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The Operation Strategies with Chinese characteristics on the Intelligent Process Management of Home-based Health Care Service

JIANG Yichen

Doctor of Management

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May, 2022

BUSINESS
SCHOOL

Marketing, Operations and General Management Department

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I declare that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university and that to the best of my knowledge it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed: Date: 2022.5.15

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Abstract

China is rapidly entering a deeply aging society. More elderly people will choose to receive health care services at home. The problem of receiving services at home is that the service providers come to the home alone. Therefore, it is difficult to get objective feedback and effective evaluation on service length, service content as well as risk prevention and control. Guaranteeing the service quality is also challenging, thus affecting the business model. In order to fill this gap, this study clarifies the four-in-one "ISAC" intervention strategy model of home-based health care service process management to effectively improve customer satisfaction from the strategic level; establishes a common indicator evaluation system to improve the service process supervision from the tactical level; innovates and develops a smart home care (SHC) system from the operational level.

The study takes Shanghai, the highest aging city in China, as a sample, and analyzes the current situation of home-based health care services and customer service expectations, designs an operational intervention system and adopts targeted interventions for practical application in the operation system. It evaluates the effectiveness of the actual operation in two groups, which are customers and employees, and discusses continuous improvement strategies and methods. This study attempts to establish an operation management system suitable for Chinese community-and-home-based health care services through scientific methods and approaches. It also provides a feasible methodology to enhance the quality and operation management capabilities. The SHC solution has been promoted and implemented in Shanghai, China, since December 2020.

Keywords: Home-based health care services, smart home care, intelligent process management, Chinese elderly service industry
JEL: M10, I19

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Resumo

A China está a entrar rapidamente numa sociedade profundamente envelhecida. Mais pessoas idosas optarão por receber serviços de saúde em casa. O problema de receber serviços ao domicílio é que os prestadores de serviços vêm para o domicílio sozinhos. Por conseguinte, é difícil obter um feedback objetivo e uma avaliação eficaz sobre a duração dos serviços, o seu conteúdo, bem como a prevenção e o controlo dos riscos. Garantir a qualidade do serviço é também um desafio, que afeta o modelo de negócio. A fim de preencher esta lacuna, este estudo clarifica o modelo de estratégia de intervenção quatro em um "ISAC" de gestão do processo de serviços de saúde ao domicílio para melhorar efetivamente a satisfação do cliente a partir do nível estratégico; estabelece um sistema comum de avaliação de indicadores para melhorar a supervisão do processo de serviços a partir do nível tático; e inova e desenvolve um sistema inteligente de cuidados domiciliários (SHC) a partir do nível operacional.

O estudo toma Xangai, a cidade mais envelhecida da China, como amostra, e analisa a situação atual dos serviços de cuidados de saúde domiciliários e as expectativas de serviço ao cliente, concebe um sistema de intervenção operacional e adota intervenções para aplicação prática no sistema operacional. Avalia a eficácia da operação real em dois grupos – clientes e empregados – discutindo estratégias e métodos de melhoria contínua. Este estudo tenta estabelecer um sistema de gestão operacional adequado aos serviços de saúde baseados na comunidade Chinesa e no domicílio, através de métodos e abordagens científicas. Fornece também uma metodologia viável para melhorar a qualidade e as capacidades de gestão das operações. A solução SHC tem sido promovida e implementada em Xangai, China, desde Dezembro 2020.

Palavras-chave: Serviços de saúde ao domicílio, cuidados domiciliários inteligentes, gestão inteligente de processos, indústria chinesa de serviços para idosos
JEL: M10, I19

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摘 要

中国正在快速进入深度老龄化社会，更多的老人会选择居家接受养老服务。但是在家中接受服务的问题是，上门的服务人员独自上门进行服务，那么服务时长、服务内容、风险防控就很难地得到客观的反馈及有效地评价，使得服务质量很难保障，从而影响其商业模式很难成立。为填补这一缺失，本研究从战略层面明确有效提升客户满意度四位一体的居家医养服务过程管理"ISAC"干预策略模型；从战术层面建立了行业通用的提升服务过程监管的指标评价体系；从实操层面创新开发了 SHC 智慧化系统有效解决过程监管。

本研究以中国老龄化程度最高的上海为样本，调研分析得出目前居家医养服务的现状和客户服务期望，设计运营干预体系针对性采取干预措施在居家医养服务运营体系实际应用，从客户及员工两个群体的实际运营开展情况进行效果评价，并持续探讨改进策略与方法。本研究试图通过科学的方式方法，建立一套适合中国社区居家医养服务运营管理体系，为改进和提升质量及运营管理能力提供可行性的方法论。目前该解决方案已在中国上海进行推广实施。

关键词：中国养老产业，智慧化，居家医养，过程管理
JEL: M10, I19

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Four years of the global COVID-19 epidemic are also four years of my dissertation writing time. From clueless to getting better, I have witnessed the process of gradually improving my academic ability. In the spare time of busy work, I often work at night, thinking and tapping my "work" on the computer keyboard. When I was still "fighting" late into the night, I have also asked myself: Is it worth to bother myself at 40 years old? However, I have the words in my heart that I have always encouraged myself, "The efforts you make today will determine what you will be like in five years". In this way, I go through one after another five years of life with effort.

My doctoral thesis is not only a theoretical and creative work, but also a reflection of my real experience in R&D. I entered the senior care industry in 2013. From being a "novice" in the medical industry, I have gradually understood the logic of the industry. China is gradually aging, and the home healthcare industry is undoubtedly a sunrise industry. It also needs to integrate modern technology to empower the traditional industry, to improve human efficiency and solve the pain point of difficult service quality supervision. In the home-based care service, the service process is a "black box" that cannot be supervised. When this problem was first discovered, how to describe it, how to solve it, and how to establish universal standards were all blank spots. I therefore raise the issue that is the focus of this research - the process management of the home-based service and led a team of health care operation business, IT technology, AI algorithm and IoT hardware teams to develop the overall solution of intelligent home-based health care service.

During the days of research and writing, whenever I encountered difficulties in R&D business or ran out of talent, my mind will recall the years of tireless efforts for this work, the encouraging eyes and the extensive knowledge of the professors who had given me guidance, my persistence of flying from Shanghai to Chengdu to attend classes, the leaders, colleagues and lovely classmates who had given me great support…… They let me not be afraid of the challenge and never lose the battle. In this process, I deeply feel the nobility of learning and the charm of knowledge, but I also appreciate the hardship of theoretical research and the shallowness of my own knowledge. Although the thesis has been revised several times, I still feel that it is not profound and comprehensive enough. I look forward to receiving criticism and guidance from professors.

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姜依辰
写于 2022 年初春时

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Chapter 1: Introduction

1.1 Background

1.1.1 Pest analysis of eldercare in China

Since the end of the last century, China has been gradually aging and the proportion of the elderly population has been growing. From 2000 until now, the number of elderly people aged 60 and above surpassing 200 million, and the proportion exceeds 17.9%. According to the trend analysis of current data, the elderly population will continue to increase for a long time in China, and the ensuing aging problem will become more and more prominent. "Elder care industry" has become a buzzword. From 2013, China and its attached local government constantly introduced about one hundred of eldercare policies. The government expected to promote the reasonable, but rapid development of elder care industry with these policies, and to strengthen the construction of old-age security and service system. In that situation, China, with a population of 1.4 billion, has the ability to cope with the phenomenon of aging society actively, and thus achieving high quality development of Chinese economy, as well as safeguarding social stability, prosperity and rapid development of China. In the following sections, the PEST analysis model is applied to present the macro elder care environment of China from four aspects: Political, Economic, Social, and Technology.

1.1.1.1 Political

In terms of political factors, China's elderly care service is jointly promoted by government leadership and the participation of social groups in an organic unity. Facing the increasingly aging demographic structure, the aging issue has risen to one of the key national strategies and issues that need to be solved, and relevant policies on elderly care services have been introduced one after another.

In September 2013, the state council of China issued document no. 35 [2013]. Some opinions of the state council on accelerating the development of elderly care services (State Council, 2013) , which clearly state that, actively dealing with ageing population problem, speeding up the development of elderly care services, and continuously meeting the increasing demand of the elderly, are the urgent task to build a prosperous society in all respects. Also, these measures can guarantee the rights and interests of the elderly, help them live better,

motivate them to consume, and further promote sustainable and healthy development of elder care industry. This regulation is regarded by the majority of elder care practitioners as the signal that the country attaches great importance to the aging of the population and tried to transfer "eldercare business" to "eldercare industry". This year is also known as "the first year of eldercare industry" in China.

One year later, the ministry of commerce issued the Guidance on promoting the development of the elderly service industry (Ministry of Commerce, 2014). In 2015, the ministry of civil affairs of the People's Republic of China issued the Notice on further improving the development of old-age service industry (Ministry of Civil Affairs, 2015). In 2016, the national health and family planning commission issued the Notice on printing and distributing the division of the plan for key tasks of combining medical service and eldercare service (The National Health and Family Planning Commission, 2016). At the same time, other relevant ministries and municipalities have also issued relevant documents or regulations. For instance, the Shanghai municipal civil affairs bureau issued the Notice on clarifying matters related to the provision of long-term care insurance services by eldercare institutions (Shanghai Civil Affairs Bureau, 2017). In 2017, the ministry of industry and information technology and other three ministries of China issued the Notice on the development action plan for intelligent health eldercare industry (2017-2020) (Ministry of Civil Affairs, 2017). In the same year, the state council issued the Notice on printing and distributing the 13th five-year plan for the development of national undertakings for the elderly and the construction of the eldercare system (State Council, 2017b). In 2018, National Health Commission of the People's Republic of China issued the Notice on issuing guidelines on promoting the reform and development of the nursing service industry (National Health Commission, 2018). It is determined that home-based health care is the most suitable way of the elderly in China at present. And on this basis, the government proposed to strengthen community care system to match the joint model of home-based eldercare.

In the five years from 2014 to 2018, China has clearly defined the overall plan related to eldercare work, that is, the "9073" pattern of eldercare in China, which means that 90% of the elderly choose to be cared at home, 7% in the community, and 3% choose to age in an institution (Nursing homes or hospitals). The basic position of home-based care services in China's elderly service system is clearly defined. It also calls for continuous improvement of the quality of elderly services, promotion of organic integration of medical care and elderly care, advance preventive management of chronic diseases in old age, and attempts to implement livelihood initiatives such as having state-guaranteed long-term care insurance to partially cover elderly

care costs.

2019 is a blockbuster year for the introduction of various eldercare policies. The intensity of the introduction of various policies has increased. In the annual report of the national government, there are 16 items related to eldercare that have never been mentioned before. In March, the general office of the state council issued Opinions on promoting elderly care services (General Office of the State Council, 2019). In June, the state council issued Opinions on the action implementation of healthy China (State Council, 2019a). In October, Guidelines on the establishment and improvement of the health service system for the elderly were issued by eight ministries and commissions, including National Health Commission of the People's Republic of China (Department of Ageing and Health, 2019). In November, the central committee of the communist party of China and the state council issued a medium-and-long-term plan for actively coping with the aging population problem (State Council, 2019b). As many as four documents have been issued within one year, and various national policies have been introduced one after another, which showed the aggressiveness and seriousness of China in dealing with the aging society problem.

In 2021, government of China piloted long-term care insurance in 49 cities, covering nearly 120 million seniors.

In 2022, the State Council issued the 14th Five-Year Plan for the Development of the National Aging Cause and Senior Care Service System (State Council, 2022), which clearly proposed to actively face the aging problem in China. In the general requirements, it was proposed to improve the elderly system, coordinated the joint development of the eldercare business and the eldercare industry, made plans by considering the overall situation, strengthened the construction of inclusive elderly care services, and formed a joint model of home-based, community-based and institutional eldercare.

1.1.1.2 Economic

From the perspective of economic factors, the orientation of the eldercare industry is closely related to infrastructure construction of civil affairs in China, the level of national economic development and the elderly's payment capacity for service products. In 2020, China's GDP exceeded 100 trillion yuan. Against the background of high economic growth, with increasing national income level and sufficient financial support in the market, sustainable capital is an important guarantee for the construction of the home-based eldercare model to develop in a sustainable and healthy way. From an economic view, the home-based eldercare model is cheaper, the elderly can live in their original place of residence. More manpower, financial, and

material resources can be saved by this eldercare model. And it reduces the burden on the government.

In addition to the traditional medical consumption, Premier Li Keqiang's government work report in 2017 clearly pointed out that China's senior care market is huge, and both traditional and new types of senior care are currently needed in China (State Council, 2017a). Now, community care, home-based care, and medical institutional care all adopted the combination model of medical care and elderly care. When medical care and elderly care are combined, economic benefits can be generated, thus creating more jobs and adding potential growth points for economic development. In the eldercare market, real estate companies and insurance companies are the main forces of investment, and they have a large amount of capital, which is the necessary resource for the development of this industry. The investment of these funds will help the development and improvement of the eldercare industry to a large extent. However, this situation is quite ideal, more specific policies and measures should be taken to form a joint force of the eldercare industry and other industries, and jointly helping the development of eldercare services in China.

Take Shanghai, a city with a huge amount of aging population, as an example. Shanghai is one of China's four municipalities directly under the central government, with a high level of economic development. This city also has a large proportion of elderly people, which may put a lot of pressure on its development. In 2018, the average pension for retired employees of Shanghai enterprises was about 3,700 RMB per month, and the pension for some elderly reached about 6,000-8,000 RMB. However, the elderly usually stores their money as savings, without creating the currency circulation. Assuming that this portion of the money is spent, it would create a large market.

Furthermore, Shanghai took the lead in implementing a long-term care insurance system in 2016, formulating specific implementation details, establishing a social insurance system, providing basic living care and basic medical care services for long-term disabled elders through various means such as social assistance, and continuing to explore a unified service standard and evaluation system. From this perspective, Shanghai itself has a large aged population, and with the government's long-term care insurance system to pay for services, then its market for eldercare services will continue to expand and is destined to have a lot of space for development.

1.1.1.3 Social

Since the 21st century, along with the aging of the population, China's newborn population is

also decreasing day by day, so that more Chinese families are not extended families of the previous three generations or more. Today, the elderly no longer lives with the young generation as they once did. They are more likely to live with their spouse only. To some extent, China's household size also reflects the changes in population structure. In just a few decades between 1974 and 2010, family size fell rapidly from an average of 5 to 3.1 persons per family, and the change was significant in terms of family composition. In the past, three-generation households were quite common in China. By 2010, three-generation households made up a small fraction of families. By 2020, the proportion of three-generation households declined continuously, and even the proportion of two-generation households also declined rapidly. In the contrast, the proportion of one-generation households is rising significantly in China. Such family size and composition are also changing the traditional concept of eldercare for the Chinese, from the 'family eldercare' (in which family members, mainly children, provide material support, life care and spiritual comfort for the elderly) to a mode such that a more elderly population will shift from informal care by family members to professional eldercare services, which mainly provided by full-time caregivers.

