

Path of Smart Senior Care in China

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Abstract:

Since 2011, China's State Council has accorded high priority to developing the intelligent eldercare industry, establishing a national policy framework that provides macro-level guidance and advances pilot initiatives globally. Exploring innovative smart aging models represents both an essential requirement for optimizing governance systems and capacities, and an intrinsic necessity for elevating public services to high-quality development standards. This research synthesizes China's current smart eldercare landscape through literature analysis, examines Artificial Intelligence (AI) implementation in aging services, and details community-level smart aging pathways within big data environments—focusing on data-driven identification of seniors' actual and potential needs, constructing IoT-based elderly care platforms through resource integration and service innovation, and delivering diversified support including companionship, education, and counseling. Findings reveal persistent challenges: primary state dominance constrains eldercare service diversification; the pronounced “silver digital divide” reflects low internet adoption among elders; and smart health infrastructure requires substantial refinement. The study concludes with actionable recommendations for industry advancement.

Keywords: Smart Elderly, Public Service, Cooperative Governance Theory.

1 Introduction

China's rapidly aging population has unlocked substantial consumption potential within the senior care market. According to the National Report on Ageing, by the end of 2021, the number of people aged 65 and over exceeded 200 million, and the proportion of older people relative to the working age group was 20.8%. According to estimates by the China National Committee for Aging (CNCA), the Chinese population of “60 +” will be close to 487 million by 2050,

or about 35% of the country's overall population [1]. This demographic trajectory highlights an intensifying aging challenge, prompting governmental implementation of comprehensive policy interventions to alleviate societal eldercare pressures. 2022 The report of the 20th Session of the Chinese People's Congress in October 2022 explicitly called for the implementation of a national strategy to actively cope with the aging of the population, the development of old-age care business and industry, the optimization of old-age care services, and the promotion of basic access

to old-age care services for all elderly people. In May 2023, the Opinions on Promoting the Construction of a Basic Elderly Service System proposed that basic elderly care services should play an important and fundamental role in realizing old age.

Topics concerning the senior care industry have also received increasing attention from scholars, especially smart senior care, which has become a research hotspot with the continuous development of technology. Smart Aging, also known as Smart Family Aging, was initially proposed by the UK's Life Trust, which advocates the use of innovative technology to provide intelligent services for the elderly. It was not until 2013 that China collectively referred to the concepts of smart aging and technological aging as smart aging [2]. The smart eldercare sector centers on utilizing cutting-edge digital technologies—including big data, IoT, and cloud computing—to deliver intelligent, personalized care services for seniors. Through smart devices, older adults can continuously track critical health metrics such as heart rate and blood glucose levels. Integrated smart aging platforms further enhance convenience by offering functions like medical appointment scheduling and in-home support services. As this field evolves into a dominant trend within the global eldercare industry, developed nations have established comprehensive industrial chains through early adoption. Meanwhile, propelled by technological advancements and evolving societal needs, China's smart eldercare sector demonstrates robust growth potential with a promising trajectory. Relevant scholars have put forward the cooperation model of intelligent elderly kang service property based on intelligent endowment [2]. In the past, family-based care has been a characteristic of China's public service, which began in 2010 when the State Council General Office launched the "Social Elderly Service System Construction Plan 2011-2015", which redefines home-care as a quasi-public good with dual public and private characteristics [3]. Presently, public financing for long-term care continues to be constrained, chiefly directed toward welfare beneficiaries through residential bed subsidies and operational cost support. Persistent apprehensions exist among public stakeholders about insufficient quality safeguards within the long-term care infrastructure [3]. With elderly care increasingly accessible as a private commodity in the market, it disproportionately benefits affluent individuals, particularly urban natives possessing the financial means and willingness to invest in superior care options. Consequently, there remains a critical need for local governments to establish fundamental pension safeguards for vulnerable urban and rural populations. Otherwise, socio-economic inequalities in elderly care will remain high. Scholars have supported the idea of integrating rural and urban elderly care systems to promote the unification of basic old-age care in China. Through the establishment of a universal system, Chinese

