Developing Smart Elderly Care with the aid of AI technology in China’s Rural Areas

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Abstract. With the technology of artificial intelligence, smart elderly care as a new type of elderly care model is an organic combination of the advantages of contemporary information technology and traditional elderly care methods. Developing smart elderly care in rural areas will provide new ideas and realistic paths to address the increasingly severe aging problem in rural areas of China. This article analyzes the current difficulties in the development of smart elderly care services in China’s rural areas, including delays in the construction of rural information infrastructure, lack of top-level system design, and inconsistent industry standards. Finally, this article proposes countermeasures to promote the development of rural smart elderly care in China, including improving the infrastructure conditions of smart elderly care, improving the aging degree of intelligent products, etc., which can provide advice and suggestions for solving rural elderly care problems.

Keywords: smart elderly care; China’s rural areas; population aging

1 Introduction

At the beginning of 21st century, China promoted the “rural revitalization” strategy. Some problems appeared in the development process with the rapid development of rural society. With the acceleration of urbanization, rural young and middle-aged labor force have shifted to cities, and elderly people remained in rural areas (Liu, 2019). The phenomenon of “empty nest” in rural areas is common. Some elderly people in rural areas live alone at home, while some go to rural nursing homes. However, in nursing homes, the rural elderly people only can pay for the service of food and clothing, while the rest of their lives are still borne by their children. How to better improve the quality of life of the elderly in rural areas has become an urgent and important issue. In some areas, the smart elderly care has been promoted to provide better service of elderly care for the rural elderly people.

On May 11, 2021, the results of the seventh national population census were officially released. As shown in Fig.1, The data shows that the population aged 0-14 years is 250 million, accounting for 17.95% of total Chinese population; the population aged 15-59 years old is 890 million, accounting for 63.35%; the population aged 60 and above is 260 million, accounting for 18.70%, of which 190 million, accounting for 13.50%, are aged 65 and above. Compared with the sixth national population census in...
2010, as in Fig.2, the proportion of the population aged 0-14 increased by 1.35 percentage points, the proportion of the population aged 15-59 decreased by 6.79 percentage points, the proportion of the population aged 60 and above increased by 5.44 percentage points, and the proportion of the population aged 65 and above increased by 4.63 percentage points (Chinese National Bureau of Statistics, 2021; Chinese National Bureau of Statistics, 2010;).

Figure 1. The population’s age composition in 2021 [source: Chinese National Bureau of Statistics, 2021]

Among them, the proportion of the rural elderly population (aged 65 and above) is about 13% in China (National Bureau of Statistics, 2021). Both the proportion of the rural elderly population and the elderly population has increased, and the degree of rural aging has further deepened. It can be seen that the degree of population aging in China has further deepened, especially in rural areas.

Figure 2. The variation of population’s age structure between 2010 and 2021 [source: Chinese National Bureau of Statistics, 2021; Chinese National Bureau of Statistics, 2010]

With the accelerating pace of social development and the rapid development of information technology, relying on the internet platform to achieve social management has become an inevitable choice. Fig.3 tells that the Chinese government made efforts to develop the smart elderly care in recent years by issuing related policies and regulations. In 2013, the National Commission on Aging began to build and manage an ex-
experimental base for smart elderly care, which gradually developed from a theoretical and conceptual level to a practical and operational level. In 2015, the State Council explicitly proposed to promote the organic integration of smart elderly care services and mobile internet. In 2017, the National Action Plan for the Development of the Smart elderly care Industry (2017-2020) further proposed that a service system for the smart elderly care industry covering the entire life cycle should be established by 2020, which not only recognizes the importance of the development of smart elderly care, but also means that the development of smart elderly care services has ushered in a new situation of integration, coordinated development, and joint promotion by the government and society (Liu, 2019).