In addition, as the population ages, the problems such as physical function loss and dementia are becoming more and more serious. At present, China has about forty million old people need different forms of long-term care. However, only a small number of elderly people want to live in nursing homes. As the traditional concepts like "living with adult children is a successful aging" and "the eldercare is responsibility of adult children" is deeply rooted in China, the choice of home-based eldercare has become inevitable. It combines the advantages of family care and institutional care, while also replacing family members with professional caregivers, which is more in line with the current conditions of China and the trend of social endowment.

1.1.1.4 Technological

In order to improve the quality of home-based eldercare services, this industry should develop unified service standards for service personnel at the early stage of development and carry out systematic business training so that all personnel can master professional and effective service skills. It is suggested that the government should increase the industry entry threshold for senior care service personnel and actively organize professional caregivers to participate in daily service cultivation and training. It will lay the foundation for future medical and nursing services to move towards a broader commercial market.

In particular, the prerequisite for the development of the construction of the home-based health care service model is to have specialized technology as a guarantee. Whether it is medical

and nursing professional service technology, or information technology such as the internet, cloud computing, internet of things and artificial intelligence technology. They are available to strengthen the effectiveness of the service in conjunction with the actual service scenario. Especially in home-based health care services, the scenarios might be even more complicated. Information technology and artificial intelligence technology are supposed to be the key factors to make the elderly get better services in the home scenario and improve the delivery quality. At the same time, the development of science and technology such as motion capture technology and voice recognition make the use of intelligent hardware more convenient and comfortable, improving the quality of services while saving labor costs. With the information era coming, "intelligent hardware", "telemedicine services", "big data platform", "artificial intelligence (AI) ", "Internet of Things (IoT) service terminal" and other technical terms have also started to be associated with elderly care services. At present, there are still some problems such as insufficient personnel, broken information flow and difficulty in monitoring the service process in the eldercare market. The emergence of these technologies is the key element to improve the quality of such services. And these technologies also solve the human resource management issues effectively that the traditional service organizations cannot address, even some organizations are not willing to address because of the huge cost.

With the development of "Internet + Nursing Service" technology, intelligent senior care products have emerged, and various regions in China have been exploring and practicing in the field of intelligent senior care products in response to the call. Relying on the Internet, intelligent senior care products provide technology products for the elderly in different scenarios, such as at home, in institutions or in the community, to meet different needs of the elderly. However, the functions of the intelligent senior care products in use are relatively limited, mainly providing services such as remote monitoring, health screening and elderly entertainments. These products only provide single function and cannot meet the complicated needs of the elderly, especially the comprehensive health care needs at home.

1.1.2 The aging trend of Chinese society

At present, China's fertility rate is getting lower and lower because of the rising education level and the pressure of increasing living cost, while the average life expectancy of Chinese people is increasing rapidly. Above all lead to the more and more serious problem of aging in China. At the beginning of the century, China's elderly population accounted for only 10%, but after decades, China's elderly population now accounts for more than 17%. The aging problem is very serious now. Further, it is expected to reach its peak by the middle of this century, and the

aging problem will be very prominent by then (Additional figure 1)

The potential of the eldercare industry is highly correlated with the rate of aging. The faster the population ages, the faster the eldercare industry develops.

The aging population of China is increasing in intensity. Statistics in 2019 showed that our country has 240 million people over the age of 60, accounting for 17.9 percent of the total population. However, the development of China is not balanced, the degree of aging population varies from place to place with significant differences.

In December 2017, there were more than 4.83 million people over 60 years old in Shanghai, an increase of 250,000 in one year, and the proportion of the elderly population reached 33%, indicating that one in three persons in Shanghai is over 60 years old. According to this prediction, the proportion of elderly will rise by 5% on average every decade in the future. And compared with Japan, Shanghai's proportion of aging population is nearly double that of Japan, which means that Shanghai not only has the highest proportion of aging population in China but also is one of the cities with the highest proportion of aging population in the world.

1.1.3 Home-based care is an inevitable choice for China to cope with aging

In 2011, the State Council issued two documents within two months on how to improve senior care services, which were the 12th Five-Year Plan for the Development of China's Aging Industry (State Council, 2011) and the Social Senior Care Service System Construction Plan (2011-2015) (General Office of the State Council, 2011). Both documents presented the function descriptions of home-based eldercare and pointed out that it was the first choice of eldercare in current society.

In 2013, the document Several Opinions of the State Council on Accelerating the Development of the Elderly Service Industry clearly proposed that the elderly care system in each region must be improved in the next seven years to form a three-part joint elderly care model with family elderly care as the basis, community support and social institutions as a supplement.

In December 2017, the state council issued the 13th five-year plan for the development of national undertakings for the elderly and the construction of the old-age care system (2016-2020). In chapter four of above policy, it puts forward the foundation of home care service. On the one hand, it claimed to strengthen family policy support system for the elderly, required adult children to perform the corresponding obligations and responsibilities. And it provided personalized services based on the precise classification for the elderly, thus it can continuously improve service quality and satisfaction. On the other hand, it asked for the improvement of

home-based elderly care system by integrating the information platform, call services and emergency rescue service. Eventually forming an integrated of home-based eldercare model.

With the analysis for various aspects information, it has provided relevant experience for the development of China's elderly service industry. In China's national conditions, the home-based elderly care model is the most suitable way for Chinese elders at present. The elderly benefit from the joy of being at home, while reducing family expenses and accompanying their children, which is a way of aging in line with the development of aging in China. At the same time, many large and medium-sized cities in China have been exploring with the home-based elder care mode. Therefore, the construction of a home-based care service mode is the development trend and inevitable choice of China's elderly care mode.

1.2 Research questions

According to the macro environment analysis of eldercare services in China based on the PEST model, it is not difficult to find that it has become a social consensus to help families solve eldercare problems by developing home-based health care services, which is also the majority choice of tens of millions of ordinary families in China.

Due to traditional beliefs in China and the current economic situation of the elderly, most of elderly people choose to receive home-based elderly care services, which can also better save medical care resources. So, the community and home-based care is playing a more and more important role for the elderly in China. However, the problems of receiving health care services at home are as follows. First, the service scenario of home-based care is at home, which is not under the daily supervision of the management of the professional organization. In addition, the service provider can only provide services to one client at a time, and the service is performed alone, so the organizations cannot fully control or directly audit the quality of all services. Moreover, the clients receiving the services are elderly people. It is difficult for them to accurately judge whether the services they receive are professional. Also, it is difficult to control and get objective and true feedback on the service process management and evaluation, regarding aspects such as service length, service quality, overall quality, risk prevention and control, and customer evaluation. Consequently, it is difficult to guarantee service quality and safety control. Moreover, it is difficult to effectively improve the satisfaction of customers as well as control the service risks and proof of service disputes of the operating organizations.

Based on above analysis, this research takes Shanghai, the most serious aging city in China, as an example to study the following four questions.

1.2.1 Application of ai, IoT, and informatization systems into home-based health care services

With the in-depth development of the "Internet + eldercare" mode, various kinds of intelligent home care products have emerged, and all regions of the country have responded to the call to conduct in-depth exploration and practice in the field of intelligent elderly care. Using of Internet, cloud computing, IoT, and other service systems and platforms based on communities, families, and institutions, and the integration of public and social service resources to meet the intelligent elderly care mode in the areas of life care, health management, medical care, leisure, and entertainment, can save costs and improve efficiency. However, the functions of intelligent-based elderly care products used in China are relatively limited, mainly providing services such as remote monitoring, health testing, and entertainment activities, with superficial service content and single product form, which cannot well meet the comprehensive needs of the elderly (Liao, 2019). But we believe that applying intelligent technology in the proper way in home-based health care services would help us to address some issues which cannot be addressed in traditional ways. So, we hope to consider the application of AI, IoT, information technology systems, and other technical methods to the process management assumptions in-depth, and to explore the practical dimension of landing, replicable and effective ways to carry out the process of home-based health care services. From the technical point of view, this study expects to use a variety of advanced technical means, and algorithm models, combining software and company-based hardware equipment. An integral intelligent solution will be formed by exploring the design concept, product logic, business path, and other aspects as well as the service organization managers, service providers, service recipients, industry regulators, service field, and environment.

So, the first research question is how to apply AI, IoT, informatization and other "intelligent" aids to improve the quality of process management based on the operation management problem of difficult supervision of home-based health care services?

1.2.2 Integration of service concepts in China and home care service quality

In the process of developing community-and-home-based health care services, China should not only refer to the successful modes of long-term care services in the West, but also incorporate and take China's unique traditional culture, payment philosophy, and policy system into consideration. In contrast to the long-term care services in the United States, to a large extent, China took a service mode dominated by professional care institutions at the early stage

of the establishment of the long-term care system. Now, with the influence of traditional religious culture, economic differences, service philosophy, resource distribution, and other factors, it began to gradually extend and develop to the community and family. At the same time, based on the development of the form of payment for care services, the form of care for the elderly has also formed a more obvious boundary between formal care and informal care, and finally formed a diversified elderly care service modes (Y. N. Liu & He, 2015). The development of long-term care services in China is still in its initial stage, and the construction of a suitable long-term care service modes for China is an important issue and challenge for all parties. Drawing on foreign experiences in the long-term care system, this study focuses on the construction of a home-based health care service mode with Chinese characteristics, in which researchers also regard traditional culture, payment methods, and policy systems as the core aspects of home-based health care. On the one hand, the Chinese concept of "affectionate" old-age care in China is mainly reflected in the Chinese way of paying for old-age care. eldercare services are usually paid for by elderly's adult children, and there is a clear separation between those who use the services and those who pay for them. For the time being, the ethics that support the adult children paying for the elderly are derived from the traditional culture of "filial piety". On the other hand, with the development of urbanization and marketization, the traditional filial culture has been gradually eroded by individualism, hedonism, and consumerism (Xiong & Zhang, 2012). In order to ensure that the elderly can obtain continuous and stable professional health care services, the protection and supplementation of government and commercial insurance companies have become an important and indispensable part. In social insurance and commercial insurance, the caregivers and the insured are the most direct contacts, and the quality of the service and the professionalism of the service providers directly affect the evaluation of the whole eldercare insurance system (Meng, 2015). Therefore, how to take into account the concerns of the three parties (Government, insurance and customers) and integrate the special service concept of Chinese characteristics to create a quality home-based health care service process supervision system is at the core and focus of this study.

The second research question is how to integrate the concept of service care into the quality improvement management of home-based health care services in accordance with China's national conditions?

1.2.3 Standardization in home-based health care services

The Chinese government has provided strong support for home-based health care services at the policy level. However, looking at the current situation of the elderly care industry, it is easy

to find that the home-based health care service in China is still facing a big development dilemma. From the analysis of the service personnel, it can be found that the current composition of the employees providing home-based health care services is concentrated in the "4050" (with age 40 to 50) laid-off workers and migrant workers, which has the status of low education level and high mobility. In addition, these people have not received systematic training from professional colleges, but only received short-term vocational skills training to obtain the corresponding qualification certificate before they started to provide services, thus resulting in the low professional quality and indifferent legal consciousness. From the analysis of the service process, it can be found that the operation mode of home-based health care service varies from place to place. There are many different operating entities, and the policy documents for home-based health care service issued by local governments are all guiding levels, which do not form a unified management standard from national and local levels, leading to the existence of many service modes and service evaluation dimensions of home-based health care service and that increases the difficulty of service quality control with standards.

his study expects to establish the standardization of home-based health care services by sorting out its services and through various dimensions such as people, objects, and products. It focuses on designing and presenting the service blueprint, reengineering the service process by using "contact point" management and combining the standardized service process with an intelligent operation system. The service evaluation and service report will be generated through an intelligent supervision system, while continuous optimization will be carried out. In this way, we will provide customers with high-quality home health care services that exceed their expectations.

The third research question is how to integrate the standardized service process into the process management operation system construction to realize the process management improvement of home-based health care service?

1.2.4 Collaboration of organization, staff, customers and intelligent systems

With the development of information technology and the internet, there are different research perspectives on intelligent elderly care. How to achieve a combination of intelligent equipment and health care service system, how to maximize the utility of intelligent tools, and how to explore a runnable and optimized intelligent health care service path are the areas that this study tries to explore and make the breakthrough. Especially in the organizational level, how to achieve the coordination of front, middle and back three platforms. The process of creating value for customers is not a single action of one or two departments in the organization, but

through the operation of the overall system, to achieve mutual cooperation, mutual promotion, mutual cooperation can output high-quality services.

In this study, the goal is to explore the scientific operation and management mechanism between different subjects and resources, build a scientific evaluation system for the quality control of service, and find the pathway to achieve quality and efficiency improvement of the intelligent equipment. The standardized service process is used to output the "language" that can be recognized by the intelligent equipment. Through the establishment of the organization's internal incentive mechanism, we increase the concept of inculcation and technical training for service personnel to enhance the willingness of service personnel to use the equipment, so that service personnel take the initiative to generate operational collaboration with the intelligent products. By collecting feedback from users and service recipients, we can continuously optimize and upgrade the intelligent tools. In the process of realizing the collaboration between IoT hardware equipment and personnel, we take into full consideration the actual situation and consider the establishment of mutual collaboration among government, enterprises, elders and families, as well as the collaboration of resources between intelligent technology and health services.

The fourth research question is how to effectively improve the quality of home-based health care services in an intelligent scenario through the collaboration of organization, staff, customers and systems?

1.3 Research framework

Based on the sample analysis of the current situation of home-based health care service in Shanghai, this research focuses on the intelligent process management and operation strategy of Chinese home-based health care service. There are seven chapters in this work, as follows:

Chapter two: Literature Review

This chapter mainly reviews the research on process management theory, ERG theory, GAP model, and SERVQUAL quality evaluation model, SPO service quality evaluation theory, and uses home-based elderly care, process management, intelligent elderly care, long-term care insurance and other aspects as keywords to search and learn the latest research on relevant aspects domestically and overseas. Through research and analysis, it determines the theoretical framework and research methods of this study, as well as the current development trend of similar research. These theories and cases will guide and support the strategies to solve the problems at the later part of this research.

Chapter three: Design and Establishment of the Process Management Indicator System

This chapter first constructs the theoretical framework of this study, and then using SPO theory as a foundation, combined with ethics, quality management, operation management, and other theories to propose the overall idea of building a home-based health care service system. Through the results of literature research, the current status of home-based health care services in China is analyzed with the sample of Shanghai, and an evaluation system of indicators of the operating system suitable for home scenario is proposed. The research hypothesis is proposed from the perspective of three evaluation indicators: structure, process and outcome, to clarify the key perspective of the operating system. Through the collection of primary and secondary data and various ways such as expert interviews and one-on-one interviews and focus groups, exploratory research is conducted on the operational indicators of home-based health care services to sort out the indicators corresponding to the indicator system to provide further ideas for the research hypotheses.

Chapter four: Questionnaire Survey and Indicators Verification

This chapter introduces the data collection methods required for the study. The researcher develops the perceived service quality questionnaire and the expected service quality questionnaire based on the SERVQUAL model to investigate what do customers mainly concern about in service process. The identification of the gaps between the customers' perceived versus expected service quality is a central point of this study, since these gaps can guide the intelligent system of home-based health care in the future. At present, the findings from questionnaires are important for us to design an operational intervention system and take measures to improve the services.