citizens, particularly those living in poverty or rural areas, will be able to benefit from the elderly. Otherwise, vulnerable older people cannot afford expensive healthcare and senior citizens, especially those who need innovative technology to function, thus hindering the sustainability of an aging society. Another financial challenge faced by older people in the senior care sector is the lack of pensions for the rural elderly population. Local rural governments must provide old-age services in the form of subsidized rates or public goods to ensure that those without pensions have access to at least basic old age services. Specifically, local rural governments should purchase smart old age services and distribute them free of charge or at a reduced rate to those in need. As a result, disadvantaged groups of older persons could also have access to innovative technologies that would benefit their daily lives. However, rural areas in China are unable to fully provide free eldercare services because of financial revenue constraints. [3] Achieving continuous in-home care through smart products represents a critical challenge requiring focused attention. This study investigates the operational pathways of smart elderly care in response to this need.

2 Examining the Practical Implementation of Intelligent Elderly Care Services within Home Settings

Within the digital economy landscape, artificial intelligence applications in eldercare are garnering increasing focus. In 2014, the Chinese Civil Affairs Department (MCA) launched a national smart home initiative in seven pilot care facilities. These facilities implemented sleep monitoring systems, fall detection devices, and self-service health screening equipment. At the same time, in 2014, Shanghai published "Guiding Opinions for Pilot Construction of Livable Communities for Older People", which set up intelligent senior centres in 40 pilot communities to provide emergency response, safety monitoring, and day-to-day life support services [3]. By 2021, the evolution of eldercare services further incorporated "digital accessibility" frameworks developed by relevant authorities. The development of eldercare services, the relevant departments through the construction of "digital barrier-free" senior care service scenes, the realization of "digital barrier-free" eldercare services, the formation of senior care government services "digital governance" new model, the construction of "intelligent medical" and "cloud platform" [4]. "Cloud platform" and realize "cloud supervision" of eldercare services. Developing a new model of "digital governance" for pension services, building a "cloud platform" for "intelligent medical care" and realizing "cloud supervision" for pension services. The "cloud platform" will realize the "cloud supervision" of

the pension services. The new model of “pension service governance”, the construction of “wisdom medical” “cloud platform”, to realize the “cloud supervision” of pension services “[4].

2.1 Artificial Intelligence and Big Data Applications in Smart Elderly Care

AI-powered solutions facilitate continuous physiological monitoring for seniors, delivering tailored health management interventions when abnormalities are detected. For example, smart wearable devices can monitor the physiological parameters of the elderly in real time and provide abnormal warnings; smart homes can help the elderly live more conveniently through voice recognition and intelligent control systems. In addition, AI technology can also take into account the emotional needs of the elderly, providing emotional comfort, social interaction, psychological problem diagnosis and other services for the elderly, for example, intelligent companion assistants can provide a certain degree of emotional support, and provide emotional value when the elderly feel lonely

The application of big data technology in eldercare services has become an important part of the current smart senior care model. Big data technology can capture the C-suite data of the elderly population in real time, and the detailed and timely data can support young people in providing personalized and customized solutions. First, big data technology provides the elderly with a unique health care and maintenance program by capturing data on their behavior, habits, and diet, and combining it with professionally provided health care advice practitioners to protect their bodies. Secondly, big data technology empowers community wisdom for the elderly. As the grassroots level where the elderly have the most contact, big data technology always helps the community analyze the data on the demand for eldercare services, so as to optimize the allocation of community resources for eldercare services, match the supply and demand for eldercare services, and improve service efficiency. At the same time, big data technology can identify potential physical problems and realize early intervention and prevention. Generally speaking, the application of big data technology can improve the intelligence level of elder care, provide more comprehensive and timely service to the old people, and promote the development of the elderly [4].

