Research on the Dilemma of Supplying Smart Senior Care Meal Assistance Service and Countermeasures–Taking Daoli District of Harbin City as an Example

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Abstract. The increasingly severe situation of population aging has become a universal problem in the world. How to achieve high-quality elderly care has become an important issue for our country to deal with population aging. Meal needs are the most basic and indispensable physiological needs in the elderly care process. The rapid growth of their needs and the rapid development of information technology have opened up new space for the development of smart senior care meal assistance services. At present, the Harbin Municipal Government continues to increase its support for smart meal assistance services for the elderly, and the smart senior care catering industry represented by Daoli District is showing a trend of expanding market size. However, the current supply of smart elderly meal services in Daoli District of Harbin City also has problems such as a low degree of smart senior care meal assistance equipment, limited policy support, and difficulty in guaranteeing the safety of platform information data. Therefore, it is necessary to cooperate from multiple angles, such as technology introduction, policy support, and platform construction, to build a smart "senior care on the tongue" for the elderly from the perspective of nutrition, health, economy, and convenience, to promote the development of smart senior care meal assistance service in Heilongjiang Province and even in the whole country.

Keywords: Smart senior care meal assistance service · Internet accelerated speed · Supply side · Data security

1 Introduction and Literature Review

1.1 Introduction

Harbin has entered a stage of rapid development of population aging. Harbin's aging population is currently ranked tenth in China. According to the seventh census data of Harbin, the population of Harbin aged 60 and above has reached 2.20 million, accounting for about 22% of the total population of Harbin. Compared with the sixth national census, the proportion of the population aged 60 and above in Harbin increased by 9.21% points.

Harbin is a typical high-population and aging city in China. As of 2018, the proportion of disabled and semi-disabled elderly in Harbin exceeded 16%, the proportion of older adults was 12.3%, and the empty nest rate reached more than 60%. Difficulty eating meals for the elderly has become increasingly prominent.

November 17, 2021, Harbin Civil Affairs Bureau promulgated the "Harbin City Civil Affairs "fourteen five" development plan, proposed to support the integration of elderly services and catering industry, to promote the diversified development of Harbin City's "silver hair economy." Promote the "Internet accelerated speed elderly" action to increase the cultivation and support of intelligent health care demonstration units. The implementation of policies related to helping the elderly promulgated by Harbin City has dramatically stimulated the development of smart senior care meal assistance services that integrate modern technological means such as the Internet of Things and big data. To solve the problem of complex meals for the elderly in Harbin from the source and to better meet the basic physical needs of the elderly. It provides diversified and high-quality senior care meal assistance services for the elderly. Also, it provides experience reference for other highly aging cities in China to build a similar smart senior care meal assistance service model.

1.2 Literature Review

Since the 21st century, China's aging has continued to intensify. In order to actively respond to this situation, China has encouraged various regions to vigorously develop smart senior care based on the continuous development of information technology such as the Internet, big data, and cloud computing. At present, China has produced many research results in concept definition, product design, platform construction, the relationship between demand and supply, and service system regarding smart senior care services. In the definition of the concept of smart senior care service, it emphasizes the use of cloud platform information system and Internet data as the core and link to integrate senior care service resources and realize the comprehensive and deep integration of Internet and traditional senior care service to improve the efficiency and service level of senior care service [3, 6, 12]. In terms of smart senior care service products, scholars mainly focus on smart wearable devices incorporating blockchain technology [8], age-appropriate smart home products [10], and monitoring devices to ensure the daily safety of the elderly [11]. In addition, some scholars carry out research on the cloud platform of smart senior care service based on Internet-related technologies such as IoT sensing and edge computing, service access and management, collaborative scheduling engine, end/cloud business collaboration, and intelligent interactive applications [2, 5, 7]. Meanwhile, some scholars have conducted a study based on smart senior care services' supply and demand relationship. Propose to build an accurate identification system at the level of supply and demand of intelligent elderly services. In order to enrich the supply of elderly services while meeting the diversified needs of elderly groups for elderly services [4].

The existing research on smart senior care services mainly focuses on combining traditional senior care services with new technologies, the innovation of service models, and the balance between the supply and demand of senior care services. There are few systematic types of research on specific meal service items. Only a few academic types

of research are related to meal service when discussing intelligent home care service or intelligent community service. The research on smart senior care meal service, which guarantees the basic physiological needs of the elderly, is far from enough.