Chapter five: Operation Strategy and Implementation Effect Evaluation

This chapter presents how to apply the solution to the operating system of home-based health care services in actual circumstances. In order to evaluate the effect of the solution, this thesis adopts the SERVQUAL model, using evaluation data from two groups of participants: customers and employees. Meanwhile, the implementation effect of the overall operating system is expected to be tested many times. The author took every 12 months as a cycle for data collection to verify the effectiveness and stability of the operation of the new operating system and continued to explore improvement strategies and methods.

Chapter six: Operation Strategy of Process Management in Home Health Care Service

Proposing the strategy for the process management and operation of Chinese characteristics intelligent home-based health care services and implementing it. It focuses on the process management of home-based health care service system, and carries out the overall construction

of the process management operation system from three aspects: "strategic level", "tactical level" and "operational level". This chapter is the core of this thesis, including the details of strategies and implementations.

Chapter seven: Conclusions

This chapter concludes the study, presenting the research contributions, the limitations of the study, and recommendations for further research.

Through the analysis of the operation mode of home-based health care services in Shanghai, China, this study investigates the core strategies of process management and operation of Chinese home-based healthcare services, with a view to controlling the service quality and creating service contact points, which can effectively improve the service satisfaction and NPS value of customers, thus bringing better economic and social benefits to the enterprise and providing quality service that exceeds expectations for elderly and their families. The specific research framework is as follows, seen in Figure 1.1.
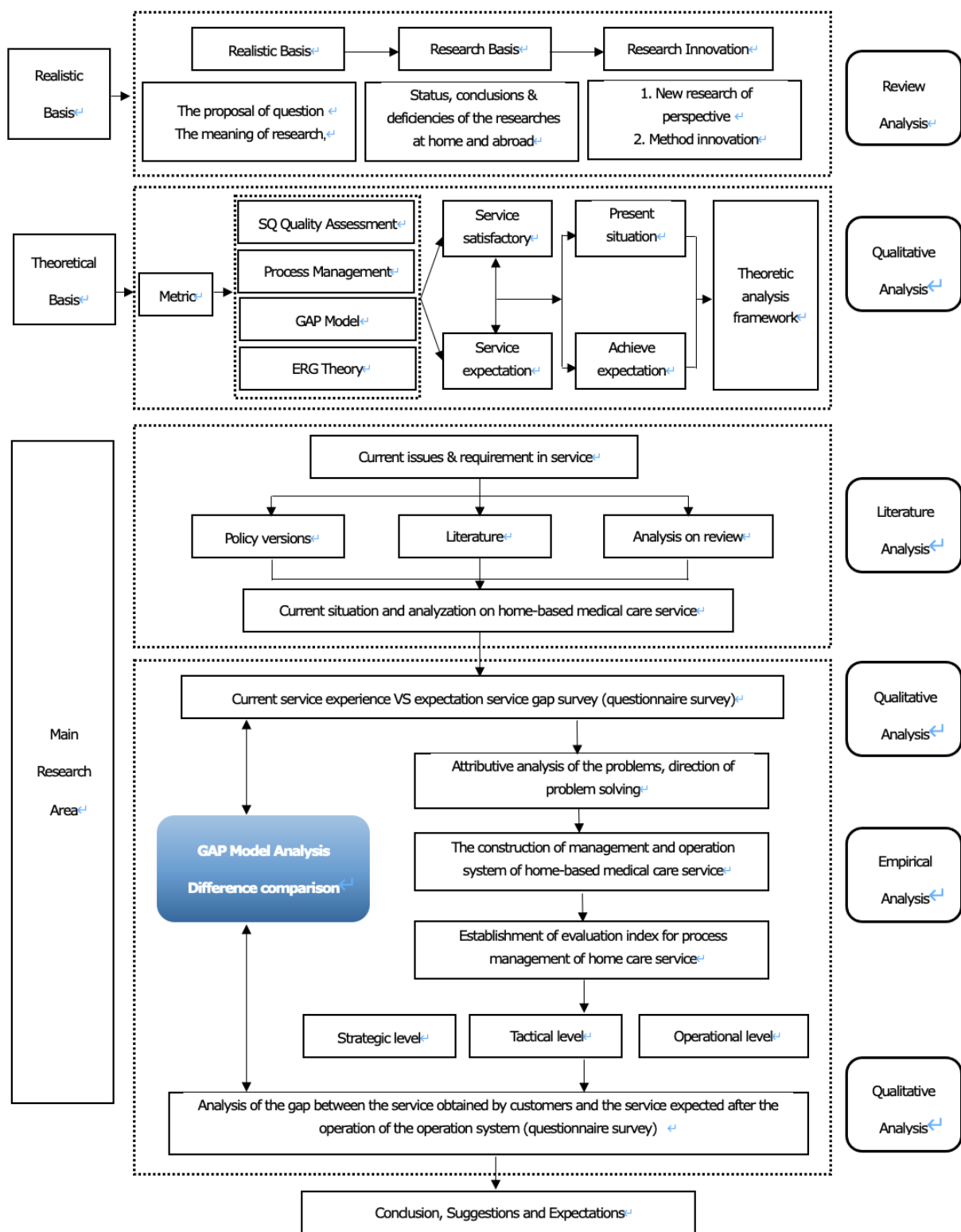
Figure 1.1 Research framework

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Chapter 2: Literature Review

2.1 Theoretical framework

2.1.1 Process management theory

2.1.1.1 Theoretical content

The International Standardization Organization ISO 9000:2000 defines "process" as "a set of interrelated or interacting activities that transform inputs into outputs", and process management refers to the use of a set of practical methods, techniques and tools to plan, control, and improve the effectiveness, efficiency, and adaptability of processes, including process planning, process implementation, process monitoring (inspection) and process improvement (disposal) (National Standardization Management Committee, 2009). The real purpose of process management is to provide better and faster service to customers. Generally speaking, the starting point of process management is the customer, and the endpoint is also the customer. However, in practice, we often ignore the customer. Therefore, the process management in a strict sense should be customer-centered. The service object and the purpose of service should be clear and everyone should take the customer's need and the result as the goal. The ultimate goal of process management is to optimize work efficiency, improve staff professionalism and achieve management replication through refined management.

2.1.1.2 Theory application and evaluation

This study focuses on process management. In home-based health care services, process management has always been a difficult point of supervision, while the process of service directly affects the perceptibility of customers and directly influences their evaluation of service quality. In this study, the author puts the theory of process management into practice, and by sorting out the process of home-based health care service, it is clear that the difficult point in the service process is the scene restoration of the home environment. Therefore, the author tries to optimize the service process by using intelligent supervision and management tools. The disassembled service process is standardized and designed, combining the standardized service with intelligent tools, and identifying the service characteristics to solve this difficulty. Eventually, the purpose of service process management and optimization is achieved.

2.1.2 Hierarchy of needs theory

2.1.2.1 Theoretical content

Abraham Maslow, a famous psychologist, first proposed the hierarchy of needs theory, which consists of five basic elements: physiological needs, security needs, social needs, respect needs and self-actualization needs. He believed that human needs are hierarchical and different levels of needs have an impact on human behavior. Meeting different levels of needs is one of the most important factors in human behavioral activities. At the same time, he explained the relationship between individual needs and motivational functions. The motivational function of needs comes from the unrealized needs of human beings. When the lower level of needs is satisfied, it decreases the motivation of the person, and the higher needs become the main factor of motivation (L. Y. Zhang & Li, 2019). The needs of the majority of a country's population depend on social factors such as the level of economic development, the level of education, and the level of technological development of the society. Among the different levels of needs, the needs can be categorized into basic needs and developmental needs, the so-called basic needs are commonly referred to as "survival" needs. Basic needs include physiological needs and security needs, which are based on the basic biological attributes of human beings, such as food, water and air. Developmental needs are the emotional needs that develop on the basis of the basic needs, such as love, respect, and self-worth realization. The hierarchy of needs theory states that "only when the basic needs are satisfied, the developmental needs arise in sequence."

2.1.2.2 Theory application and evaluation

In this study, service product design will be carried out based on the hierarchy of needs theory. The content of eldercare service products can be divided into basic demand service and developmental demand service from the need level. Basic services refer to dining services and medical care services that meet people's physiological and safety needs. The development demand services are high-level, including the culture entertainment service, the education service. With the improvement of the economic foundation and customers' own quality, the needs of eldercare become more and more diverse. At the present stage, basic social contradictions have undergone fundamental changes, the basic eldercare services can meet elderly's essential needs, and now they expect higher level service standards and more personalized services. At the same time, the service requirements of the elderly change from the pursuit of safety and health of service content to the attitude of service providers, the efficiency and the form of service. People with different living standards and qualities have

different requirements for the service content, and they also have different evaluation criteria for the elderly care service (Tian, 2018).

2.1.3 Customer orientation theory

2.1.3.1 Theoretical content

Customer orientation means that the organization should take the customer as the center, start from the customer's perspective and pursue customer satisfaction as the ultimate goal when carrying out organizational activities and policies, and emphasize that the organization should assume certain social responsibilities and make contributions to social development. The core of customer orientation theory is that we should pay attention to consumer surveys and analysis of consumption ability, consumption preferences, consumption behavior, and dynamic adjustment of product content to fit customers' needs in the operating process. The beneficial aspect of customer orientation is that it can promote service providers to pay more attention to the customer experience of the people being served. In the rapid development of community-and-home-based health care services, the elderly in the community are the main beneficiaries and the users. In order to improve the efficiency of their business and enhance the satisfaction of community elders with the home-based health care services, service providers must insist on being user-centered, i.e., they must be aware of the reactions of elders to their services, strengthen communication with the elders and their families, and grasp the problems and root causes of the provided service management norms and processes, so as to adopt effective measures and methods to intervene and improve (Qiu, 2016).

2.1.3.2 Theory application and evaluation

Under the guidance of customer-oriented theory, the author believes that the "customers" of home-based elderly care services in China should not only stay in the perspective of the elderly but should fully consider the service experience and feelings of the elderly's adult children. Typically, they pay for the services. Therefore, in this thesis, combined with the present situation of home-based care service demand in China, multiple aspects such as service providers for home-based care, demands on home-based care service content, and payment characteristics will be all considered. By acknowledging the level of service satisfaction of the elders and their adult children, we will manage the quality of home-based care service sufficiently and comprehensively. At the same time, with the intelligent management tools and comprehensive service system, management on home-based service quality might be improved.

2.1.4 Customer value theory

2.1.4.1 Theoretical content

In 1954, Peter Drucker, a famous management scientist, put forward the Customer Value Theory. He believed that the advancement of the industrial revolution and the development of science and technology have greatly enriched the material wealth of society. The economic market supply exceeds demand, and demand determines supply. Customer demand determines the type of product and the quantity produced. It is where the customer value theory comes in Woodruff (1997) and Weingand (1995)put forward customer value hierarchy model on the basis of this. It explained the gaining of customer satisfaction and the cause of the high or low customer satisfaction. It divided customers into different levels according to the relationship between the properties of the products, the result and the target. With comparisons between each level of expected value and the gained value, the customers get satisfaction in the different extents. The level of customer satisfaction depends mainly on the value obtained. The higher the value of the service obtained by the customer, the higher his perceived satisfaction; while the lower the value obtained, the lower the perceived satisfaction. Therefore, customers are sensitive to price, quality and other requirements. Customer values include basic values, expected values, need values and unexpected values. Different customer values represent different levels of customer satisfaction. Based on this, Jeanke et al. (2001) further elaborated the Customer Value Gap Model, and they argue that companies can reduce the gap between customer expected value and customer perceived value, so as to provide customers with real value need satisfaction (Toussaint, 2016).

2.1.4.2 Theory application and evaluation

Based on the Customer Value Theory, this study analyzed the receptive evaluation of service objects and family members on home-based care services, so as to understand the gap between the perceived service and expected service of the elders and family members when receiving the service and take this as one of the quality indicators of home-based health care service management. However, due to the significant difference between service objects and service providers in service cognition and understanding, the gap between expected service and actual service is inevitable. This thesis tries to overcome this deficiency to some extent by studying from different perspectives and constructing the management system of home-based care service.

2.1.5 Employee assistance program (EAP) theory

2.1.5.1 Theoretical content

In 1974, James Wrich published the Employee Assistance Program, which was used to describe assistance planning at the workplace. It applied psychology to the company to provide business management and personal psychological help to managers and employees. There is no academic consensus on the concept of EAP. Walsh (C. X. He et al., 2009) was the first to explain the concept of EAP. In his view, EAP is the use of organizational policies and procedures to identify or reflect personal or emotional problems that directly or indirectly affect employee productivity. Since then, EAP theory has gone through three stages: germination, formation, and maturity. At present, the EAP theory has been widely used in corporate employee management, and it is regarded as an important tool to solve various psychological and behavioral problems of employees, work efficiency, and reduce operational costs.

2.1.5.2 Theory application and evaluation

In China, due to the lack of corresponding theoretical guidance, EAP research is mainly concentrated in the field of consulting. With the change of socio-economic and cultural environment and the development of information technology, employee assistance programs are gradually becoming a new management model. In this thesis, based on EAP theory, the author intervenes the ability, quality and psychological status of service practitioners in home-based care services, so as to improve the overall quality of home-based care service practitioners and achieve the ultimate goal. That is increasing customer perception and improving service quality. At the same time, through the investigation of home-based care service practitioners, the organization could understand the difficulties and needs of such people in their work process, and then provide long-term and effective support for the practitioners, and help them to work easier.

2.1.6 Servqual model

2.1.6.1 Model content

SERVQUAL is an abbreviation of "Service Quality". It is a service quality assessment system developed by American marketing experts Pena et al. (2013) in the late 1980s on the basis of total quality management theory. The core of this theory is the "service quality gap model", which means that service quality depends on the gap between the level of (Wisniewski, 2001)service perceived by the user and the level of service expected by the user (hence the term

"expectation-perception" model). The system uses customer satisfaction as an important criterion for measuring the service quality. A consumer survey found that one of the most important factors affecting service quality was the level of customer satisfaction. Therefore, it is particularly important to establish a service model oriented to customer satisfaction. User expectations are a prerequisite for implementing good services, and the key point of providing good services is to exceed user expectations. The model is SERVQUAL Score (Q) = Actual Perception Score (P) - Expectation Score (E). According to the positive and negative values of Q and its scale, the service companies can judge their own service quality level: if Q value is positive, it indicates that the service quality is higher than the previous level or higher than the average level; if Q value is negative, it indicates that the service provided does not meet the customer's requirements and must be improved as soon as possible; if Q value is close to zero, it indicates that the company provides normal services and fully meets the customer's needs. By comparing the specific scores of each indicator, enterprises can find out why they have such service quality problems, i.e., what the problems are, so that they can make progress and improve their service quality.

