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Research on the Planning and Design of Smart Communities for the Elderly-A Case Study of Shanghai City

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Abstract. In recent years, as the population ages and technology develops rapidly, smart community construction has become an important means to meet the aging challenge and enhance the elderly's quality of life. This study focuses on the planning and design of smart communities in Shanghai for the elderly, aiming to solve the problem of how smart communities can better meet the needs of the elderly. This study takes six villages in Xinjing, Beixinjing Street, Changning District, Shanghai as the main research object, and comprehensively uses the methods of field investigation, case analysis and questionnaire survey to deeply analyze the current situation of its intelligence and residents' use feedback. It is found that the six villages in Xinjing have made some achievements in smart facilities, but there are some shortcomings in smart medical care and smart platforms. Based on this, this paper puts forward some targeted strategies, such as reasonable planning of smart facilities according to residents' needs, strengthening the integration of smart medical care and recreational sports facilities, and building a comprehensive smart platform, so as to provide reference examples for the aging construction of smart communities in Shanghai and even the whole country.

Keywords: Service for the elderly, China, smart facilities, smart medical care, smart platform.

1. Introduction

Driven by the global digital wave, Shanghai has actively participated in the construction process of the new digital infrastructure in China [1,2]. Through comprehensive planning and layout, clear construction goals and key areas; Continue research and innovation to promote the application of a new generation of information technology; Invest a lot of money to build a high-speed and stable network infrastructure; Building a data center to ensure the safe storage and efficient processing of data; Actively cultivate digital talents and provide strong support. In this process, the government, enterprises and all sectors of society work closely together to form a strong joint force to promote the development of digital new infrastructure in Shanghai and inject vitality into urban modernization.

With the rapid development of science and technology and the acceleration of urbanization, the construction of the smart community system has become an important trend of urban development. When confronted with community management issues, such as a large population density and an

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unbalanced distribution of resources, the building of a smart community is designed to boost management efficiency and improve residents' living quality by means of modern information technology. Especially in the context of aging, the traditional mode of providing for the aged faces great challenges. Smart community services provide convenient services such as online medical care and intelligent security for the elderly, which not only reduces the burden of providing for the aged in families and society, but also integrates the resources for providing for the aged, improves the service quality, enhances the sense of security and happiness of the elderly, and meets their diverse needs. This will help to build a new pension model, provide a feasible path for Shanghai to cope with the challenge of aging, promote the sustainable development of the city and create a good social atmosphere for caring for the elderly.

This study focuses on the aging planning and design of smart communities in Shanghai. Through field investigations in six villages in Xinjing, Beixinjing Street, this paper conducts in - depth analyses of their current intelligent situation.This paper also collects residents' feedback, and identifies existing problems.In combination with the development trend of cutting - edge technologies and relevant policy guidance, this paper puts forward targeted improvement strategies and future development directions, aiming to provide reference examples for the aging - friendly construction of smart communities in Shanghai and even the whole country.

2. Analysis of the practice of aging construction in advanced smart communities

2.1. Smart facilities

With the vigorous development of smart community construction, it is essential to adapt smart facilities to aging to improve the quality of life of the elderly. Communities in many cities have actively explored and accumulated rich experience in this regard. For example, many communities in Chaoyang District of Beijing vigorously promote the construction of smart facilities [3]. Shuangjing Street and Shuanggarden club are equipped with smart facilities such as smart charging piles, access control, smart monitoring systems and face recognition devices, and there are also environmental monitoring facilities that can monitor a variety of ecological indicators. These facilities provide convenience and security for the lives of the elderly. For example, smart access control and monitoring systems guard community safety, and environmental monitoring facilities help the elderly to know the community environment in time; Huixinyuan Community in Xiaoguan Street has facilities such as green smart charging, smart clothes recycling device and smart access control. The Guangda Road Community in Laiguangying District has established smart waste - sorting systems, smart access - control systems, smart medical facilities and emergency rescue facilities, which offers experience for the construction of smart communities.

2.2. Smart medical care

In the community home care system in Shijiazhuang, the smart medical service for the aging is being explored [4]. The survey shows that the elderly living at home in local communities have a high demand for intelligent medical and nursing services, especially in terms of smart medical security. Demand is influenced by many factors. Among them, female elderly people with severe mobility difficulties and moderate to severe anxiety and depression have a higher demand for intelligent medical and nursing services, while other elderly people have relatively low demand. Given this situation, various communities consider optimizing services in a targeted manner. For example, provide medical monitoring equipment for the elderly with mobility difficulties and

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chronic diseases, thus paying attention to their health status in real time; Provide more personalized medical and health management services for those elderly women in need. At the same time, for elderly groups with low education or poor economic conditions, simplify the operation process of smart medical equipment, and provide cost subsidies or preferential policies to enhance their acceptance and use experience of intelligent medical and nursing services, and effectively meet the diverse needs of the elderly.

