794), system platform quality (0.646), and terminal equipment performance (0.423) are the three most important factors affecting the acceptance of smart aged services.

Table 3. Hypothesis test results($p < 0.01$, *** $p < 0.001$)**

Hypothesis	Standardized coefficient	C.R	Results
H1: Terminal equipment performance → services acceptance	0.423***	4.869	Supported
H2: Information quality → services acceptance	0.198**	2.597	Supported
H3: System platform quality → services acceptance	0.346***	4.346	Supported
H4: System platform quality → terminal equipment performance	0.497***	5.525	Supported
H5: System platform quality → information quality	0.456***	5.130	Supported
H6: Service interaction quality → services acceptance	0.306***	3.785	Supported
H7: Service guarantee → services acceptance	0.372***	4.488	Supported
H8: Resource support → services acceptance	0.163**	2.375	Supported
H9: Resource support → system platform quality	0.331***	4.129	Supported
H10: Resource support → terminal equipment performance	0.254***	3.365	Supported
H11: Resource support → service interaction quality	0.478***	5.394	Supported
H12: Resource support → service guarantee	0.317***	3.897	Supported

Conclusions and Discussion

Based on the field survey data of Chengdu, the structural equation model is used to study the key influencing factors and mechanism of the acceptance of smart aged care services in nursing homes. The research results show that: system platform quality, terminal equipment performance, information quality, resource support, service interaction quality and service guarantee are the key factors that directly affect the acceptance of smart aged care services. The higher the perceived quality of these six dimensions, the stronger the willingness of the elderly to accept smart aged services.

The intelligent terminal equipment factor has the greatest direct impact on the acceptance of the elderly's smart aged care service. Therefore, the most direct way to improve the acceptance of smart aged care services is to improve the perceived quality of terminal equipment. Service providers can develop smart devices for the elderly by integrating information technology, artificial intelligence and aged care services. Strengthen the education and training of the elderly network and information technology to help the elderly improve their ability to operate intelligent terminal devices, and improve their understanding and understanding of smart terminal devices.

From the perspective of the overall impact effect, the resource support has the greatest impact on the acceptance of smart aged care services. Resource support is the basic guarantee for the provision of smart aged care services by nursing homes. Firstly, suggest strengthen the infrastructure of nursing homes, such as network communication and fiber-optic cables, through the development of smart aged care service collaborative development planning and support policies, and provide a good policy environment and resources for the construction of system qualities and the promotion and application of smart terminal equipment. Secondly, establish a sound financial subsidy mechanism, such as the use of government procurement services, price subsidies, etc., to reduce the economic burden of the elderly and the family. Finally, establish a long-term mechanism for diversified investment in government, society, enterprises, etc., such as PPP cooperation, to provide sufficient financial resources for the development of smart aged services. By providing comprehensive resources support for the nursing home, it will help increase the opportunities for the elderly to enjoy smart aged services, and thus enhance their acceptance of smart aged care services.

In addition, the system platform quality is also an important factor influencing the acceptance of smart aged services. Since the smart aged care service is a new type of old-age service model with high integration of online and offline services, the smart aged service platform is equivalent to the "glue" between the nursing home and the elderly. Suggest strengthen the construction of smart aged care service system platform, integrate various service platforms into business platforms, adopt open operation management methods, mobilize the enthusiasm of all parties to participate in services, and coordinate the government, society, family subjects and service resources. While increasing the

effective supply of services, it provides a good platform for the development of smart aged service system platforms, application software development, smart terminal equipment and services, and fundamentally the fastest and most effective acceptance of the elderly for smart aged care services.

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