SERVQUAL classifies service quality into five levels: tangibility, reliability, responsiveness, assurance, and empathy. Each of these levels is broken down into multiple questions. Users are asked to rate the expected, actual perceived and minimum acceptable values for each question through a questionnaire. Based on this, an Analytic Hierarchy Process (AHP) is used to determine the weighting coefficients of each influence factor. Finally, the final quality scores are obtained based on the inter-influence relationships among the factors. In this study, 22 specific factors are established to illustrate the service quality score based on questionnaire design. The service quality score is obtained by the questionnaire survey, customer rating and comprehensive calculation. Tangibility is a pleasant form of presentation. The service staff should be well-dressed, in harmony with the environment, have good professional ethics and quality, and treat people politely. The intelligent equipment and tools used are advanced enough, and the interactive interface is friendly. Reliability means that the service provider provides services that meet the needs of the elderly according to the service promises to the elderly. Responsiveness mainly refers to the efficiency of the service. When a customer makes a service request, the service must provide the corresponding service in the fastest possible time and be able to ensure that the service is provided on time. assurance means that the service provider repeatedly provides uniform and correct service results, and that the service staff has the expertise technology and skills focused on maximizing consumer rights and earning the trust of consumers. Empathy is the evaluation of the service provider's

emotional involvement. There is a positive correlation between service quality and service personnel's emotional experience; the more positive emotions of service personnel the higher the service quality; otherwise, the opposite is true. Service personnel are warm and friendly, able to put themselves in the position of the service recipient to adjust the service plans according to the customer's requirements and characteristics, and do their best to meet the consumer's requirements (Wisniewski, 2001).

2.1.6.2 Theory application and evaluation

In this study, the SERVQUAL model was used to establish the evaluation index dimensions of the process management quality of home medical care service. In addition to the original five dimensions, combined with the actual business situation to explore the quality evaluation dimensions in line with the home-based health care industry, and provide an effective evaluation system for improving the actual business.

2.1.7 Perceived customer service quality model

2.1.7.1 Model content

Swedish service marketing expert Grnroos proposed the "Customer Perceived Service Quality Model" in 1982, which was shown in Figure 2.1 (Grnroos, 2012). He thought that the customer evaluation process of the quality of service was actually the comparison result of its actual feeling in the process of accepting service with its expectations before he accepts the service: if the actual feeling satisfies customer expectations, then the customer perceived quality is superior; if fails to meet customer expectations, even though the actual quality with objective standards is good, customer perceived quality is still not very good.
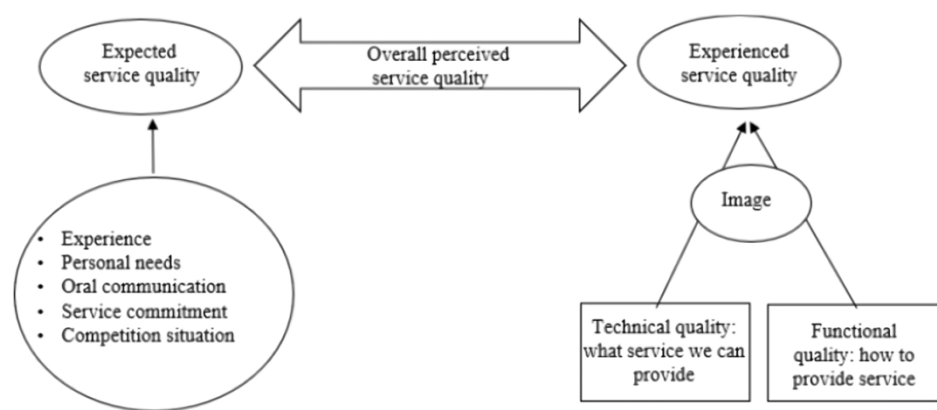
Figure 2.1 Model of perceived customer service quality

Source: X. Y. Liu et al. (2003)

The core of Grnroos's "Customer Perceived Service Quality Model" is that "quality of

service and product is evaluated by the customer". It is considered that customer-perceived service quality is the comparison between customers' expectation of service and perceived performance. If the actual service performance is greater than the service expectation, the customer's perceived service quality is good, and vice versa. Customer satisfaction with perceived service quality should be slightly higher than expected, or at least consistent with expected quality. It is not economical to pursue too high service quality, while low perceived quality will lead to customer dissatisfaction. Therefore, the main goal of service quality management is to pursue the best cost-effective customer perceived quality (Grnroos, 2012).

The main dimensions of the perceived customer service quality model include technical quality and functional quality, desired quality and experienced quality. Technical quality is related to the output of the service. It is the objective result obtained by the customer during the production of the service and at the end of the contact process between the buyer and the seller. Functional quality is related to the process of the service and is what the customer experiences and feels in the process of service production and through the contact between the buyer and the seller. The technical quality of the service indicates what the customer gets (WHAT), which is easy to assess objectively, while the functional quality indicates how the customer gets these service results (HOW), which is quite subjective and generally difficult to assess objectively. Desired quality is the level of service quality that customers imagine or expect in their minds. It is the result of a series of factors, including ① marketing campaigns, such as advertising, mailing, public relation, and sales promotion; ② customers' previous experience of receiving the same or similar services, as a quality benchmark, has an impact on customers' expectations; ③ the better the image of the company providing the service, the higher the customer's expectations of its services; ④ a customer's evaluation will be affected by other customers evaluations who have taken similar services; ⑤ the stronger and more urgent the customer's demand for the service, the lower the expectation of the service quality. The quality customer experience quality refers to the impression that customers get through the experience and evaluation of the technical and functional quality of the service in the process of receiving the service (Grnroos, 2012).

2.1.7.2 Theory application and evaluation

This theory provides a basis for enterprises to improve their service quality. This study will use this theory to guide enterprises to carry out service quality measurement. This study is mainly about the service, which has its essential characteristics. Professional services should focus on

both professional skills and service experience, so that consumers can get the best user experience. Home-based health care services provide standard services with professional skills such as specialized nursing, professional rehabilitation, and medical care, which will make customers perceive obvious therapeutic efficacy and body's recovery. Service experience means making customers get the smooth and considerate service feelings through service etiquette, service materials, and a well-designed service process. The combination of both factors would effectively improve customers' perception and thus make customers recognize the overall service quality.

2.1.8 Service quality gap model

2.1.8.1 Model content

The Service Quality Gap Model was proposed by American marketing experts Parasuraman et al. (1985), and is also known as the 5 GAP Model. The 5 GAP model was specifically used to analyze the root causes of quality problems,   which is shown in Figure 2.2.
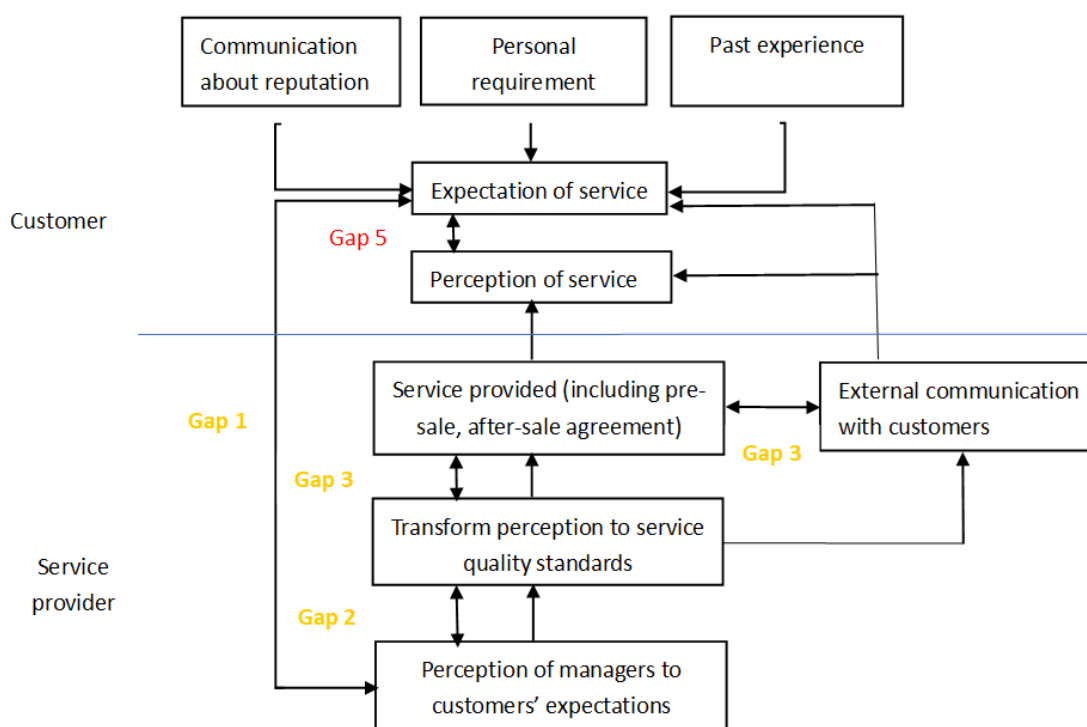
Figure 2.2 Service quality gap model

Source: X. M. Chen (2008)

Customer gap (Gap 5) is the gap between customer expectation and customer perceived service, which is the core of the gap model. To narrow the overall gap, we need to narrow the following four gaps: Gap 1—not knowing customers' expectations; Gap 2—not choosing the right service design and standard; Gap 3—fail to provide services according to standard; Gap

4—service delivery does not match external commitments. First, the model illustrates how quality of service is formed. The upper half of the model deals with customer-related phenomena. Expected service is a function of customers' actual experience, personal needs and word of mouth communication. In addition, it is also affected by the marketing communication activities of enterprises. The actual experienced service, known in the model as the perceived service, is the result of a series of internal decisions and internal activities. When a service transaction occurs, managers' understanding of customer expectations plays a guiding role in determining the service quality standards followed by the organization. Certainly, the service transaction and production process experienced by the customer is a quality factor related to the service production process, and the technical measures implemented in the production process are a quality factor related to the output of the service production. When analyzing and designing quality of service, this basic framework explains what steps must be considered to identify the root cause of the problem. There are five kinds of differences between elements, namely the so-called quality gap. The quality gap is caused by inconsistencies in quality management. The most significant gap is between the expected service and the perceived (actual experience) service gap (gap 5) (Pena et al., 2013).

2.1.8.2 Theory application and evaluation

In this study, the 5GAP model is used in the research framework to compare customer satisfaction before and after the use of effective intervention strategies, so that the implementation of operational intervention strategies can be continuously revised based on the gap factors in the four dimensions. And reviewing the analysis results can make the interventions gradually effective and useful.

2.1.9 Customer satisfaction index (CSI) model

2.1.9.1 Model content

The Customer Satisfaction Index, also known as CSI, was first established in Sweden in 1989. It is an indicator calculated by establishing a model based on customers' evaluation of the products and service quality of an enterprise (X. Y. Liu et al., 2003). It is an economic indicator to measure customer satisfaction. Based on the theoretical basis of CSI, more than 20 countries and regions such as Germany and Canada have successively established national or regional customer satisfaction indicator models (Fornell & Liu, 2006). Dr. Fornell in the United States summarized the results of theoretical research and proposed to form an econometric model of customer expectation, perception after purchase, purchase price and other factors, so as to put

forward the ACSI model in Figure 2.3.
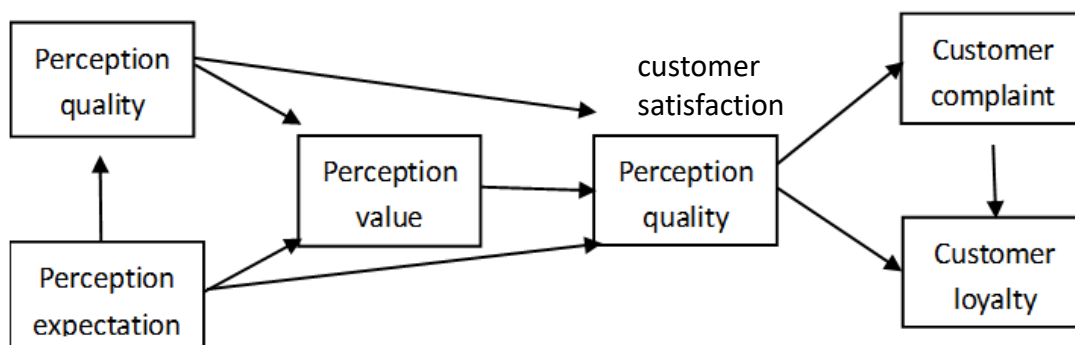
Figure 2.3 ACSI satisfaction index model

The model includes six variables, namely, perception quality, perception expectation, perception value, customer satisfaction, customer complaints and customer loyalty. Among them, perception quality, perception expectation, and perception value determine customer satisfaction, and customer satisfaction is the input variable of the system. Customer satisfaction, customer complaints and customer loyalty are the outcome variables that determine customer evaluation and feelings (X. Y. Liu et al., 2003).

2.1.9.2 Theory application and evaluation

In this study, the ACSI model is applied to the service concept and service reengineering. Adopting a service concept that is in line with consumers' cultural backgrounds would make them more able to perceive service differentiation and meet service expectations. At the same time, the service concept is presented in a more effective way in the service by establishing service touchpoints and reengineering the service process, so that customers can effectively feel the value of the service. Through the input of the three variables in the early stage, we expect to get customer satisfaction improvement and reduce user churn, so as to enhance customer stickiness, effectively obtain loyal customers and make them willing to make referrals and new user recommendations.

2.1.10 Structure-process-outcome (SPO) quality assessment theory

2.1.10.1 Model content

In 1966, Avedis proposed that "structure", "process" and "outcome" are three important factors in the evaluation of health care services (Y. Han, 2017). He believed that "structure" mainly includes all the external hardware and software resources of the service organization, including human, material, financial, and organizational structure. These factors build the overall framework of the service. The evaluation of the structural dimensions often focuses on the

number of personnel, qualifications of service personnel, facilities and equipment. "Process" focuses more on the service itself, considering how and how to provide the service, mainly considering the organization, team management, skill training, performance assessment, service process content, service time. "Outcome" focuses more on the service itself, considering how and how to provide the service. In this study, different factors are considered, such as the satisfaction of service users' needs, the growth rate of service purchase recommendation, and the identification of service characteristics. Based on the fact that home-based health care services have the general attributes of the common medical and health services, so it is applicable and feasible to apply this theory to the quality evaluation of this kind of service.

2.1.10.2 Theory application and evaluation

This study applies the SPO quality assessment theory to the establishment of quality evaluation indicators for the process management of home-based health care services. It designs and manages the input structural resources from multiple aspects and dimensions from the front end, and controls the input resources in the process, which is the focus of this study. Finally, we use quantifiable and measurable business indicators in line with the actual business scenarios to evaluate the results and make them as the output for the continuous optimization and improvement, so as to continuously and effectively improve customer satisfaction.

2.2 Literature review and research status

There is a serious shortage of long-term care services (a kind of home-based health care service) for the elderly in China, the quality is not high, and the participation of private and non-governmental organizations is not. The development of home-based care services is in line with the needs of China's economic situation, social culture, customs and habits, and the concept of elderly care. The smooth implementation of home-based care services cannot rely on the effort of one party. At present, China's home-based care service is in its infancy and needs to meet the requirements of all parties better. There are different degrees of difficulties for the current industrial mode of home-based eldercare service. Therefore, some scholars did have conducted research on different dimensions. This study reviews these studies (shown in follows) in order to better understand the current gap in eldercare services of China. To clarify, the term "home-based health care" in following content is used to describe the care service for elderly at home. Because, home-based health care is the main service mode and also content of the eldercare, and it also reflects the elderly's core needs, that is health. So, the author would focus on home-

based health service in this thesis.