2.3. Smart platform

Mafu Street Community, Hongwu Road Street, Qinhuai District, Nanjing, as a national model elderly-friendly community, has performed well in the construction of a smart platform for aging [5]. As a national model elderly-friendly community, the community actively uses the smart platform to improve the service level. The community introduced the Nanjing volunteer service organization "Time Bank", built an online mutual support service platform for the aged, and connected volunteers, the elderly and volunteer services in series with smart technology. Volunteers and clients can automatically match and dock services through the platform. After the service is completed, the volunteer's service time is automatically counted in the system, which can be viewed in the "My Nanjing" APP and used to redeem services in the future; The community cooperates with the power supply company to build a power data service platform to monitor the safety of elderly people living alone and ensure their lives through power consumption data; The wisdom platform of the community also integrates all kinds of community service resources [6], such as housekeeping services and maintenance services, and the elderly can easily obtain these service information and make appointments through the platform; At the same time, the platform has set up community announcements, activity notifications and other sections to facilitate the elderly to keep abreast of community dynamics and enhance communication and interaction between the community and the elderly.

3. Analysis of the current situation of community intelligence in Beixinjing

In order to further understand the current situation of new infrastructure construction in Shanghai's smart communities, six villages in Xinjing, Beixinjing Street, Changning District, Shanghai, were selected for field research. From the first proposal of "Digital Changning" to the city's first "internet plus Life Service Industry" innovation pilot zone, the "Al+ Community" in Beixinjing Street was recognized as the first batch of artificial intelligence demonstration application scenarios in Shanghai at the end of 2020, with advanced concept [7]; Six villages in Xinjing were built in 1996, with a total area of 59,778.18 square meters. There are 1,100 existing households, 897 registered households, 2,104 registered households, and the actual population is about 2,360. There are 823 elderly people over 60 years old in the community, and the aging rate reaches 39.1% (the data is the statistical data obtained by consulting the community grid staff when the author conducted a field survey in Liucun, Xinjing in January 2025).

Smart facilities are mainly concentrated in the community residents' committee located in the community center, and there is a smart reading space in the building, which can borrow and return books by itself and ban the position of librarian; At the same time, there is also a smart sports area, equipped with fitness equipment that can intelligently customize the fitness plan according to personal physique; Public restaurants are also open to residents, and some elderly people like to be lively, so they can come here to have dinner with everyone; For young people's smart government affairs, it is to create a network office that can be used on mobile phones. At the same time, for

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businesses that cannot be handled by mobile phones, such as printing, copying and scanning documents, these can be operated through public machines set up in the community. In addition, there are two garbage collection stations full of ingenious ideas in the community, and the wet garbage put by residents will be directly decomposed into water and air and released in the station, which is environmentally friendly and efficient; Most of the bus stop signs around the community are also "intelligent", tracking the approximate arrival time of the next two buses in real time, which provides great convenience for residents to travel.

However, there are shortcomings in smart medical care and smart platforms. Although there is a health service station in the building, equipped with professional doctors, blood pressure meters, blood glucose meters and other self-service measuring equipment, which facilitates the daily health monitoring of the elderly, it is still difficult for the elderly who are inconvenient to move or feel unwell at home. At present, the main platform for feedback problems of the elderly is mobile communication app group chat, and sometimes the information cannot be seen and processed in time, which leads to the problem being solved in time. Through communication with residents, they are eager to have more convenient and efficient intelligent medical services and feedback channels, such as online consultation and quick response problem handling mechanism.

4. User evaluation

A total of 89 questionnaires regarding the needs of community residents were distributed, and the actual recovery rate reached 92%. The results of the recovered questionnaire clearly show that the use and satisfaction of smart facilities by community residents show significant characteristics and trends. Judging from the composition of the residents who participated in the survey, the proportion of women is slightly higher, with residents over 60 accounting for about 70% of the total number, and the education level is mostly concentrated in high school and below and junior college. In view of the influence of education level and age on the frequency of residents' acceptance and use of smart facilities, this population structure lays the foundation for subsequent analysis.

Regarding the specific feedback on intelligent facilities, people's satisfaction with intelligent cultural living facilities is mediocre. 40% of the people find them convenient, while 42.5% of the people consider them to be so - so. Although it has the advantages of no management and high degree of freedom, the problems of insufficient quantity and lack of manual service are prominent. The utilization rate of intelligent fitness equipment and self-service reservation in intelligent recreational sports facilities is high, reaching 86.25% and 72.5% respectively, but 36.25% of residents think it is convenient, 43.75% think it is average and there is more room for improvement. Wireless city has a high degree of satisfaction with management facilities, and 45% people think that convenience, unmanned management and long opening time are advantages, but insufficient quantity and unstable operation still need to be solved; The utilization rate of intelligent transportation facilities is high, and there is room for improvement in satisfaction. The main problems are the lack of facilities and unstable operation. The overall satisfaction with intelligent old - age service facilities is mediocre, with 41.25% of the people being satisfied. The facilities have the advantages of simple operation and long opening hours, but they are short of manual services and lack some facilities. In terms of transportation, 45% of the residents choose private cars to get to intelligent facilities, and 33.75% of the residents can accept a 10 - 20 - minute journey, which reflects the demand for easy access to the facilities. In terms of preference, 57.5% of the residents prefer to use smart facilities offline, highlighting the importance of face - to - face services. On the whole, community residents are in urgent need of intelligent facilities, but they still need to be