The marginal contribution of this paper is mainly twofold. Firstly, we researched the smart senior citizen meal service points in Daoli District of Harbin City and the related enterprises that developed the smart senior citizen meal service equipment and platform. Using in-depth interviews to understand the actual supply status and supply mode of smart senior care meal service in Daoli District of Harbin City, we provided practical experience for expanding multi-level supply of smart senior care meal service. Secondly, explore the synergy of multiple subjects and resources from the problems that restrict the supply of smart senior care meal assistance services. To establish a smart senior care meal assistance service supply model that meets the demographic and economic characteristics of Harbin city and provide a practical basis for improving the quality and efficiency of smart senior care meal assistance service in Heilongjiang province and even in China.

2 The Connotation of Smart Senior Care Meal Assistance Service

Harbin's smart senior care meal assistance service is mainly provided for the elderly without children, the elderly with subsistence allowances or low income, the elderly living alone, and the elderly in pure old families. This paper mainly selects Daoli District in Harbin, which has formed a large-scale smart senior care meal assistance service supply, as the research object, conducts field research, and explores the connotation of smart senior care meal assistance service.

2.1 The Connotation of Smart Elder Care Catering

Before the concept of smart senior citizen meal service was introduced, the most frequently mentioned concept was the basic "home senior citizen meal service" and "senior citizen canteen." Some scholars classify senior meal assistance service into senior canteen service model and home care meal assistance service model [9]. The service model of the senior canteen is through the establishment of a senior cafeteria. A particular food distribution center processes ingredients for the senior canteens and encourages eating in the store. Some senior cafeterias also provide the service of purchasing food on behalf of the elderly, relying on the cafeteria to supply senior dining services. The home care meal service model is to provide home delivery service for the disabled elderly, semi-disabled elderly, empty-nest elderly with mobility problems, and elderly living alone by relying on the delivery platform of the community or the individual delivery platform of the canteen or restaurant.

With the rapid development of information technology and the improvement of people's economic income and living standards, the traditional elderly meal service can no longer fully meet the market demand and the needs of the elderly. China is vigorously promoting the transformation of the traditional manual senior care meal assistance service model to the smart senior care meal assistance service model. Combined with the Action

Plan for the Development of Intelligent Healthy Aging Industry (2021–2025) promulgated by China in 2021, this paper defines intelligent elderly meal service as oriented to the community elderly meal scene, integrated application of the Internet, artificial intelligence, and other technologies providing online meal ordering, face payment, delivery to households and other services for the elderly, while strictly implementing precise meal subsidies, meal nutrition management, food safety supervision.

3   The Current Situation of the Supply of Smart Senior Care Meal Assistance Services in Daoli District, Harbin City

Daoli District is the central urban area of Harbin, and its population ranks second in the city. The district's total area is 479.2 km², of which the urban area is 49.9 km². It has four towns and 19 sub-district offices under its jurisdiction. As of 2019, the total population of Daoli District is 785,455, and the population over the age of 60 is 207,985, accounting for 26.5%. It has a vast supply market for smart senior care meals. Since 2021, Daoli District, Harbin City, adhering to the civil affairs sentiment of helping the people, was the first to start the senior care meal assistance service project. Takes the lead in launching the elderly meal service project and comprehensively builds a smart senior care meal assistance service of "community assistance restaurants plus senior care meal assistance points" and "Internet plus delivery meals" supply system.

3.1   The Current Situation of the Supply Scale of Smart Senior Care Meal Assistance Services

The supply of smart senior care meal assistance service in Daoli District, Harbin, will begin in 2021. The service will be piloted in several streets and communities such as Shangzhi Street, Hebai Community, and Fushun Street. Using the "Internet accelerated speed" method to achieve full coverage of smart senior care meal assistance service, effectively solve the problem of "difficulty eating" for the elderly, and create a doorstep meal service circle. As shown in Fig. 1, as of June 9, 2021, 20 community-based smart meals for the elderly have been built in Daoli District, Harbin, covering 19 communities. As of June 29, 2021, Daoli District, Harbin established 57 smart senior care meals restaurants, and 31 have been officially put into operation, realizing that the smart elderly meals cover 40% of urban communities in the district. As of July 14, 2021, 74 smart elderly meal points have been built in Daoli District, Harbin, covering 47% of the urban communities in the district. Among them, 63 community elderly meal points integrated by the community have issued more than 8,000 electronic elderly care meal cards, providing the elderly with More than 16,000 meals. It is expected that by the end of September 2021, Daoli District will achieve full coverage of 156 urban communities with smart elderly meals and further expand the supply of smart senior care meal assistance services in Harbin (Table 1).