2.2.1 Research on home-based health care service

According to the CLASS (CLASS is a large-scale nationwide social survey project directed by the National Survey Research Center at Renmin University of China. By collecting social and economic data of the Chinese aging population regularly and systematically on both individual and community level, CLASS aims at understanding various problems and challenges that Chinese people would face during the aging process.) baseline survey data families are the main source of support for older adults, with about 80.1% of children providing financial support to their elderly parents, and families are the primary care resource for older adults in China (Peng, 2017). The proportion of older adults in China using community-based senior care services is very high, with 94.16% of older adults choosing to age at home or at their children's homes. While the proportion of seniors who choose to age in community daycare stations or nurseries is only 0.4%, and the proportion of seniors who choose to age in institutions is 3.73%. It can be found that under the influence of Chinese traditional culture, the majority of elderly people still choose to age at home (Peng, 2017). On the other hand, the number of children has a direct influence on the choice of place for elderly people to age, and the majority of elderly people want their children to provide care, 48.53% of them want their children to be the main caregiver.

2.2.1.1 Cultural aspects of eldercare

G. L. Li (2017) points out that parent-child-feedback is the essence of home-based aging, and the way of home-based eldercare does not entirely depend on the family structure of intimate co-habitation; the form of separation of children and parents does not change the home-based eldercare mode, and more means could be used to realize the content of parent-child-feedback such as economic support, life help, and emotional comfort. Our traditional family culture is the basic starting point for constructing a modern elderly care system with Chinese characteristics. The modern elderly care system, on the other hand, is a support system based on elderly care culture and various elderly care modes as a framework, combining economic security, physical and mental health and dignified living for the aging population. The construction of the elderly system is concerned with the support and protection of the family, government and society, and should also focus on the elderly industry, employment system, maternity policy, social insurance system and medical and health care environment and other related elements. Y. He (2016) points out that with the changes in China's demographic structure, family structure, and class structure, the traditional culture of old-age care is constantly

encountering conflicts and challenges. The traditional culture is dominated by the culture of filial piety, respect for the elderly, and family culture of old-age care. The culture of old-age care influences the mode and content of old-age care. The traditional culture of old-age care requires families to provide for the elderly financially or materially, and also breeds the family mode of eldercare, which emphasizes blood relations. But with the development of economy, more and more adult children leave their hometown for work, so their parents have to migrate with adult children, if they need to get family eldercare supports. It means the elderly have to accept the mode of eldercare in other areas (not in their hometown), which force the elderly to change. At the same time, the elderly has to bear more expensive expenses for this kind of eldercare, and it is difficult to maintain by their own income, so most of the time they have to rely on young people's labor remuneration. Therefore, there should be methods to dissolve the gap between the traditional elderly culture and the relocation of elderly. Yang and Sun (2010) also pointed out that the old-age culture in China was a kind of old-age culture based on the morality of blood, and the traditional old-age culture was receiving challenges with the influence of a series of factors such as economic development, demographic changes, changes in living environment, and changes in social mobility. It is very important to build an old-age culture with Chinese characteristics in response to the development of the times and changes in the old-age model. Wu and Wang (2014) points out that along with the transformation of China, the elderly care mode is also experiencing the conflict and integration of tradition and modernity. It is deeply influenced by culture, producing patterns, social culture and cultural ethics. The traditional Chinese elderly care mode takes "filial piety" as the cornerstone. Who will raise them, how to raise them, and how well they are raised are often the core content of the eldercare's assessment. However, with the influence of globalization and informatization, the eldercare payment in the family is gradually provided by the young people, and the dual satisfaction of economic investment and emotional needs, the establishment of eldercare security system has become an important dimension that the advanced eldercare mode must pay attention to.

Lin (2018) also raised the similar question. The family unit in contemporary society has indeed undergone great changes. More and more families have evolved from the previous three generations living together to the elderly and adult children living separately. This change is particularly evident in Asian countries because, in East Asian culture, a large cross-generational family living together is considered to be a manifestation of family happiness, so many families used to live in this way. But now, due to the change in the modern lifestyle and the mobility of work, young people are more and more inclined to leave their parents' area and live

independently, which leads to fewer and fewer intergenerational families existing. Lin believes that this living mode of elder parents and adult children living together is a very good environment so that adult children can assume the part of the responsibility of caring for their aged parents. Moreover, the behavior of adult children taking care of the elderly is more in line with the important value of traditional culture, that is "filial piety". Therefore, such a mode of providing eldercare services through family members is an important solution to the problem of the aging population in society. However, with the development of social economics, the popularization of the concept of independent life, and the continuous growth of the aging population. This intergenerational way of living together can be predicted to become less and less. Definitely, it would lead to challenges to the previous model of taking family members as the main caregivers for the elderly. Lin (2018) concluded that it is difficult for families in the modern social environment to assume all the nursing responsibilities of elderly family members as before, and they need the help of full-time and professional home care personnel. Peterson and Ralston (2017)also described similar dilemmas in the elderly care industry in their article. They even investigated the views of many countries on the elderly, because such views will also affect the development and implementation of home-based eldercare. Unexpectedly, some Asian countries have more negative views of the elderly than western countries. People living in these Asian countries may be more likely to regard the elderly as a burden. This research result undoubtedly intensifies the challenges faced by the home-based elderly care model with adult children as the main care resource. On the one hand, objectively speaking, it is very difficult for children to become the main caregivers of home-based elderly care when they do not live together with their elder parents. On the other hand, even subjectively, some young people regard the elderly as a burden, which also leads to their inability to take full care and nursing responsibility in home-based elderly care. The above two aspects show that the supply of home-based elderly care services needs the support of formal and professional caregivers. Peterson and Ralston (2017) also elaborated on the importance of increasing the manpower supply of formal and professional nursing and caregiving staff for the whole home-based elderly care service. Unfortunately, the shortage of professional nursing staff in western countries and some Asian countries can be foreseen and may persist (Keefe, 2011; Vogt, 2018). For the globe, the supply of home-based elderly care services and the supply of formal and professional caregiving and nursing staff will become a great challenge to the global aging issue. For China, perhaps this supply problem is not so acute, because the huge population base will provide much potential elderly care and nursing staff for Chinese society. However, the problem facing China is the challenge of the professional skills of elderly care personnel. W. Y. Xu (2012)

believed in the research that the level of elderly care nurses in China will restrict the development of the long-term care insurance system. Therefore, it can be seen that nursing or caregiving staff with insufficient professional levels cannot solve the supply problem of home-based elderly care services. For the problem of service supply, the author of this paper will design targeted intervention strategies based on the contributions of the above literature in order to alleviate the problem of service supply of home-based elderly care.

2.2.1.2 Pattern aspect of eldercare

X. Y. Liu and Pan (2020) points out that in the contemporary elderly service mode, the supply of elderly services is mainly undertaken by the government, which promoted the culture of filial piety in the new era with the guarantee of law, improves the capacity of family elderly care based on the credibility of the government, improves the elderly welfare system, and expands the new elderly care model to provide the foundation for family elderly care. As a social behavior, elderly care service is deeply influenced by culture, and there is a positive correlation between family elderly care service and "filial piety" culture, and "filial piety" culture is also the basis of family elderly care ethics. Y. K. Lu (2019) points out that senior care services should follow the principle of "from outside to inside", pay attention to the value of senior care services, and strive to achieve the "humanity" of products; adopt the principle of cultural respect for the different local cultures, and provide humanistic services to the elderly. We adopt the principle of cultural respect for the different local cultures and provide humanistic services to the elderly. In the service, we should give the elders the right to choose and pay attention to the service value, personnel value and image value. Z. Yu (2020) discussed the philosophy of home-based health care services from the perspective of social well-being. It can include respecting human rights, confirming ethical values, promoting emotional integration, caring for feelings, interdependence, and intimacy. From the perspective of the service process, the attitudes that should be upheld in the service include, for example, recognition of differences in lifestyles and values, respect for one's own decisions, reciprocal collaborative relationships based on trusting relationships and safe care techniques, and deepening communication with family and society.

2.2.1.3 Policy aspect of home-based health care service

In terms of home-based health care service policy, Zhao (2017) conducted a study on government responsibility in the home-based health care service mode and pointed out that China currently lacks a holistic and continuous approach to the elderly service system, and the government as the service regulator has problems such as multiple management and difficulties in departmental collaboration. In terms of service supervision, only the digital performance of

service outcomes can be used to judge the quality of service. There is no powerful tool to judge the quality of service, nor can we obtain effective data information on the service process, and no open and transparent data information of the process supervision is produced. In this regard, the author believes that the visualization of service process data should be an important dimension of research. Hu (2017) proposed that the development of community elderly home-based care services requires the joint participation of the government, community and society, but at the current government level, there are various problems such as insufficient financial support, lack of policies and regulations, and difficulty in evaluating supervision. These problems lead to the government as the service regulator not being able to supervise the home-based care services, and the quality of home-based care services cannot be guaranteed. The study found that although the government encourages social capital to participate in senior care services, social capital participation in senior care services faces many difficulties due to geographical differences, policy uncertainty and long investment return cycle. At the social level, his study found that the lack of professional staff and the general lack of quality of practitioners in home-based care services have prevented the quality of home-based care services from being improved and further exacerbated the difficulties in service supervision. F. Li (2019) further researched the government's responsibility in home-based health care services, pointing out that the government plays a dominant role in home-based elderly care services, and in the process of promoting the development of services, the government assumes an indispensable role in policy formulation, financial support, resource integration, and supervision and management, with particular emphasis on the government's regulatory responsibility. In terms of service supervision, local governments have issued corresponding policies and taken corresponding measures, such as carrying out special quality actions and strengthening institutional quality assessments. Although certain results have been achieved, they are still insufficient. Therefore, in view of the above dilemma, the introduction of high-tech means and the promotion of "Internet+" to further improve the supervision of home care services has become one of the effective measures.

2.2.1.4 Research on the construction of the home-based care services system

Jiang (2019) studied that perfecting the top-level design of services can improve the construction of home-based care service system, and the construction of the service system most fundamentally needs to be considered in depth from service standards, service personnel, and service evaluation together, and ultimately, by providing the overall service standardization concept of society and establishing a complete system to achieve the purpose of service

regulation. Weng (2018) pointed out that the construction of home-based care service quality system should adopt a combination of static standards and dynamic processes. While establishing standardized static service standards, the theory and method of total quality management should be introduced to promote the implementation of the standardized content, only then can we achieve the purpose of balanced integration and continuous improvement, so as to truly form an effective and enforceable service system. H. Zhu (2016) studied the components of the elderly service supply system and pointed out that home-based care service contains many links from service product generation to delivery to the elderly. Each link ultimately affects service quality and service level. It starts with the four process links and emphasizes the role of service content, service quality, different service pricing strategies, and information technology platform in the process construction.

Kroneman et al. (2016) analyzed and summarized the development of long-term care in the Netherlands, pointing out that after a major reform in the mid-20th century, the payment for long-term care services in the Netherlands has gradually shifted from government-led to individual and commercial participation. Matus-López (2015) noted that the establishment of a well-developed care delivery system effectively addresses the social and health-related cross-cutting issues in long-term care, while promoting the positive development of long-term care services. Brown et al. (2016) points out that quality improvement of home-based health care services is designed to be a joint effort of caregivers and stakeholders. Service quality improvement requires the formation of a team with theories of quality of care, leadership, and the ability to change.Dankner et al. (2016) states that the basis of care quality's improvement is understanding the causes of problems. After understanding the causes one, it can make changes to address those issues and ultimately change the outcomes.

Lindquist et al. (2013) points out that factors such as price of services, technology dependency, demand for service personnel, and cost of services can affect the quality of health care services, and thus building a health care service system is based on these dimensions to develop a total quality management plan. Kuei-Fu (2018) points out that the sense of work value, professional satisfaction, and the safe environment of the service with the clients are important factors that affect the total quality management of care.

Ghasemi et al. (2021) points out that health care services for the elderly are a special economic business that involves many organizations, which need to provide high quality and innovative services in order to better compete and enhance their competitive advantage. Among them, total quality management is an important part, and it has more correlation with employee relations, consumer satisfaction, and business performance. Farzadnia et al. (2017) states that

health care service industry, as a special service industry, has used the practice of total service quality management earlier to improve service quality. The content of the basic total service quality management should include products, service processes, service personnel, service environment and other aspects. On this basis, its proposed total service quality management should also include the following dimensions, such as leadership, strategic planning, information and technology, human resources, process management and business results.

2.2.1.5 Standardization of home-based care services

Gu and Zhu (2015) points out that building a standardized service system for community elderly at home helps to improve the quality of elderly at home service. China has not yet established perfect unified standards for service technology and service management in the field of home-based care. Building an effective and feasible standard system can use the thinking of system analysis to effectively correlate community and home services so that the two forms interact and rely on each other. Finally, it will form an organic combination of organization, personnel, technology, management, and other elements.

M. Wei et al. (2019) suggests that a "multi-level elderly care service system should be established based on home, relying on community and institutions, and built around the integration of medical care." The service system should include three dimensions, which are foundation, service provision and service support. Only by constructing a standardized service system can service providers be guaranteed to provide quality and traceable services in the market environment and minimize the risks in the service provision process.

2.2.1.6 Perspective of quality management of home-based health care services

Mou (2014) points out that the construction of a scientific and reasonable community-and-home-based care quality evaluation indicator system is the key to home-based eldercare service quality evaluation. In accordance with the principles of objectivity and practicality, independence and integrity, scientific consistency, importance and operability, we construct an evaluation indicator system that meets the basic needs of the elderly. Shang and Chen (2017) studied the home-based service quality system in four dimensions, catering, housekeeping, medical care, and entertainment. It pointed out that in the process of conducting service quality assessment, the contents should be disassembled and assessed separately to further improve the accuracy of the assessment results. Using expert interviews and literature research, L. Zhu et al. (2019) argues that home-based care service quality should include both service structure quality and service outcome quality, and that the establishment of service quality indicator system is important for both regulating the home-based care service market and improving the service

quality.

Xie et al. (2019), by collating and summarizing the domestic and international literature, found that most of the current studies on senior care service quality use the SERVQUAL model as the main evaluation tool, while the modified SERVPER model is less frequently used. Q. Xu and Bai (2016) used the evaluation method of "Topsis" to select the home-based care service performance indicators to evaluate the quality of home-based care services and categorized the service quality into three parts: target level, criterion level and program level, which together evaluated the service quality. Y. X. Zhang (2012) proposed to use SERVQUAL tool to evaluate the service quality, and his innovative addition of perceptibility dimension on the basis of model pair finally constructed the home-based service quality evaluation model. Tian (2018) proposed adding the safety dimension and deleting the assurance dimension on the basis of the SERVQUAL model, and analyzed the quality of home-based care services by evaluating the dimensions of safety, reliability, consequentiality, empathy, and tangibility. Song (2016) believes that many evaluation indicators in the evaluation process of the quality of home-based care services have fuzzy nature without clear boundaries and extents. Therefore, his method of combining hierarchical analysis and fuzzy evaluation to evaluate the quality of home-based care services guarantees the clarity and system of evaluation results and improves the reliability, accuracy , and objectivity of evaluation.