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strengthened in terms of quantity, types and service quality, so as to improve residents' satisfaction and experience.

5. Future development direction of smart community

With the rapid development of science and technology, cutting-edge technologies such as artificial intelligence, big data and Internet of Things are infiltrating into all fields of social life at an unprecedented speed, and the construction of smart communities has also ushered in more innovative opportunities and challenges. These technologies provide strong support for solving the problems existing in the current smart community and realizing the sustainable development of the smart community. At the same time, the state and Shanghai also actively promote the construction and aging transformation of the smart community at the policy level, which points out the direction for the development of the smart community. However, there are still many shortcomings in the application of technology and the implementation of policies in smart communities, which need to be improved.

From the perspective of technology application, big data technology has strong data processing and analysis capabilities. In the construction of smart communities, the intelligent facilities can be optimized in terms of configuration according to the usage data of residents. For example, through the in-depth analysis of residents' borrowing records in smart reading space, we can accurately grasp the reading preferences of different residents, thus supplementing the types of books in a targeted manner and meeting the diverse cultural needs of residents. However, at present, the number of intelligent cultural living facilities is insufficient, and the services are not targeted, which fails to fully tap and utilize the advantages of big data technology. As a result, it is difficult for residents to meet their needs in cultural life effectively, and the smart reading space cannot give full play to its due role.

The core value of Internet of Things technology lies in realizing the interconnection and real-time data sharing between devices. In the field of recreational sports in smart communities, it can realize the real-time communication between intelligent recreational sports facilities and residents' health data. By monitoring and analyzing residents' exercise data and health indicators, we can customize personalized exercise programs for the elderly, provide scientific and reasonable exercise guidance, and promote the health of the elderly. However, the reality is that the current intelligent recreational sports facilities have obvious defects in function setting and operation instructions. The functions of some facilities are too complicated for the elderly to understand and operate; The operating instructions are not clear and concise, and there is no targeted guidance, which makes the elderly encounter many difficulties in the use process, which greatly hinders the application of Internet of Things technology in the field of smart community health sports.

Artificial intelligence technology has great application potential in wireless city's management and transportation facilities. In community management, it can optimize the access control identification system, improve the accuracy and safety of identification, effectively prevent strangers from entering the community at will, and ensure the safety of residents. In terms of transportation facilities, artificial intelligence technology can improve the accuracy of bus stop information, provide residents with more accurate bus arrival time prediction, and facilitate residents to arrange travel time reasonably. However, the existing wireless city management and transportation facilities in the community are unstable, and the technical update and equipment upgrade are lagging behind. This not only affects the residents' experience, but also reduces the intelligent level of these facilities, and cannot give full play to the advantages of artificial intelligence technology.

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At the policy level, the state and Shanghai actively promote the construction of smart communities and the aging transformation. The state has issued a series of encouragement policies, advocating the use of digital means to improve the level of community services, with particular emphasis on the intelligent transformation of old-age services. Shanghai has also followed the pace and formulated relevant action plans, clearly demanding to optimize the layout of community smart facilities and improve the convenience and accuracy of old-age services [8]. However, combined with the results of this survey, there is a gap in the implementation of policies in the community. Although intelligent old-age service facilities have the advantages of simple operation, they lack manual services and facilities, which is inconsistent with the precise service requirements emphasized in the policy; Smart medical service is difficult to meet the needs of the elderly with mobility difficulties, and it also fails to effectively achieve the policy goal of combining medical care with nursing care, reflecting the problem of resource allocation and demand docking in the process of policy implementation.

However, according to the survey results of six villages in Xinjing, there is still a big gap in the implementation of policies in communities. In terms of intelligent old-age service facilities, although some facilities have the advantages of simple operation and long opening hours, there are problems of lack of manual services and insufficient types of facilities. This is inconsistent with the precise service requirements emphasized in the policy and cannot meet the diversified and personalized needs of the elderly. In terms of smart medical services, it is difficult to meet the medical needs of the elderly with mobility difficulties, and the policy goal of combining medical care with nursing care has not been effectively achieved. This reflects that in the process of policy implementation, there are problems such as unreasonable resource allocation and inaccurate docking with the actual needs of the elderly, which has greatly reduced the implementation effect of the policy.