2.2 Smart Elderly Services in Aging Place

A critical element of smart elderly care solutions involves the health monitoring management system. Utilizing cutting-edge technologies like smart beds and wearable trackers, this system facilitates real-time tracking of vital senior health indicators, including heart rate, blood pressure, and sleep quality. The collected data is sent to the cloud

for comprehensive analysis. Subsequently, the system leverages analytical insights to offer tailored health recommendations and management strategies, empowering seniors to better oversee their well-being. Complementing this, assisted living systems employ smart devices (e.g., intelligent mattresses and toilets) to aid older adults in performing daily activities. These technologies enhance seniors' lives by enabling independent adjustments to routine behaviors. Furthermore, social interaction and psychological support systems utilize devices such as smart assistants to engage seniors through voice communication, providing essential companionship and emotional comfort. The system can provide adequate psychological support to respond to any emotional changes that may occur in the elderly. Intelligent assistants, for instance, might have a conversation with their elders every day to provide emotional communication and reduce the feeling of isolation. Safety and emergency response systems use smart devices, such as those that detect falls and fire alarms, to constantly track the health of seniors. Technology can quickly activate emergency response measures, such as alerting medical services or emergency contacts, to ensure the safety of older adults in an emergency [5].

3 The Development Path of Community Wisdom Elderly Service under the Background of Big Data

3.1 Data-Driven, Accurate Service with the Support of Big Data Technology

Community wisdom elderly service should first focus on the in-depth mining and accurate analysis of data. It is not only the collection of basic information about the elderly, but also the comprehensive integration of multi-dimensional data on their living habits, health status, interests and service needs. By means of data analysis, we can get an understanding of the actual and potential needs of older people and provide a scientific foundation for the accuracy of service. For example, for the health management of the elderly, wearable devices can be used to monitor their heart rate, blood pressure and other physiological indicators in real time, which can be combined with historical data to predict potential health risks and intervene in advance. At the same time, based on their daily activity data, such as the number of steps they take and the quality of their sleep, the elderly can be provided with personalized exercise plans and nutritional advice, so as to promote a healthy lifestyle. In addition, by analyzing the social behaviors and interests of the elderly, we can recommend suitable cultural and recreational activities, such as painting and calligraphy classes and gardening lectures, to enrich their spiritual life. In order to realize precise services,

it is also necessary to establish a feedback mechanism to continuously collect the evaluation and suggestions of the elderly on the services, form a closed loop of data, and continuously optimize the contents and methods of services to ensure the pertinence and effectiveness of the services.

3.2 Science and Technology Enabling Smart Elderly

Technological advancement constitutes the primary catalyst for developing community-based intelligent eldercare solutions. Supported by digital infrastructure encompassing big data, Internet of Things (IoT) systems, cloud computing, and artificial intelligence, comprehensive elderly service platforms can be established to enable efficient and automated service delivery. IoT applications further facilitate interconnecting domestic devices, including intelligent locks and environmental sensors-creating secure and accessible living habitats for senior residents. Cloud computing provides the possibility of storing and processing huge amounts of data, ensuring real-time updating and efficient analysis of data. With the introduction of AI, the elderly care services have been transformed. For example, the intelligent voice assistant and the emotion recognition system can be used to understand the needs of the old people and give them close companionship. In addition, the construction of an intelligent elderly service platform should also focus on the optimization of user experience. The interface design should be simple and clear, easy for the elderly to operate; the function settings should be comprehensive and practical, covering health management, life care, emergency rescue and other aspects. At the same time, the platform should support multi-terminal access, such as cell phone apps and smart TVs, so that the elderly can enjoy services anytime and anywhere.

3.3 Multi-Party Synergy, Sharing and Building

The development of community wisdom elderly service cannot be separated from the joint participation and synergy of multiple forces, such as the government, enterprises, social organizations and volunteers. In this process, resource integration and service innovation are key. The government should give guidance to the development of intelligent old people, for example, by offering financial subsidies and tax incentives, and encouraging enterprises and social organizations to participate actively. In the meantime, it is necessary to strengthen supervision to guarantee the quality of service and the safety of data. The enterprise should make full use of its technological superiority to develop more products and services, such as intelligent house and remote sensing, and take part in building and running intelligent old people service platform. It is necessary for social organizations to act as a bridge, to

integrate social resources and to promote the creation of service. Through the establishment of volunteer service platforms, for example, they can attract more volunteers to take part in older people's services, as well as offering a variety of services such as companionship, education and counselling. As an important complement of services, volunteers should be fully attached to and supported. The introduction of training and encouragement measures can contribute to the improvement of the ability and level of volunteers to play a more active role in intelligent older people [6].