2.2.1.7 Perspective of home-based service quality management practices in various countries

Since the 20th century, the practice of home-based care service has been gradually developed in the United States, Europe, and other countries, all of which are faced with different challenges and difficulties in the process of development.

Gannon and Davin (2010) investigated the current situation of home-based care services in Ireland and France and pointed out that the quality of home-based care services depends on the relationship between the participating parties, and home-based care services are significantly superior to institutional care in terms of costs and benefits. Malley et al. (2019) pointed out that the quality indicator of home-based care service contains multiple dimensions. It may contain different aspects, such as safety, effectiveness and experience. It is a vital role for the policy level and practical level to clarify the synergy between each dimension. In addition, the author believes that the experience of the service personnel has a significant influence on the service quality. Joling et al. (2018) states that high quality home-based care services can be effective in reducing public expenditure on long-term care and hospitalization for frail older people.

However, high quality home-based care services depend on the regulation of service quality indicators.

Hanberger et al. (2015) pointed out that transparent management by the government and service providers, with the help of measures such as national targets and standardization can further guarantee and provide the quality of home-based care services. Trydegard and Thorlund (2001) studied the quality of home-based care services in Sweden and found that the quality of services varied significantly across Swedish regions and that the quality of services directly affected the equity of access to care for older people. Harrington et al. (2001) pointed out that the quality of service depends on the daily quality of life of elders, and the important indicators affecting the quality of life depend on the management status of the service provider. Gillis et al. (2000) pointed out that among the indicators of service quality, the degree of staff matching and personal quality are very important, followed by service continuity, service hours, and service availability, all of which influence the evaluation of service quality.

In summary, it can be found that the process quality supervision of home-based eldercare services has been a common pain point and difficulty in this industry, and there are still no unified and effective supervision indicators and tools for the process quality supervision of home-based care services, so it is especially important to research and explore effective quality supervision indicators and tools.

2.2.2 Research on home-based eldercare services with Chinese characteristics

Wong and Leung (2012) found that long-term care services for the elderly in China are in serious shortage, with low quality and low participation of private and non-governmental organizations. The development of home-based eldercare services should fit the economic situation, social culture, customs, social norms in China, and the concept of aged care. To ensure the smooth development of home care services is not a single effort to achieve the effect also needs good collaboration between the supervision party, home care service provider, and home care service recipient. At present, China's home care service is in its infancy and needs to meet the needs of all parties. There are varying degrees of difficulties for the current home care service industry model.

2.2.2.1 From the perspective of service providing

Y. X. Wang (2019) studied China's eldercare service supply system and pointed out that China's traditional "co-living" eldercare mode is changing with the development of the economy, and more and more families are gradually turning into the "generational separation" eldercare mode.

In view of the transformation of the eldercare model, the demand for home-based eldercare services is increasing, and the supply system urgently needs to change to adapt to the current demand for these services. However, in this process, the service supply system has the dilemma of insufficient total supply, unbalanced regional distribution, fragmented supply system, and low-quality supply system. Therefore, the construction of a complete service supply system has become an important basis to improve the above predicament.

Wong and Leung (2012) also studied from the perspective of elderly care practitioners and pointed out that the development of long-term care services was hindered by the lack of qualified eldercare service providers. It is estimated that China needs at least 10 million trained elderly care practitioners, and only a small fraction of those working in the field are currently trained and qualified. This situation directly affects the level of service quality.

2.2.2.2 From the perspective of service demand

The service needs of the elderly can be divided into physiological needs, communication needs and value realization needs according to the influence of different factors such as age, culture, and economic income. Combined with the actual needs of the elderly, Hao (2020) proposed that under the background of China's aging population, most elderly people prefer to receive medical care services in the home environment. Although the state vigorously advocates the service mode of home-based health care for elderly, in fact, the current mode in China might be only applicable to the elderly in some institutions. In addition, although most communities have carried out family doctor services, family bed building, and other ways to further meet the needs of medical services for the elderly at home, in fact, the services they can provide are very limited, and it is difficult to meet the further needs of the elderly such as rehabilitation treatment and symptom management. Therefore, the continuous expansion of home care services has become one of the important issues to be solved to promote the development of home care services in the next step.

Hou (2018) pointed out that the service needs of the elderly can be distinguished into dependent needs and expectant needs. Therefore, it is necessary to prioritize the service needs of the elderly according to the priority of the service needs of the elderly at different levels. Only by providing the corresponding service needs of the elderly on the above basis can truly meet the needs of the elderly in real daily life, and the elderly can really feel satisfied with community-based or home-based eldercare services.

2.2.2.3 From the perspective of service essence

In his research, Mu and Zhu (2019) pointed out that a strange situation occurred in the home-

based care model in Urban areas of China, that is, many people said they needed home-based care services, but they did not actually buy such services, which we call "good product but no one buy". However, the emergence of this phenomenon reflects, on the one hand, based on traditional Chinese culture, the elderly are accepted in the "original place of residence" (family) to receive eldercare services because they are more accustomed to the familiar living environment and long-term living community. However, on the other hand, the lack of professional services for home care, the lack of professional and technical personnel, and service network operation capacity defects, result in the elderly or children will not pay for such low-quality services. In particular, the service content that can be received at home is not as good as that of nursing home institutions, because the diversity of services in institutions is better. In recent years, although some community home care services in China's economically developed areas have added the service of "family building hospital bed", they hope to provide medical treatment, nursing, and services similar to eldercare institutions for the elderly at home through some interdisciplinary professional service teams. However, this kind of service is difficult to further expand and develop because of practical problems such as service risk, service efficiency, and service payment. Therefore, the researchers believe that the basic direction to break the old-age dilemma in China is to improve the participation of social resources in old-age services, provide routine old-age services at home, combine old-age services with commercial operations, and form a service network with different services. At the same time, on the premise of China's socialist state nature, we should adhere to the principle of "public welfare is higher than commercial", "benefiting the people is higher than making profits" and "social benefits of eldercare are higher than economic benefits of eldercare".

Hu et al. (2019) conducted an investigation and analysis on the willingness of the elderly to age in place, and the results showed that the elderly have a strong willingness to receive care in the community and at home. This result is very consistent with the cultural concept of Chinese characteristics. The author also believes that the promotion and development of the model of community and home-based eldercare can not only meet the needs of the elderly and their families, but also reduce the economic pressure on the Chinese government to build the eldercare institutions and hospital beds, and is a win-win eldercare model. Such services need to be diverse, professional, accessible, and high-quality so that the community and home-based care model can be applied on a large scale. Therefore, there is still a long way to go for the construction of China's community and home-based eldercare service model.

2.2.2.4 From the perspective of home care and medical care combination

Y. Wang and Qian (2018) believed that the emergence of community and home-based eldercare service model would largely solve the problem of China's aging population growing at full speed. In particular, it can solve the daily needs for the disabled or disabled elderly. The author mentioned the establishment of a care model similar to a virtual nursing home, but the establishment of a virtual nursing home requires a good combination of medical services and basic living care. Because the two types of services belong to different government departments, one belongs to the Civil Affairs Bureau, and the other belongs to the Health Commission. Therefore, so it is difficult to effectively combine living care services and medical services well in a specific implementation. In order to solve these problems, the government not only needs to construct medical and living care services combination from the perspective of the elderly to meet the diversified service needs, but also needs to strengthen the coordination and linkage of relevant departments, develop a systematic medical and living care combined programs, and explore the healthy eldercare model.

X. Z. Yu et al. (2021) found that the concept of home-based eldercare has been enhanced among the elderly in China, and their demand for medical and nursing services has increased significantly. The elderly hope to meet their needs at home through high-quality healthcare services and hope that the overall eldercare model can be changed. However, this transformation also needs the support of the overall construction of the community home-based eldercare service system.

L. Zhu et al. (2019) believe that in China, faced with the challenge of an aging society, the government has issued a large number of medical and eldercare service policies and vigorously supported the medical and eldercare industry, so the number of community and home-based eldercare service institutions in various cities have surged in just a few years. As China is rapidly entering a deep aging society, the overall community and home service system is not fully established and mature, and it cannot cope with the increasing demand of the elderly and the government's high requirements. Demand, policy, and service capacity are not at a unified level, and there is also a lack of quality evaluation indicators and quality evaluation implementation for the services provided by each service organization.

W. P. Zhu and Lin (2022) point out that Japan is an early developed country to enter the aging community. In the past few years, the government has also introduced several policies and measures to actively establish various eldercare modes and gradually form an eldercare service system. At present, to cope with the challenges of a deep aging society, under the

existing system, Japan government is further exploring the combination mode of community and home-based eldercare, the comprehensive community nursing care fund is established at the same time. The goal is to promote "regional medical service system" and "comprehensive community care system" joint development. And it is believed to be a solution to the problem of aging population in Japan. According to the research, in order to build medical and nursing services to meet the needs of the elderly, it is necessary to consider not only service design, service operation, and service quality, but also the payment channel of the overall service, which is the necessary condition for the sustainable and development of the community and home-based health care mode.

In summary, it can be found that there is little research content on the home care service systems with Chinese characteristics. It might be related to the fact that China is in the stage of transformation from public welfare eldercare to marketization eldercare industry. In the past few decades, this industry has paid more attention to the basic living security, the government's purchase of services for the elderly in need, and the social public welfare effect, it has not been more involved in the service supply, service design, service quality control, and service system construction. Most studies focus on the current service dilemma, demands from government perspective, service types and supply-demand relationship, so the solutions given are too broad and lack practical operability of the implementation. However, it can also be seen that the home-based eldercare model and system construction under China's national conditions cannot be mechanically copied and applied to foreign models. It is also necessary to establish the service content and service quality improvement methods in line with the Chinese cultural background and Chinese characteristics payment policy. Only in this way can China solve its own aging problem.

2.2.3 Research on intelligent tools and methods to support eldercare management

With the development of social economy, global aging is becoming more and more serious. At this stage of research, it is found that "eldercare at home" is a common mode for aging society, and the flourishing development and application of intelligent design in the new era has brought new opportunities for aging in place. Using intelligent technology to create a suitable family living environment for the elderly may become one of the effective means to solve the problem of home eldercare. And with the continuous promotion and deepening of "Internet+", intelligent equipment has been more and more introduced into the field of elderly care services, becoming the focus of everyone's attention.

2.2.3.1 Perspective of intelligent eldercare industry development

Y. Wei and Xu (2020) pointed out from the perspective of overall industrial development that the intelligent health eldercare industry is an important means to develop high-quality eldercare services and an effective way to solve the imbalance of the eldercare industry. However, the intelligent eldercare industry has problems such as insufficient concept, lack of professionals and insufficient policy support. The most fundamental solution to the above problems lies in the government strengthening policy support and actively promoting the development of the intelligent eldercare industry.

A study pointed out that from the perspective of energization, there is generally a decrease in internal and external double-layer control of the elderly. As a result, the continuity of life of the elderly cannot be achieved. The introduction of intelligent eldercare equipment can help improve the elderly internal and external control of the life, improve learning, communication, and creativity, and makes the "intelligent" of the elderly themselves improve, eventually achieving the fundamental purpose to return to society and regain self-care ability (K. Wang & Lin, 2019).

From the perspective of the introduction of intelligent eldercare products to service process management, S. J. Yin et al. (2019) believed that the intelligent management of the current service process is still in the stage of exploration and test. At present, there were some problems like lack of unified standard, lack of effective management mode, and confused management main body. To solve these problems, with the help of modern methods, a perfect service evaluation system can be established from three aspects: the service recipients, service providers and service regulators. On the basis of the system, service processes will be evaluated, ultimately achieving service process monitoring (S. J. Yin et al., 2019).

X. Yu and Yao (2017) pointed out that with the arrival of the comprehensive aging society in China, the issue of providing for the aged has become the focus of the government, families and society. It has become an urgent need to find a way out for the aged. Under the influence of the rapid development of information and communication technology and China's inherent national conditions, home-based care has gradually become the main mode of elderly care service in China. However, in the specific operation process, due to the fragmentation and instability of service content, home-based care urgently needs information construction and intelligent operation. Under the current conditions, there are still some problems in promoting the intelligent operation of home-based eldercare, such as low utilization of social service resources for the elderly, delayed construction of information platforms, government's

information system for the elderly care industry is immature and low level of scientific policy formulation and decision-making. In view of the complex problems existing in the current intelligent operation of home-based care in China, the exploration and construction on the eldercare service management structure will assist the government in making management decisions, promote the healthy development of home-based care service industry, integrating social service resources for the elderly and construct intelligent home-based care service and management pattern with attaching equal importance to service and management.

2.2.3.2 From the perspective of "internet + big data" intelligent elderly community practice

Nie (2016) studied the intelligent home-based eldercare service equipment from the perspective of user acceptance and pointed out that the service content, operation convenience and service safety of intelligent equipment for eldercare purpose affect the elderly's cognition and acceptance of the intelligent equipment for old-age care service. K. Han (2019) points out from the perspective of the current situation and problems of intelligent elderly care services that the existing problems of intelligent home-based elderly care equipment include the low intensity of benefit to the people, difficulty in meeting high-level demands, low recognition and acceptance and low level of intelligence, which should be solved from the aspects of policy formulation, supervision mechanism and talent training (K. Han, 2019).

Jin and Lu (2016) believes issues as the imperfection of the traditional Chinese eldercare industry hardware facilities, single pattern of social eldercare, low participation rate of private sector, the lack of professional service personnel and multi-sectoral management lead to the difficulty on the combinations of eldercare industry to work effectively. With the financing and operating difficulties, the eldercare demand of our era cannot be met. The "Internet+" eldercare mode has the characteristics of low cost and high efficiency, which provides a new way of thinking to solve the current senior care problems. Borrowing from Jing han Real Estate senior care model and Happy 9 industry model, through data analysis, building service cloud platform, flexible operation business mode, docking industry chain, boosting intelligent senior care with modern technology, and improving management and service quality (Jin & Lu, 2016).

Similarly, Guo and Qu (2017) believe that the Internet is an important space carrier of the aging society based on the development form of the existing Internet and 5G. In addition, big data might be a technical solution to support the aging society. Through literature collection and case comparison analysis, the characteristics and connotations of "Internet + Big Data" aging modes are sorted out. The intelligent system of Internet Big Data technology consists of

infrastructure, data resources, service platform, application system and interactive display. The basic framework includes top-level design, standard specification and security guarantee. Finally, we suggest the construction of "Internet + big data service" elderly service system from the aspects of national policy support, industrial development mode selection and business mode innovation. Based on the "Internet + Big Data" senior care system, a standardized senior care service evaluation system and an information security system should be established, providing Chinese seniors with a treasured sense of security, belonging, worthiness and happiness.

With the rapid development of the concept of intelligent community, Tang et al. (2017) proposed that China is now vigorously promoting community-and-home-based care services supported by aging-in-place services. However, poor information mobility has led to an imbalance between supply and demand for home care services in China and weak integration of resources. The proposal of home-based care service in intelligent community provides a solution to this problem. At present, Chinese scholars' research on this service in intelligent communities is still in its infancy, mainly focusing on the exploration of functions and implementation approaches and lacking the construction of specific service modes. Pan (2018) also put forward that intelligent eldercare means achieve the effective docking and optimal allocation of health eldercare resources between individuals (families), governments (communities), institutions and various healthcare resources through innovative technologies such as the Internet of Things(IoT), big data, cloud computing and intelligent hardware, so as to promote intelligent upgrading of eldercare services and comprehensively improve the level of healthcare services for the elderly.