In view of the above problems, in terms of smart facilities, in order to meet the diverse needs of residents, it is necessary to rationally plan the launch of smart facilities according to the age, education level and actual use needs of residents in various regions. Focus on adding old-age service facilities in areas where elderly residents gather, and increase investment in intelligent cultural life and recreational sports facilities in areas where residents have frequent activities. At the same time, in order to ensure the normal operation of intelligent facilities, it is necessary to set up a professional maintenance team. The team is responsible for regular maintenance and inspection of intelligent transportation, community management and other facilities, timely finding and solving problems in the operation of facilities, and ensuring the stability and reliability of facilities. In addition, special feedback channels should be set up, such as online feedback platform and telephone hotline, so that residents can report facility failures in time and the maintenance team can respond quickly and carry out maintenance. In addition, in the area of intelligent cultural life and old-age service facilities, special personnel are arranged to be on duty to provide operational guidance and answer questions for residents [9]. These staff should have professional knowledge and skills, and be able to patiently and meticulously help residents solve various problems encountered in the process of using the facilities, so as to improve the residents' experience.

In terms of smart medical care, we should actively promote the deep integration of smart sports facilities and smart medical care. For example, the health data monitoring function is added to the fitness equipment to collect real-time data such as heart rate, blood pressure and exercise intensity of residents during exercise and transmit these data to the medical platform. Through the analysis of these data, the medical platform provides personalized health advice and exercise guidance for residents, and realizes the organic combination of exercise and medical treatment. Use the smart

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platform to carry out online consultation, appointment registration and other services, break the time and space constraints, and facilitate residents to seek medical treatment. Organize offline lectures and free clinic activities regularly, and invite professional doctors to explain health knowledge, diagnose and treat diseases for residents. In view of the characteristics of mobility inconvenience of elderly residents, we provide on-site services, including on-site physical examination and drug delivery, to effectively meet the medical needs of the elderly. Establish electronic health records for residents, collect daily health data of residents with intelligent facilities, such as physical examination data, disease history, drug use, etc., and realize real-time monitoring of residents' health status [10]. Once the residents' health data is found to be abnormal, the system will inform the residents themselves and relevant medical institutions in time, so as to take corresponding treatment measures to achieve early detection and treatment of diseases.

In the construction of smart platform, it is very important to build a comprehensive platform that integrates the use of smart facilities, medical services, community management and other functions. Through this platform, residents can conveniently inquire about the use of various intelligent facilities, make appointments for medical services and participate in community affairs. Through in-depth analysis of the data collected by the platform, we can understand the needs and usage habits of residents more comprehensively and accurately, and then optimize the layout and service content of intelligent facilities. Set up an interactive section on the platform to encourage residents to share their experiences and suggestions, and promote exchanges and interactions among residents. Community management departments respond to residents' feedback in time, enhance residents' sense of participation and belonging, and create a good community atmosphere.

6. Conclusion

The analysis of six villages in Xinjing under Beixinjing Street and the implementation of the related schemes have yielded remarkable results in the areas of smart facilities, medical care, and platforms. Smart facilities are planned according to the characteristics of residents, professional operation and maintenance are stable, and manual services enhance the experience; Smart medical care integrates facilities and services, establishes electronic files, and realizes accurate health management; Smart platform integrates functions, optimizes services through data analysis, and enhances community cohesion through interactive plates.

However, there are also many shortcomings in this study. From the research scope, only six villages in Xinjing, Changning District, Shanghai are the main research objects, and the sample is single. Therefore, future research can choose a larger sample to study and improve the representativeness of the research group.

In the research content, there is insufficient discussion on the social level of the smart community. The construction of smart community is not only the application of technology and the improvement of facilities, but also has a far-reaching impact on the social aspects such as the construction of community culture and the interaction between residents. Future research can deeply analyze the use of smart platform and the introduction of intelligent facilities, and comprehensively reveal the influence of smart community construction on community social structure and residents' lifestyle.

Despite the above shortcomings, the practical experience of six villages in Xinjing is still of great significance based on the actual needs of the aging transformation of smart communities in Shanghai. In the future, Shanghai should fully promote the successful model of six villages in Xinjing, and constantly improve and innovate on this basis, and update and improve according to the needs of the elderly to meet diverse needs. Deepen smart medical care, strengthen cooperation

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between medical institutions and hospitals, and use artificial intelligence to realize early warning and intelligent diagnosis of diseases. Expand the functions of the smart platform, including intelligent security, home control, etc., and build an all-round smart life scene. In addition, pay attention to training professionals, improve the skills and service level of community service personnel, and ensure the efficient and sustainable development of smart communities. In this way, we will build a national leading model for the aging transformation of smart communities, so that the elderly can enjoy high-quality old age life.

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