4 Existing Problems and Suggestions of Smart Elderly in China

4.1 Existing Problems

Firstly, the Chinese government is the main provider of nursing services at present, and the suppliers are relatively single. The degree of cooperation of other subjects such as social market non-governmental organizations is low, and many resources are not developed. In addition, the supply role of the grassroots government, community, social security and other departments is not clear, and the role of the provider, supervisor and implementer of elderly care services is not clear. In China, the old care mode is based on the direct public administration, which means that the government invests in the building, and the community council runs and manages it, or is supported by the government, and the community neighborhood committee invests in building and administration [2]. In this model, the government financial pressure, low efficiency, low service quality, service content is not rich, most areas can only meet the basic material needs of the elderly. The lack of large-scale digital platforms in the community-based elderly care model makes the development of the digital economy in the healthcare industry lag behind, especially the lack of digital application innovation capabilities and a strong information sharing platform.

Second, the lack of data platforms and information silos results in a waste of resources. Due to the lack of a digital platform for the elderly with community wisdom, information silos have been formed within the senior care industry, resulting in a large waste of resources [3]. After the establishment of many home-based community eldercare services or facilities, most of them cannot function properly due to the lack of timely maintenance and repair, and the number of users of the facilities is far less than the number of people who can carry them. 95% of the users of these facilities are healthy elderly people, and many elderly people who have a hard need for community service but have limited mobility have not enjoyed or even heard of home-based community service facilities for the elderly

[4]. Despite sustained governmental allocation of substantial fiscal resources, outcomes remain incongruent with enhanced welfare outcomes for homebound seniors [5].

Thirdly, the pronounced “silver digital divide” underscores limited internet adoption among elders. Statistical data reveals China’s internet users reached 9.04 billion by March 2020, achieving 64.5% national penetration. Notably, citizens aged “60+” constituted merely 6.7% of this demographic, indicating persistent technological unfamiliarity within this cohort [7]. The popularization of the Internet to the health of the elderly service model of innovation has brought opportunities, but some of the elderly old-fashioned ideas, and even have no contact with the Internet, the lack of trust in intelligent health care products. With the growth of age, the cognitive level of the elderly, learning ability, response ability and memory will appear obvious decline phenomenon, so that the elderly on the knowledge and acceptance of intelligent healthy aging products there are certain obstacles, the elderly generally use the intelligent healthy aging products are mostly smart phones, televisions and so on, the level of intelligence is not high.

Lastly, the system of intelligent healthy ageing services needs to be improved. Intelligent health elderly service involves civil affairs, health, social security, municipal supervision and other departments, need a number of measures to coordinate and promote, at present, this work is still the civil affairs, health departments responsible for the management of the duties between departments is not clear, did not form the government, the market, the community, the family, and other parties to the resources of the synergy. After the interview, the medical service is under the Health Bureau, the Civil Affairs Bureau is under the Civil Affairs Bureau, the health care is under the Human Resources and Social Security Bureau, and the information platform is under the Big Data Bureau. For example, ouhai district wisdom health old age service platform in the early stage by the civil affairs bureau to lead the construction, later platform operation, system upgrade and other manpower and funds invested by the civil affairs bureau, and online diagnosis and treatment platform by the health bureau is responsible for the construction and maintenance of the system platform between the function is not yet open. At the same time, ouhai district government departments have not yet formulated wisdom health old-age medium and long-term development planning, the jurisdiction of wisdom health old-age industry overall layout planning is not in-depth, has not yet established the relevant specification content, charging standards, subsidy standards and financial investment mechanism [7].

In the process of digitization of the smart amusement industry, the data security protection mechanism and privacy protection norms are facing severe tests. There are technical loopholes in the underlying protection system

of the Internet platform, which neither deploys complete quantum encryption technology nor lacks blockchain distributed storage architecture, and the loopholes of the system are susceptible to penetration attacks by malicious codes; the user authorization mechanism has not yet formed a standardized process, and the interface for the collection of biometric data has not yet been set up to provide a secondary verification link, which has formed the risk exposure of information security for the elderly group. The user authorization mechanism has not yet formed a standardized process, and the interface for collecting biometric data has not yet been set up to provide a secondary verification link, creating a risk exposure that threatens the information security of the elderly. In the transmission of sensitive medical data such as neuroelectric signals, more than 63% of service providers have not opened data traceability ports to guardians, a technological cover-up that directly reduces informed consent provisions to formal commitments [8].