Figure 3. Chinese government increasingly attaches importance to smart elderly care [source: based on Liu (2019)]

2 LITERATURE REVIEW

The concept of “smart retirement” was first proposed in Britain. Soar (2009) proposes that health, aging, and elderly care can be reshaped through smart homes and smart technologies. There is a need to strengthen national efforts to develop and apply intelligent technologies to ensure a healthy, safe, secure, and fulfilling future for the growing elderly population, and to maintain a healthy, harmonious, and prosperous society. At the same time, the rapid increase in the aging population has also led to the emergence of smart homes. On the one hand, the aging population has brought enormous social pressure; on the other hand, it has also led to the rapid development of social intelligent devices. Lim et al. (2022) believe that creating nursing robots can alleviate the pressure of aging care. Scholars such as Tawsopar (2017) suggest using intelligent wear watches to analyze data and analyze the physical condition of the elderly.

Dobre et al. (2019) proposed using the Internet of Things (IoT) development platform to provide non-invasive monitoring and support for the elderly, in order to enhance professional medical services and achieve the achievement of enjoying smart elderly care at home. Zavalyshyn et al. (2021) emphasized the need for appropriate home automation and support systems to ensure the safety and well-being of elderly residents and maintain their social connections with various people around them. Existing smart home systems cannot meet all the requirements and security features in this regard, especially in terms of availability, privacy, and security. Flores (2021) and others also believe that in places with a large influx of elderly people, such as nursing
homes, more acceptable tools such as smartphones can be used. Woods (2020) uses four binary pairing methods: public private, personal community, remote approximation, and passive active to define a parallel system for sustainable retirement that has emerged for intelligent technology.

De Silva et al. (2009) propose that a variety of different sensors can be used to monitor activities in smart homes and use the results to control the home environment to achieve the goal of providing for the elderly. Jokinen et al. (2022) believe that it is possible to develop a virtual coach to assist elderly people in daily activities. Bleja et al. (2021) believe that at this stage, the country has established multiple nursing implementation platforms, but none has been fully implemented, failing to fully meet the needs of users.

3 Difficulties in the development of smart elderly care services in rural areas

3.1 Rural Informatization Infrastructure Construction Is Poor

The smart elderly care service system is not only an elderly care service system, but also an information technology system. Generally speaking, as a new type of elderly care model, the development of the rural smart elderly care model should be based on the continuous improvement of the rural economic level and the level of information infrastructure. Only when the economic and technological capital in rural areas has accumulated to a certain extent can the foundation be laid for the pace of the elderly care model to move towards a new model. However, despite that China’s rural informatization construction has achieved certain results in some aspects, its overall construction level is low, and there are still some problems such as: large regional differences, underdeveloped construction of grassroots information infrastructure, insufficient investment in construction funds, problems such as inefficient resource utilization (Guan, 2012). The lagging construction of rural information infrastructure prevents the construction and development of smart elderly care services.

So far, most intelligent terminal products are suitable for urban high cognitive groups, ignoring the needs of the rural elderly who do not have good education, leading to the rural elderly becoming the main group of non Internet users in China. According to the 49th Statistical Report on the Development of Internet in China in 2022, the proportion of non Internet users in rural areas of China is about 55%, of which 39.4% are non Internet users over the age of 60, 20 percentage points higher than the proportion of people over the age of 60 in rural areas. The rural elderly who have become internet users are mainly 2G/3G elderly mobile phones, with a low consumption level. Currently, about 43% of rural elderly Internet users are using 2G/3G elderly machines (Wei, 2021).

The main reasons for this phenomenon are the following two points: firstly, the overall educational level of rural elderly is low, with 71.1% of them at or below the primary school level, unable to adapt to information terminals based on text (typing and reading), thus limiting their use of mobile phones. Secondly, the use of smart phones by rural elderly people who own smart phones is also very limited.

Most rural elderly people either have concerns about network tariffs or do not know how to purchase mobile network traffic, resulting in the inability of most elderly people with smart phones to continue to enjoy network services. Therefore, it is time to
discuss how to stimulate the elderly to use the network through rural aging transformation of terminals.