Y. Liu and Xie (2017) proposed the innovation mode of eldercare communities, which points out that the problems of an aging population and empty nests (lonely elderly) are more and more serious in recent years. At present and in the future, people will have to face the urgently unsolved eldercare problem. By the effect of population, family structure, China's urbanization process, and traditional concepts, the community is regarded as the basic unit of people's lives in the Chinese characteristics' eldercare mode. It is expected to provide a perfect and systematic eldercare service. Along with the concept of "intelligent eldercare", people began to consider the use of advanced IT technology methods to improve the community and home-based care and achieve the effective integration of service resources. Based on data about population, infrastructure, geographical situation, and service resources for a region, which is collected by field investigation and resources collection, IT technology means are applied to provide better service for the elderly. Finally, based on the relevant case studies at home and

abroad, this paper makes use of the Internet of things, mobile Internet, and intelligent technological means to build the eldercare mode of the eldercare ecosystem and develops the scheme design of the intelligent-style community eldercare.

For intelligent community, M. Lu (2019) proposed that the home-based care service in intelligent community adopted advanced information technology and combined with eldercare industry's operation concept. It has gradually become the main mode of the eldercare service's development in China. In recent years, with the introduction of concepts such as "combination of medical and health care" and "healthy China", the intelligent health care industry has highlighted its strong market potential. Among them, wearable medical equipment has become an important breakthrough direction in the "silver economy" due to its perceptibility, service continuity and many other advantages.

About the future development of eldercare community, Lv (2019) proposed that community eldercare, institutional eldercare and home-based eldercare are the three major modes in China. Among them, community-based eldercare as well as home-based one are more likely to take place in the elders' original community. Theoretically, community-based eldercare has more advantages compared with home-based eldercare. Therefore, many regions in China have already started practical exploration. In response to the problems of community elderly care and home elderly care, building an intelligent community elderly care system can create a scientific and reasonable elderly care environment for the elderly according to their needs, so that they can enjoy intelligent elderly care services in the community.

Shen and Li (2018) proposed that with the application of information technology in the field of old-age care, the concept of "intelligent community and home-based eldercare" has gradually become the focus of research and practice. From the perspective of eldercare providers, home-based care in intelligent communities presents the practice form of "government-led and enterprise-operated" in parallel. At the same time, it faces the risk of "double failure" while playing their respective roles. Based on a city survey found that this is closely related to the current eldercare's suspension. According to analysis of the behavior of central government, local governments, enterprises, the aged and other main bodies on eldercare field, development thoughts about intelligent community and home-based care that taking the community as service location are proposed. In other word, the top-down management style will be transformed into a bottom-up way of governance, hoping to provide a better reference for the development of intelligent community and home-based care.

X. Y. Yin (2019) proposed that the advent of the silver tsunami era brought severe challenges to China. Under the unremitting efforts of many sides, China's medical-and-care-

combined service system is constantly improving with the home as a basis, communities as support, and institutions as supplements. The pattern of community and home-based care will become the choice of most elderly people. The arrival of the "Internet +" era has injected new impetus into the optimization and upgrading of community and home-based care in China. However, in the process of operation, problems such as the insufficient supply of effective elderly care services and emphasis on expansion rather than operation need to be solved urgently. It is necessary to build a complete "Internet +" community and home-based elderly care pattern from the aspects of establishing an elderly care information database, strengthening department work cooperation, and developing "elderly-suitable" products.

With the promotion and development of intelligent community, it is gradually formed in both city and rural area in China. G. Wang (2017) found that along with the high-speed development of society and economy, as well as the unceasingly thorough process of our urbanization, our country has to face problems taken by the aging population while tasting the advantages of "demographic dividend". Considering the practice of the one-child policy since 1980 and the special national conditions of our country, aging population problems are becoming increasingly serious at present. In practice, there are many new eldercare modes based on the existing family eldercare and institutional eldercare modes. The community and home-based eldercare mode has become a relatively common eldercare mode in cities because it conforms to the eldercare concept and social development requirements of the elderly in China. However, in practice, many problems still exist. It cannot well satisfy the eldercare need of the elderly. We will start by combining community and home-based care in cities with "Internet +" and seek and explore a new eldercare mode that fits the eldercare demands of the aged in our country as well as fitting the development of economics and society. This paper studies the "Internet +" mode of urban community and home-based care. The evolution of the eldercare mode in China is reviewed and the urban community and home-based care with "Internet +" mode are put forward. The internet eldercare mode in China will be contrasted with the modes in other countries to analyze the present situation and practical experience of them. The superiority of the community and home-based care with "Internet +" mode of solving the population aging problem in China will be demonstrated. In the aspect of model construction, we will scheme the framework of the community and home-based care with "Internet +" mode and propose policy suggestions for constructing the mode in order to promote the successful development of the mode and provide plans for subsequent intelligent-style eldercare development.

W. Chen (2016) pointed out that currently, China has implemented different types of

eldercare modes. However, compared with the experience and implementation of some western countries, China still has obvious deficiencies in the overall development of the eldercare service industry. With the continuous progress of social development and the rapid development of medicine, the trend of "population aging" is increasingly intensified. Moreover, due to the fact that the elderly is the main group of patients with chronic pain and the deep-rooted concept of caring for the elderly by their adult children, the elderly's demand for home-based care is also increasing year by year. Based on the observation of the foregoing service system of "Internet + eldercare" and community and home-based elderly care, the basic concept of "Internet +" community and home-based care is proposed.

Besides the urban areas, the rural areas also need the development of intelligent eldercare mode. Y. Q. Zhang and Zhang (2017) pointed out that in China, the aging problem of the rural population is more serious than that of it in the urban. Along with the advent of aging society, the main labor force outflow in rural areas and the weakening of family eldercare capacity, the traditional home-based care can no longer meet the old-age problem of rural elderly. Therefore, it is urgent to explore a new eldercare mode to solve the problem of rural elderly. The development of modern information technology, represented by the Internet of Things, has brought opportunities to solve the problem of aging population.

In response to the current situation and actual needs of rural elderly people aging at home, the intelligent home-based care service mode is explored. Some problems have also been found in rural areas. Y. Q. Zhang and Zhang (2017) investigated and analyzed the current situation and needs of rural areas, and gave some policy suggestions on the implementation of intelligent home care services in rural areas, as follows:

(1) Strengthen the top-level design of the rural intelligent home-based eldercare system.

(2) Increase rural information infrastructure construction.

(3) Accelerate the development of intelligent eldercare platform and products.

(4) Overcome the "digital incognizance" among the elderly.

(5) Strengthen the training of professionals for intelligent home-based elderly care.

2.2.3.3 Integration of intelligence into home-based eldercare

The United States (U.S.) has established mobile medical services for the elderly in major cities since 1999 to provide home-based medical services for the elderly in need. Its use of a systematic and intelligent business mode enables the elderly to enjoy service resources while effectively reducing service costs (F. L. Xu & Wang, 2019). On the other hand, the U.S. is actively using electronic information technology in senior care services, and has established

telemedicine services, intelligent senior care applications, as well as paying more attention to the safety of the elderly, such as personal emergency response equipment, intelligent home supervision equipment, fall alarm equipment, wearable healthcare equipment.

The United Kingdom (UK) is an early adopter of the concept of " intelligent senior care " and has established intelligent senior care service centers in the community to provide a variety of wearable information and intelligent tools for seniors, improve healthcare services and help seniors live independently (Smith et al., 2013). Currently, the technology tools commonly used in the UK's intelligent aging services include digital health, telemedicine and mobile health, and the main services include the creation of health electronic files, dynamic monitoring of health information and online medical services.

In 2007, Germany set up the AAL (Ambient Assisted Living) research program for environmentally assisted living, which connects various intelligent instruments to the platform through an expandable intelligent technology platform, and analyzes and responds to the physical condition and living environment of the elderly (Carlos, 2012). The implementation of this program not only reduces the financial burden on the country but also the cost of elderly care, while improving the convenience of life for the elderly.

Japan is the world's most aging country, and Japan's intelligent senior care is a very important economic industry, mainly focusing on medical, nursing care and intelligent senior care fields. Japan's intelligent senior care equipment focus more on the users themselves, emphasizing the concept of human-centered design, and designing functional home systems, nursing robots and intelligent toys that are suitable for use by the elderly (Cui, 2020).

Singapore proposes to establish a "Smart Nation" plan that seamlessly integrates IT, network and data, and proposes to use technology to realize aging in place and intelligent aging services (Nawaz, 2021). In terms of intelligent product design, more attention is paid to the safety of elderly people's living, designing home intelligent alarm system and fully considering the comfort and safety of elderly people's home environment.

Comprehensive above can be found that there is a certain degree of gap between the development of intelligent elderly care in China compared with foreign countries, but with the development of the economy and society, China has invested greater attention to policy support, economic investment and technical support for intelligent medical and health care services. There are advantages in China such as high network penetration rate, a huge senior care market and strong service characteristics. At the same time, the application of intelligent means in the field of home care service is still in the preliminary stage of development. Most intelligent device services are limited to the collection and management of health data. The author will try

to introduce intelligent devices into the supervision process of home care services, so as to help explore the "black box"(Means the service details in process are often hidden) of home care services through intelligent means. This innovative approach is undoubtedly a major breakthrough for the improvement of the quality of home care services.

2.2.4 Research on process management

China is rapidly entering the era of service economy. One of the features of this rapid development is the increasing proportion of services in the national economy. In the process of service provision, the service process is actually the process of value provision and transformation. Therefore, it is particularly important to study and manage process management well. Especially in home medical care services, which require professional technology, the gap in knowledge between the service provider and the service provider makes it more likely that customers do not understand the service content, which may ultimately affect the service experience of customers. This presents a new challenge to the quality management of the service process in the home eldercare industry.

2.2.4.1 Management of service process

L. Liu and Su (2019) pointed out that process management is a management concept originating from the West. It is a management method that focuses on standardization, standardization, and institutionalization. However, sometimes, this management method also places too much emphasis on process control and ignores the realization of objectives and results, resulting in a situation of giving consideration to one and losing the other. The process management of the new international standard advocates strengthening the performance management as the guidance, which greatly improves its scientificity, practicality, and effectiveness. The improved process management mode advocates starting with the key steps and improving the management system pragmatically, thus greatly improving the level of managers.

Conger (2015) proposed that today's advanced management methods and tools should be used for service process management, including service blueprint, FMEA (failure mode event analysis) and six sigma. These tools can effectively support process management and make process management more practical and practical. At the same time, process management can not be completed at one time. In order to ensure the competitiveness of the enterprise, it is necessary to continuously and regularly evaluate the service process, and put forward analysis and improvement suggestions in combination with the tool model. At the same time, it can also improve efficiency, reduce waste and improve quality.

Jawahar and Mohammed (2021) proposed that service process management is related to human effectiveness. The belief in self-efficacy and the internal drive of employees are crucial to management performance and organizational success. Therefore, service process management is not only a single side management, but also needs the consistency of all persons in the organization. From the establishment of strategic objectives to the specific implementation of them, the whole workflow needs to be well coordinated. At the same time, we also need to adhere to the "person-oriented" concept to promote the implementation of process management and create better performance for the enterprise.Kir and Erdogan (2020) pointed out in his article that in today's digital era, enterprises need to respond to market changes quickly, and business process management has always been a booster for enterprise optimization and operation efficiency improvement. The automation of BPM (business process management) cannot only rely on focusing on process space and classical planning technology to achieve business optimization. It needs to cover enterprise strategy, social policy, organizational capacity, internal collaboration, etc., and become a holistic approach. Therefore, BPM, digital system and intelligent technology should be combined to form a unified intelligent business process management framework. This will enable enterprises to respond to market changes quickly and extend the life cycle of the overall business.

2.2.4.2 Process management in healthcare industry

De Ramon Fernandez et al. (2020) pointed out in his article that business process management is a new strategy in management, which is mainly used in industry, service industry and business. Clinical processes and service processes in other industries do have some common shortcomings, such as task repeatability, bottlenecks, lack of communication between participants, and long waiting time at each service node. These questions also lead to the inefficiency of some clinical processes, which increases the cost of health care. In the past few years, business process management has been applied to the medical and health fields. On the one hand, the process management strategy of the medical industry is usually used to optimize the management of medical institutions, mainly to help manage operators. On the other hand, for the improvement of some medical service processes, process management can also play a great role in improving. For example, some clinical processes are performed by clinical personnel and can only be completed through interaction with patients, such as blood sampling, expert testing and evaluation, or surgery. In short, in recent years, process management has been applied in many aspects in the medical industry and is considered to be able to improve the management and service quality of the medical industry as a whole. And some evidence has

been found to support the use of business process management as an effective method to optimize clinical processes. Then, more comprehensive follow-up work, better technical support and more participation of all clinical staff are the key factors to realize the cost of human potential.

Martinho et al. (2015) pointed out that many healthcare organizations have been trying to properly combine business process management and related information and communication technologies. The purpose is to further improve patient service and improve the quality of medical care. However, the information system used by some large medical institutions can not be well integrated with the business process of medical services, because the information system only acts on some individual service parts, and does not allow the information flow to connect the whole medical service process. Therefore, this study builds a workflow model and manages the service process by using the real data of the business process, which helps to guide the further optimization of the medical service business process and makes the complex medical service get effective process management and service quality improvement. Through investigation, Mens et al. (2015) found that in the Netherlands' medical institutions, the service process could not be controlled because the service process was not fully standardized, which ultimately led to the difficulty in improving the service quality. Therefore, he studied, formulated and implemented a standardized management method for risk screening and evaluation process, decomposed the business process decision logic into a variety of business rules, standardized the screening process, and made each risk factor screening basically the same. Due to the introduction of this new standardized process, the process is effectively managed and controlled, saving about 1600 hours of time every year. The labor cost is effectively reduced and the work efficiency is improved. Antonacci et al. (2016) pointed out in the article that the adoption of business process management practices in the medical industry is becoming a key driving factor to improve the health care process. At the same time, some appropriate methods and tools are also needed to solve potential problems in user behavior and service functions from the early stage of the health care life cycle, so as to improve service quality, reduce the waste of healthcare cost, and finally improve the effectiveness of business process management methods.

2.2.4.3 Combination of intelligent technology and process management

L. Liu (2019) points out in the article that intelligence service in the community has become a new innovation field in the current social development. The purpose is to achieve the integration of service and community, so that the resources in the community can be integrated and shared,

so as to improve the operation efficiency of the service, improve the professional and technical level of the service and reduce the input cost. Especially in the field of eldercare, intelligent technical means are integrated into the overall management system of community and home-based service, which may improve the service quality. There are many application fields of this integration, the infrastructure of the community elderly care service system is constructed, intelligent technology is used to identify the service needs of the elderly, and software system is used to efficiently transmit service information. However, this aspect is still in the early stage of development. There is no detailed planning policy for the integration of information technology into elderly care services, and there is no more experience to learn from. The government or community management organization may try to build a management system, aiming to provide intelligent service for the elderly in communities.