4.2 Solution

Develop a comprehensive database documenting individual profiles of elderly residents within communities.

According to the Smart Health Care Industry Action Plan (2021-2025), smart care is run on the basis of intelligent equipment and digital infrastructure. This paradigm mandates fusing individualized wellness solutions with advanced technologies — spanning the Internet of Things, Big Data (BD), Cloud Computing (CC), and Artificial Intelligence. Concurrently, communities must develop comprehensive elderly profiles databases that extend beyond basic demographics to incorporate service requisites, medical histories, and health documentation [9]. Communities must define their responsibilities, take account of local conditions, add valuable databases, and choose their management staff. At the same time, it is necessary to realize the information sharing among the related data departments and the elderly service organizations. The Government Strengthens Policy Direction and Incentives The government needs to make precise efforts in policy formulation and financial support. First, the government should take into account the actual situation of the aging and economic level of the region and speed up the formulation of operable implementation policies. For example, with regard to the participation of property service enterprises in home care, the government should formulate detailed rules covering service content, charging standards, and safety norms, and at the same time set up a project for the preparation of standards concerning intelligent ageing, so as to provide policy guidance and standard support for the participation of property service enterprises in home care services. Second, increase capital investment. The government should broaden the channels of fund-raising and alleviate the financial pressure on property service

enterprises through financial subsidies, tax exemptions, and loan interest subsidies. For instance, some subsidies should be given to enterprises that buy smart elderly care devices and develop information platforms, so that they can improve the level of nursing services.

Reasonable allocation of resources from all sides of the community, active integration of elderly care resources, to provide the old people with systemic care. Departments such as housing and construction, industry and information technology can strengthen digital infrastructure construction, such as reserving interfaces for smart elderly care equipment in newly constructed neighborhoods and upgrading network coverage in older neighborhoods; departments such as civil affairs and health care can promote contracted services for integrating medical care and nursing care at home carried out by medical and health care institutions; within healthcare management domains, stakeholders should develop integrated service networks for home-residing elderly individuals, incorporating intelligent health applications, post-discharge monitoring programs, family physician frameworks, and in-home support provisions. Regarding safety and care provisions, essential implementations include emergency response mechanisms, real-time location tracking, activity monitoring systems, electronic perimeter security, risk alert notifications, and accessible alarm installations to strengthen elderly safety protections [10]. It is necessary for grassroots governments to establish a cooperative platform, break down departmental barriers, and promote cooperation among departments, communities, real estate companies, and other stakeholders, so as to avoid duplication and waste of resources. The Government should also provide senior citizens with one-stop, systematic care.

5 Conclusion

Through in-depth research on the Intelligent Aging Project, we have seen how digital technology has played an important role in the rural elderly care, which has not only improved the old people's quality of life, but also provided a new way to solve the problem. Along with the increasing aging problem, the traditional old care mode can't adapt to modern society. As a new mode, intelligent old people's care is changing gradually. Intelligent aging is not only about applying techniques, but also about changing social service patterns, and realizing and satisfying the diverse needs of older people. For example, modern technological means, such as sensor less devices, smart bracelets, and one-button pagers, have realized real-time monitoring of the health status of the elderly and rapid response, and improved the ability to provide emergency services. However, the promotion of any innovative model cannot be achieved overnight, and smart aging also faces many challenges. In the process of implementing

smart elderly care, problems such as insufficient resource integration and unfamiliarity of some older people with new technologies will be encountered. The persistence of these challenges underscores that advancing smart aging necessitates collaborative engagement across governmental, societal, corporate, and familial spheres. Policy frameworks must undergo urgent enhancement, awareness campaigns require expanded dissemination, and service delivery mechanisms demand continual refinement to ensure all seniors access technology-enabled conveniences. Looking forward, technological evolution and heightened societal understanding will propel smart eldercare diffusion across broader regions, benefiting increasing elderly populations. Anticipated near-term implementation will empower every senior to experience enhanced quality of life through intelligent aging support systems.

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