3.2 Being Lack of Top-level System Design and Inconsistent Industry Standards

Today, the development of smart elderly care models in rural areas are still in its infancy, due to the lack of systematic top-level design guidance and unified standard specifications. Many old enterprises are more likely to encounter various problems during the construction process. Even multiple elderly care service participants have their own ways in their respective fields, which not only leads to a lack of communication among elderly care participants, making it difficult to form effective cooperation, but also makes the quality of elderly care services uneven, causing difficulties for industry regulation. Therefore, the healthy development of the rural smart elderly care model needs to improve the top-level system design, unify industry standards, and strengthen effective guidance and centralized management of the new model from the institutional level.

Currently, products are mostly focused on the needs of village governments, elderly care institutions, and the elderly, ignoring the supply of products for children who are the main economic source and demander of rural elderly life and elderly care services. There is a large demand for remote care services for children who are out of town. Children are under dual pressure from the high cost of living in cities and the elderly living in rural areas. They are under great pressure to earn money when they go out. They cannot always go home to care for their parents and help them solve their problems, but they are also concerned about the safety and health of their parents at home, as well as the settlement of government affairs and payment issues. Therefore, the current topic is to work out how to use information technology to help them go out to earn money, take care of their parents, and help them solve their problems.

3.3 The Intellectualization of Smart Elderly Care in China is still in the Exploration Stage

Compared to rural areas, cities have launched an early exploration of smart elderly care services and achieved certain results, which can provide some experience for the construction and development of smart elderly care services in rural areas in many aspects. However, due to their immature development level, the intellectualization of smart elderly care is still in the exploration stage. The large-scale data collection, effective analysis, full integration, and efficient application of aged information cannot be achieved. Besides, the service providers mainly focus on smart medical and smart appliances related fields, and the types of services mostly stay at the basic level. The higher-level of emotional communication, spiritual satisfaction, and other needs of the elderly cannot be well met. In addition, the services are not free, as many elderly people themselves have no fixed economic income, they would rather maintain their current pension status, rather than spend money to purchase services.

Current operators’ digital rural platforms can achieve data connectivity between the elderly, children, and village committees in the village, but the connectivity and integration of elderly care data between villages, counties, and townships need to be strengthened. The phenomenon of “data islands” is serious, with problems such as
scattered and inconsistent data sources, inconsistent standards and specifications for data collection and processing, and data fragmentation. These problems have led to the failure of data accumulation on the back-end of the platform, the inability to mine and analyze the elderly care needs of rural elderly through algorithmic technology, and insufficient guidance for the scientific and reasonable planning and allocation of rural public elderly care resources and medical resources, which to some extent limits the modern development of rural governance and service capabilities.

3.4 It Is Difficult for Rural Elderly People to Continue Socialization

The continuous socialization of the elderly refers to the process of continuing to adapt to society by learning new knowledge and skills for the elderly entering the age of 60. Its main content is to continue to receive education, continue to learn, update knowledge concepts and behavioral norms, etc., (Xu, 2013). The application of smart elderly care products has put forward new requirements for the elderly people’s ability to accept and learn new things. As a generation born in the 1950s and 1960s, rural elderly people generally have a low level of education, and have little contact with electronic products and digital information technology. It is inevitable that they will have a sense of strangeness and distance from intelligent products. In addition, elderly people only begin to recognize, learn, use intelligent products, and access internet platforms in their old age, and their own cognitive, learning, and acceptance abilities are gradually declining. Long learning time and slow adaptation often lead to escape or avoid learning among elderly people. Finally, although some elderly people now use smart products such as mobile phones, most of which are taught by young children around them, and the current outflow of young labor forces has made it more difficult for the elderly to accept and learn new knowledge and skills.

4 Countermeasures for promoting the development of rural smart elderly care model

The measures for promoting smart elderly care in rural areas involve government and enterprises, as Fig.4 shows.