3.2   Status Quo of the Main Body of Smart Senior Care Meal Assistance Service Providers

The supply process of the smart senior care meal assistance service in Daoli District involves many service providers such as the government, street communities, old-age
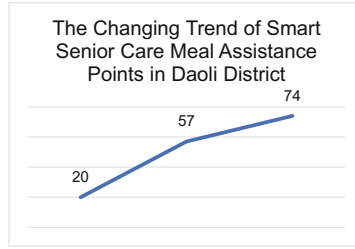
The Changing Trend of Smart
Senior Care Meal Assistance
Points in Daoli District

74

57

20

Fig. 1. The changing trend of smart senior care meal assistance points in Daoli District.

Table 1. The number of smart senior care meal assistance points in Daoli District, Harbin City in 2021.

Date	2021.06.09	2021.06.29	2021.07.14
Number	20	57	74

institutions, "Internet accelerated speed" old-age service companies, and catering companies. They have different roles. They have different roles. As the main body of the system supplier in the smart senior care meal assistance service, the government department is mainly responsible for formulating the smart senior care meal assistance service fund subsidy policy, tax preferential support policy, and establishing a service supervision system to ensure the steady development of the smart senior care meal assistance service in Daoli District. Streets, communities, and neighborhood committees, as the operating entities in the smart senior care meal assistance service, are mainly responsible for integrating human resources and space resources within their jurisdiction, determining the operation and management methods of the smart senior care meal assistance, and formulating the daily operation and management safety specifications of the smart senior care meal assistance service. "Internet accelerated speed" pension enterprises and catering companies, as the direct suppliers of smart senior care meal assistance service, are mainly responsible for the research and development of smart senior care meal assistance equipment, the provision of nutritional package processing and preparation, and the Internet meal delivery service to households.

3.3   The Current Situation of Supply of Smart Senior Care Meal Assistance Service Equipment

The application of information technology in senior care meal assistance services is mainly to use advanced technologies such as big data technology, human-computer interaction technology, robotics technology, detection and control technology, and microelectronic information technology to develop intelligent meal assistance robots, electronic meal assistance cards, restaurant automatic weighing settlement system, remote security monitoring, and other smart old-age meal service equipment. Provide smart equipment support for smart senior care meal assistance services. The MY TABLE series of meal-assisting robots developed by Harbin Engineering University in 2016 belong to the more
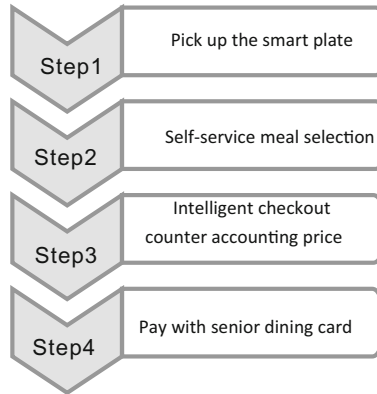
Fig. 2. Work process of smart self-selected fast settlement system

mature meal-assisting robots developed by universities. Including a table rotation mechanism, a manipulator rotation, a lifting mechanism, and a meal pickup mechanism can help the disabled elderly be powered by pedals, meal selection, and meal use of three switches to achieve independent dining. Starting from June 18, 2021, Daoli District will provide the elderly with the service of applying for the "Daoli District Respect Meal Card" service. The elderly can quickly apply for the card with their ID cards, and community grid workers can also go to households for the physically challenged elderly. Through the use of the Respect for the Elderly Meal Card, seniors between the ages of 70 and 79 can enjoy a 10% discount on the inclusive package, and those aged 80 and above can enjoy a 20% discount on the inclusive package. The self-selected restaurant quick settlement system in Daoli District smart senior care meal assistance points uses the Internet of Things technology and RFID radio frequency technology. To achieve automatic weighing and settlement of meals, seniors can choose their own meals, and freely check the calorie and protein content of meals, ensuring that meals are nutritious and avoid waste, and at the same time save the labor cost and operating cost of meal assistance points. Provide more smart senior care meal assistance service for the elderly in Harbin (Fig. 2).

3.4 The Current Situation of Supplying Cloud Service Platform for Smart Senior Care Meal Assistance Service

The supply of senior care meal service should follow the "people-oriented" thinking. Harbin Daoli District uses big data, blockchain, and other information technology to build the elderly meal wisdom cloud platform and Daoli District community elderly restaurant official accounts. The government leads the Harbin senior meal assistance smart cloud platform to formulate construction goals and construction rules and coordinate the main builders such as Internet companies, elderly care service companies, and relevant universities to conduct platform research and development. The senior care meal assistance smart cloud platform uses a uniformly installed camera monitoring system to supervise the construction and operation of community senior care meal assistance points

comprehensively. Intelligent terminal equipment such as the old meal card settlement system matched with the intelligent cloud platform collects and monitors the real dining needs of the elderly in Daoli District. The platform will hand over the dining data to the professional extensive data analysis technology department for data collection, data analysis, feedback, and other processes. According to the data analysis of the different dining needs of the elderly, to supply personalized dining customization services for the elderly. In order to improve the quality of meal assistance services for the elderly. The official account of Daoli District Community Helping the Elderly Restaurant integrates service functions such as inquiry, reservation, publicity, and evaluation. Older people can use the official account to inquire about the distribution of the Daoli District's smart elderly restaurants' special meals and make reservations for meals on the public line, or use the "telephone reservation" section of the public number to order meals online. After the meal, the elderly can also evaluate and vote on the official account.

3.5 The Current Situation of the Supply Mode of Smart Senior Care Meal Assistance Service

Harbin Daoli District, mainly through the government's financial contribution to the construction of smart elderly assistance restaurants, to provide policy and regulatory support and business subsidies, to encourage the community to integrate the community's human resources, space resources, and other resources to mobilize the enthusiasm of social welfare organizations and catering enterprises, to encourage their independent operation, and gradually formed an "enterprise investment construction," "street-enterprise construction" and "social integration" to provide the elderly with wisdom to help the elderly meal service supply model. The "enterprise investment construction" model consists of the streets taking out public resources such as unused community rooms and investing in the construction of community restaurants for the elderly through third-party institutions, or relying on existing resources such as community daycare centers and home care service stations. The "street-enterprise construction" model relies on enterprises and institutions canteens, property canteens, and other places to invest in the construction of additional elderly meal service projects. "Social integration" mode by the street integration of public welfare, integrity management, management standard social catering enterprises, the use of its own site in the regular external sales of food and beverage at the same time, to provide the elderly with in-store meal service and "Internet plus initiative" delivery meal service.

4 The Dilemma of Supplying Smart Senior Care Meal Assistance Services

In recent years, with the effective combination of modern technology and information technology and home-based care, the Harbin Municipal Government has gradually created a smart community home-based care service model. The smart senior care meal assistance service is an essential part of it to meet the dining needs of the elderly. Although Harbin City, represented by Daoli District, has been actively exploring the

supply of smart senior care meal assistance services and has made specific achievements, successfully solving the problem of "difficult meals" for some elderly. However, the supply of smart senior care meal assistance services in Daoli District of Harbin City is still in the initial stage. Many problems hinder the efficient supply of smart senior care meal assistance services due to the influence and constraints of various related factors. The following summarizes the dilemma of the supply of smart senior care meal assistance service in Daoli District of Harbin City, taking into account the actual situation of Daoli District of Harbin City.

4.1 Imperfect Support Policies for the Supply of Smart Senior Care Meal Assistance Services

At present, the supply support policy of smart senior care meal assistance service implemented in Daoli District of Harbin City can make the smart senior care meal assistance points realize the supply of public welfare services while avoiding long-term losses and achieving balanced income and expenditure or even income exceeding expenditure. However, there is a lack of financial support policy to introduce smart senior care meal assistance equipment in the smart senior care meal assistance points. This makes the current intelligent degree of some senior citizen meal service points low, in addition to the basic senior citizen meal cards and Internet plus initiative delivery services. It is difficult to introduce more smart senior care meal assistance equipment such as intelligent dining assistance robots and automatic weighing and settlement systems. This will hinder the configuration of intelligent equipment and technology in the smart senior care meal service points and thus affect the intelligent development of senior care meal assistance service supply.