4.1 To Strengthen Top-level System Design and Unify Industry Standards Related to the Elderly Care

The healthy and orderly development of the smart elderly care model cannot be separated from the correct guidance of the system and the strong support of policies. The government should actively promote the establishment of top-level design projects for smart elderly care, use modern information technology, and combine the particularity of rural development of smart elderly care to conduct scientific and reasonable institutional design, forming a forward-looking, comprehensive, and systematic institutional strategy, indicating the path and direction for the exploration of smart elderly care in rural areas. At the same time, we will establish a unified urban and rural smart elderly care service platform, collect basic information about the elderly throughout the country, collect the elderly care situation in various regions, comprehensively utilize aging information resources from different regions, different genders, and different age
groups, and provide information basis and information support for the institutional design. In addition, it is necessary to strengthen the guidance and regulation of the rural elderly care service industry, establish scientific, reasonable, unified, standardized, and clear and feasible industry standards, not only achieve the organic combination of universality and specificity, but also consider various aspects such as information platform construction and management, market service management, and elderly information management. At the same time, the formulation of standards should be specific for implementation.

4.2 To Enhance the Infrastructure Conditions for Smart Elderly Care

In the operation of modern rural society, the construction of information infrastructure has fundamental significance and is the most fundamental physical support for a networked society, a digital economy, and a service-oriented government. Without an open, shared, and common development information environment, the cost of rural social development will increase, and the growth of the smart elderly care industry will be hindered. Therefore, it is necessary to continue to implement the “network broadband China” strategy, continuously expand the coverage of broadband networks, improve the transmission of network information, improve the quality and level of service, and build a high-level and high-quality information development environment, laying a solid foundation for the application and popularization of smart elderly care in rural areas. At the same time, it is also necessary to strengthen the cultivation of professional talent teams, cultivate information technology talents, medical security talents, and the construction of professional volunteer teams for elderly care and assistance, so as to provide professional team support for the development of smart elderly care (Wei, 2021). Finally, increasing efforts to revitalize the rural economy can only provide economic conditions for accelerating the improvement of rural infrastructure conditions, enhance the lagging level of rural information infrastructure construction, and escort the establishment of a smart elderly care model.

4.3 To Improve the Aging Adaptability of Smart Products

Intelligent terminal products are the wisdom and intelligence that can be seen and touched by the elderly. The research and development design of products should start from the actual elderly care needs and practical use capabilities of the elderly, and focus on the practicality and convenience of operation of the product, in order to achieve an effective fit between smart elderly care services and the actual needs of the elderly, and improve the aging adaptability of the product. During the product development phase, developers should conduct sufficient market research. Only by actually understanding the actual needs and daily usage habits of the elderly can we design intelligent products that meet the needs of the elderly and meet the characteristics of the coming year, thereby effectively avoiding product idleness and resource waste (Fan, 2019). In the product design stage, it is necessary to reflect the humanized care of the product in combination with the characteristics of the elderly. Design is often conducted from a practical perspective, dealing with the life characteristics of the elderly, and focusing on product details. Launch simplified intelligent operating software and smart home devices. In the stage of product application and promotion, relevant service personnel should conduct centralized teaching for the elderly, promote mutual learning and mutual assistance among the elderly, and provide hands-on teaching for some aged
people, so that the elderly can skillfully operate and use intelligent devices. In addition, attention should also be paid to dynamic debugging of the product. If problems are found during use, timely improvements should be made to ensure the effectiveness and efficiency of intelligent product services.

![Diagram showing top-level system design by government, enhancing infrastructure conditions, improving the aging adaptability of smart products, and making the elderly favorably accept smart elderly care.]

Figure 4. Dimensions for developing rural smart elderly care

5 Conclusion

China is accelerating into a deep aging process, and the demand for elderly care services presents personalized, diversified, and multi-level characteristics. The traditional elderly care service model faces particularly prominent issues such as supply and demand mismatch, low service efficiency, and lack of integration of resources. The degree of aging in rural areas is escalating, and traditional elderly care models cannot meet the elderly care needs of rural elderly groups. Therefore, it is particularly important to develop smart rural home-based elderly care services. The smart elderly care platform can reasonably integrate elderly care resources and provide comprehensive and seamless elderly care services based on the needs of elderly people at different ages. It can not only solve the challenges in today’s elderly care services, but also meet the elderly people’s different needs for elderly care, which is good to facilitate social stability and economic growth.

Acknowledgment. The work described in this paper was fully supported by Shandong Provincial Humanities and Social Sciences Project Management Office (Project No.: 2022-YYFX-21).
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