4.2 Security Risks Exist in the Data of the Smart Senior Care Meal Assistance Service Supply Platform

The smart senior care meal assistance service supply relies on the senior meal assistance intelligent cloud platform and the official account of the community elderly restaurant in Daoli District, both of which need to use the personal information of the elderly as the database. These personal information mainly include information about the older person's residence, physical health, payment account information, and information about relatives such as children. At the same time, the senior care service companies providing smart senior care meal assistance services will also collect data related to the dining situation of the elderly. They will design personalized meal assistance services for the elderly and develop corresponding smart senior care meal assistance service equipment. However, complex data and information security issues arise while collecting the personal information and senior care data of these seniors. There is currently a lack of effective and efficient data security for the personal information and senior care data of the elderly. In the absence of a perfect information protection system on the smart senior care meal assistance platform. It is easy for lawless elements to invade the information platform, causing the leakage and illegal use of these senior care data and personal information of the elderly. When older people lose their property or are harassed by information leakage, it is difficult for them to use legal weapons to defend

their rights due to the inadequacy of data information protection laws and regulations and their weak awareness of personal privacy. As a result, the elderly are skeptical and fearful of new things related to the Internet. The elderly are reluctant to accept the smart senior assistance meal service with simple payment and convenient dining to avoid being duped.

5 Countermeasure Suggestions for Solving the Dilemma of Supplying Smart Senior Care Meal Assistance Services

Population aging will become a basic national condition in China, and the development of smart senior care is an important task to actively deal with population aging. While solving the problems of "difficulty in cooking" and "difficulty in eating" for the empty nesters, those are living alone, the elderly, and those who have difficulty taking care of themselves. The supply of smart senior care meal assistance services also provides a transformation opportunity for some restaurants that have difficulties operating to cooperate with the community and the government and provides a new platform for restaurants to generate revenue help employment. However, many shortcomings still need to be solved in the smart senior care meal assistance service in Daoli District of Harbin City. In the future, careful design, scientific planning, and enhanced interaction are needed to continuously promote the sustainable and healthy development of smart senior care meal assistance services.

5.1 Improve the Financial Support Policy of Smart Senior Care Meal Assistance Service

On the one hand, the government should continuously increase the financial support for the supply of smart senior care meal assistance services actively build a financial budget system. In the original construction subsidies, operating subsidies, meal delivery subsidies, and meal subsidies for the elderly in difficulty four kinds of financial support policies to improve the financial investment growth mechanism. At the same time, provide the corresponding tax and industrial commercial preferential policies for the smart senior care meal service points. Further, increase the basic financial support for smart senior care meal assistance service, and provide financial solid policy support for the supply of smart senior care meal assistance service. On the other hand, the government should set up a particular financial account to use smart senior care meal assistance equipment. Provide corresponding financial support for purchasing smart senior care meal equipment and platform services for smart senior care meal points. To reduce the purchase price of smart senior care meal equipment and platform services from the root, encourage meal aid points further improve the smart level of smart elderly meal aid service supply, and promote the sustainable development of smart senior care meal assistance service.

5.2 Guarantee the Data Security of the Supply Platform of Smart Senior Care Meal Assistance Service

On the one hand, the data use of the platform should be strictly regulated by government legislation, and the provisions of the introduced policies and regulations such as the

Data Security Law and the Personal Information Protection Law should be firmly implemented. Establish and improve the whole process of data security management, review system, and data security emergency disposal mechanism, and organize data security education and training to ensure data security. On the other hand, adopt blockchain technology and other technical measures to safeguard data security. Blockchain technology is essentially a shared database with characteristics such as "unforgeability," "traceability," "openness and transparency," "multi-node Maintainability," and other characteristics. Thus, it has corresponding advantages in terms of data privacy protection. Its ability to safeguard senior care data from network eavesdropping, support anonymous transactions, and decentralized architecture also ensure that the cloud platform effectively protects against cyber attacks [1]. Thus, the senior dining smart cloud platform built with blockchain technology can effectively use data encryption technology to define users' permissions, ensure data transparency on the senior dining smart cloud platform and guarantee the privacy and security of senior users' personal data.

6 Conclusions

The aging population in Harbin, as a long-standing and irreversible social norm, has a significant impact on the development of smart senior care. From the supply-side perspective, the smart senior care meal assistance service provides a new way of thinking and means to meet the growing demand of older people for meals. Although the current Harbin Daoli District smart senior care meal assistance service in the government's strong support is ushering in a period of rapid development opportunities. There are still many problems that need to be solved. Under the guidance and unified planning of the government, the community should cooperate with the promotion and encourage the active participation of senior citizen enterprises and restaurants to steadily promote the high-quality development of smart senior care meal assistance service in Daoli District, Harbin City. At the same time, it provides a reference for Harbin city and even Heilongjiang province to build a systematic smart senior care meal assistance service and further promote the sustainable and healthy development of elderly care in China.

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