Y. X. Wang (2019)points out in the article that the development of elderly care services in China is in a preliminary stage, that is, the stage of gradual transformation from "Provide service by a real person" to "man-machine integrated elderly care services". The combination of eldercare and technology can provide great support for a variety of eldercare service models. Integrating high technology into the traditional elderly care service industry can expand the service delivery scale, broaden the service capability boundary and improve the service quality. This also greatly improves the service operation efficiency, reduces the time cost investment, helps to optimize the allocation of service resources, and provides the multi-level service supply capacity of the entire industry

2.2.4.4 Management service transparency

In many hospital systems and management systems, access to patient medical records and information has been strictly managed and controlled. Such management stems from the protection of user privacy, especially health-related privacy, which should be more closely protected. However, AlThqafi et al. (2016) pointed out in the article that the access control of patient medical information in the hospital information system may become a challenge to the concept of "patient-centered" modern health care services. Fine grained access control (FGAC) has been identified as a necessary security control method in these medical systems. Based on this, Althqafi suggests using a refined business process management method to implement FGAC, which can provide real-time access control based on the "Need-to-know" principle. On the one hand, it can ensure the security requirements, on the other hand, it can promote information transparency in healthcare services and improve service quality.

DesRoches (2020) pointed out in the article that the debate over access and ownership of

personal digital information has become a central issue in the field of health care. Ten years ago, it was undoubtedly a relatively rare idea to allow patients to access their clinical records and medical information at any time. Now, in the United States and other places, the transparency of health care information is an important issue that continues to be regulated by legislation. The 21st century cure Act introduced in 2016 requires clinicians and medical institutions to allow patients to access information in their electronic medical records. The rules of this legislative priority developed by the relevant government agencies greatly expand the types of information that patients must have easy access to and exchange electronically between clinicians. More and more researchers support sharing transparent medical records with patients, including clinical notes, which helps to strengthen communication, trust clinicians and patient participation, and promote transparency of service and treatment information.

From the above, it can be found that process management is widely used in industry, commerce and service industry. However, in the elderly care service and the whole industry, the research on Process Reengineering and process design using process management is relatively rare. Some literatures suggest that it is necessary to strengthen the combination of intelligent cutting-edge technology and community elderly care, and at the same time, appropriate process design and process management can be carried out. Especially in the home scenario, the research on service process management is almost blank. This also shows that there are many directions for the process management of home-based elderly care, both internationally and in China, that can be further explored and studied. Although the international community also pays attention to the research content of "transparent" management, it only stays on the transmission and sharing of information. There is little research on the transmission and process supervision of specific service information in the "black box" in the home service scenario. It is worth noting that China's home-based medical care service industry is in the early stage of development. If the supervision of the service process of home-based service cannot be well solved, the service quality may be difficult to be guaranteed, which will affect the entire industry and even the business model is difficult to recognize. Therefore, this study is of great significance to the entire elderly care industry and the customers involved in the service.

2.2.5 Summary of literature analysis

In the literature review part, this study searched and read literature on "home eldercare services", "Eldercare with Chinese characteristics", "Integrating intelligent means into eldercare management", and "process management" according to keywords. Through reading the literature in recent years, it is found that many scholars pay much attention to the construction

of the eldercare culture concept, service quality management, the establishment of service standardization, and the use of advanced technology to improve management efficiency, this has also formed a certain consensus. In particular, there are a large number of research contents in terms of eldercare mode and related policies. Also, it can be found that China's eldercare industry is still at an early stage. Although many elderly people in China choose the home-based elderly care model, there is little research on this aspect. According to the research direction of this paper, the literature reading is summarized as follows.

In the research of home-based eldercare care services, the mainstream view is to attach importance to the construction of the elderly care service system, especially the service quality management, and standardization, and pay attention to the needs of both service personnel and customers. China has also emphasized the importance of policies in the purchase and payment of home-based elderly care services, giving full play to the government's support and guarantee functions. However, most of the relevant studies focus on the overall development model of the elderly and the service demand for the elderly, but there are few studies on the establishment of the home-based eldercare system, especially in the system construction and quality management of the home-based health care service

As for the research on the Chinese characteristic elderly care service, since the whole industry is in the early stage, more current research focuses on the limitations and difficulties of the Chinese style elderly care service, and the development suggestions are mostly macro aspects, lacking consideration of Chinese customs and cultural concepts, as well as the implementation of refined elderly care service operation strategies.

In the aspect of integrating intelligent means into eldercare management, most studies still pay more attention to the application of intelligent technology and intelligent equipment. However, when these technologies are applied in the elderly care community and elderly care service scenarios, they still emphasize the technology itself, and lack of specific practices for the deep integration of service scenarios and technologies. This combination of intelligent technology and home service is exactly the focus of the author's research, because in order to solve the service process supervision in the home scene, it is necessary to adopt some intelligent technical means to "replace manual" to supervise and improve the service quality, but the current research on this aspect is relatively insufficient.

After reading the research and articles on process management, the author found that at present, more attention is paid to the hotel industry and aviation service industry in terms of process management. Although process management is also involved in the healthcare industry, but mainly in medical institutions. Such service process management is more likely to be carried

out under the supervision of professionals in large hospitals. It may be different from the supervision in the home healthcare scenario. The research on the professional health care services provided in the home scenario is relatively blank.

Also due to cultural differences, international medical services tend to conduct periodic research and feedback according to the care cycle. Foreign medical and elderly care services do not pay attention to the process management of each sub service, but focus on the service process in an overall stage as the feedback of process management. However, the service quality of each periodic service is composed of each single service. If you only pay attention to the period service but pay less attention to each service, the service quality supervision will be delayed and become a retrospective supervision method, which may lead to the improvement being not timely.

With the increase of the elderly population, the aging problem of the whole society is becoming more and more serious. In particular, the Chinese government is promoting long-term Care Insurance, a type of insurance that focuses on the payment of health care services at home for the elderly who stay in bed for a long time. The pilot cities (districts) have been expanded from 35 in 2016 to 49 in 2020. The inadequate protection of long-term care for disabilities has become a social problem to be solved. While long-term care insurance is the major institutional guarantee for China to cope with the aging of the population actively. The implementation of long-term care insurance will greatly promote the development of home-based health care service industry. The insurance system, which is closely related to each of the elderly will benefit more after completion.

With the promotion of long-term care insurance led by the government, home-based elderly care services will develop rapidly and the market demand will further expand. However, "how to effectively supervise and improve the service quality of medical care service process under the home-based service scenario" becomes the basis of whether the home-based health care service model is established. It is also the "pain point" and "essential need" of service providers, government and commercial insurers that pay fees, as well as users and families who accept services. Based on the characteristics of the industry, the research adopts advanced management concepts and operation means and applies AI, IoT, Virtual Reality (VR) , and other intelligent management tools to reconstruct the service process from multiple perspectives of users, service providers and enterprises, to continuously improve the overall operation ability and customer satisfaction and conduct pattern exploration and strategy research.

It can be found that the development of home-based care services in China is facing

challenges and difficulties to varying degrees. How to meet the needs of all aspect stakeholders and provide quality-assured home-based care services is an important direction of current thinking. This study attempts to establish a set of operation and management system suitable for Chinese community home-based health care service in a scientific way and method, so as to provide a feasible methodology for improving and enhancing quality and operation management ability. This is also the greatest contribution of the theory and research of this study. It is hoped to promote the development of home-based eldercare industry effectively.

2.2.6 The evidence of indicator systems

Home-based health care service system indicator selection is the key to this study. In order to effectively ensure the scientificity, rationality, and validity of the study indicator selection, the researcher refers to the literature review and existing model. The author selects the following articles' relevant information as the evidence for establishing an indicator system, as shown in Table 2.1. It can effectively guide and support the next step of this study, which is building a home-based health care service process management indicator system.

Table 2.1 The Evidence of Indicator Systems

Scholars	Elemental level	Metric layer	Research area
Y. He (2016)	Service Principle	Eldercare culture, blood relations, family structure	Eldercare
Z. Yu (2020)	Service Principle	Ethical values, caring for feelings, intimacy	Eldercare
Yang and Sun (2010)	Service Principle	Blood morality, residential environment, social mobility	Eldercare
Wu and Wang (2014)	Service Principle	Filial culture, production methods, social structure	Eldercare
Y. K. Lu (2019)	Service Principle	Value of service, value of people, value of image	Eldercare
Zhao (2017)	Service supervision	Service supervision, sectoral assistance, performance evaluation	Eldercare
Hu (2017)	Service supervision	Supply status, demand for services, policies and supervisions, service personnel	Eldercare
F. Li (2019)	Service supervision	Policy development, financial support, resource integration, supervision management, technical methods	Eldercare
M. Wei et al. (2019)	Service supervision	Service foundation, service delivery, service support, standardized services	Eldercare management
Jiang (2019)	Service supervision	Service standards, service personnel, service assessment	Eldercare management
H. Zhu (2016)	Service supervision	Service content, service quality, service pricing, information technology network	Eldercare management

		platform	
Gu and Zhu (2015)	Service supervision	Service technology, service management standards	Eldercare management
X. Y. Yin (2019)	Service supervision	Intelligent equipment, service standard, management main body, management mode	Eldercare management
Nie (2016)	Service supervision	Intelligent equipment, policy development, supervision levels, talent development	Eldercare management
Tian (2018)	Service supervision	Reliability, safety, consequence, tangibility, empathy	Eldercare management
K. Han (2019)	Service supervision	Intelligence, supervision mechanisms, talent development	Eldercare management
Y. Wei and Xu (2020)	Service supervision	Intelligence, perceptions of eldercare, professional staff, policy support	Eldercare management
Jin and Lu (2016)	Service mode	Internet+, service personnel, regulatory bodies	Eldercare management
Guo and Qu (2017)	Service mode	"Internet + big data", infrastructure, data resources, service platforms, application systems, interactive presentation, service standards	Eldercare management
X. Liu and Xie (2017)	Service mode	Intelligent eldercare, basic population, infrastructure, geographical situation, service resources	Eldercare management
M. Lu (2019)	Service mode	Intelligent technology tools, operational concepts	Eldercare management
Mu and Zhu (2019)	Service mode	Culture concepts, payment methods	Eldercare management
Y. Wang and Qian (2018)	Service mode	Combination of eldercare and medical care, service design	Eldercare management
W. P. Zhu and Lin (2022)	Service mode	Combination of eldercare and medical care, service design, payment methods	Eldercare management
Gannon and Davin (2010)	Quality of service	Service providers, cost benefit	Eldercare
Malley et al. (2019)	Quality of service	Service personnel, service experience, policy support	Eldercare
Joling et al. (2018)	Quality of service	Service quality indicators, service payment methods	Eldercare
Hanberger et al. (2015)	Quality of service	Management modes, standardization, policy purpose	Eldercare
Trydegard and Thorslund (2001)	Quality of service	Service users' feelings	Eldercare
Harrington et al. (2001)	Quality of service	State of institutional management, quality of daily life	Eldercare
Gillis et al. (2000)	Quality of service	Personnel match, service continuity, service hours, service content	Eldercare
Kuei-Fu (2018)	Quality of service	Sense of job value, career satisfaction, safe environment for service with clients	Healthcare management

Ghasemi et al. (2021)	Quality of service	Employee relations, consumer satisfaction, business performance	Healthcare management
Matus-López (2015)	Quality of service	Products, service process, service personnel, service environment	Healthcare management
L. Liu and Su (2019)	Process Management	Process Management, standardized process	Healthcare management
Jawahar and Mohammed (2021)	Process Management	Organization synergy, performance management	Healthcare management
Kir and Erdogan (2020)	Process Management	Business process management, digital system, enterprise strategy	Healthcare management
De Ramon Fernandez et al. (2020)	Process Management	Security improvement, process reengineering	Healthcare management
Martinho et al. (2015)	Process Management	Decision support, process optimization, process reengineering	Healthcare management
Mens et al. (2015)	Process Management	Digital system, process redesign	Healthcare management
Antonacci et al. (2016)	Process Management	Process reengineering, standards, process optimization	Healthcare management
L. Liu (2019)	Process Management	Intelligent eldercare, decrease cost and improve efficiency	Eldercare management
Y. X. Wang (2019)	Process Management	Intelligent eldercare, decrease cost and improve efficiency	Eldercare management
AlThqafi et al. (2016)	Process Transparency	Information transparency, process reengineering	Healthcare management
DesRoches (2020)	Process Transparency	Information transparency, process reengineering	Healthcare management

Chapter 3: Design and establishment of the process management indicator system

3.1 Analysis of service indicator characteristics

Community home-based health care service is a kind of service with Chinese characteristics, based on the traditional Chinese concept of family health care service. Because of the traditional Chinese culture of "family", a large number of seniors do not want to live in a nursing institution, which has led to the development of home-based health care services and the special attributes of it in nature. In this thesis, we analyze the characteristics of home-based health care services and try to develop relevant indicators from the following aspects.

3.1.1 The service providers of home-based health care

In order to meet the needs of most elderly people for home care, community home-based medical health care services need to provide services to meet the needs of elderly people with different health conditions, which may involve household chores, daily care, medical care, or even end-of-life care. The age, personality, education level, training experience, and self-motivation of the service providers will affect the competency of the home care service providers. At present, the service personnel in the eldercare industry generally have a low professional identity, low salary, and low professional level of "three low" performance. The professionalism of the service personnel in the process of home service directly affects the quality of the service.

3.1.2 The content of home-based health care services

As a special consumer product, the service content (health-related service) has become one of the fundamental evaluation indicators of the product's merits. The content of these services involves physical, psychological, and social aspects, and needs to meet the physical conditions, psychological characteristics and cultural customs of different old people. In Shanghai, the governmental long-term care insurance contains nearly 42 service items, including daily care, medical, spiritual comfort aspects. However, since the service needs of different elder people vary greatly, the content of home-based services is variable too. In order to ensure that these

services meet the individual differences, the service time, service content and service mode need to be flexible and variable, which makes it difficult to evaluate the quality of these services. Therefore, it is impossible to use a single indicator to make a one-sided evaluation of the quality of services.

3.1.3 The organization and management of home-based health care services

Home-based health care services are based on special service scenarios and are different from institutional health care services. Because institutional health care has developed standardized and systematic management methods and clear quality evaluation indicators. Also, home-base health care services are limited by special service scenarios, the time, place, and even the content of these services must be changed accordingly with the variable need of the elderly. As a result, managers of these service cannot quickly, directly and effectively get acknowledge of the whole service process and the service experience of customers. It is also impossible to develop a unified evaluation indicator to evaluate the quality of services. On the other hand, there is no objective standard to evaluate the service quality, and most of the time, we need to rely on the elderly people's own experience. Each person has different concerns and different feelings, and the evaluation of service quality is bound to be different. It is not possible to develop a uniform and valid measurable indicator for evaluating the quality of home-based health care services.

3.2 Objectives for the construction of the indicator system

In order to ensure the continuous improvement of the quality of home-based health care services, and the people who accept services could receive premium and respectful service, the goal of building the process management system of home-based health care services should be reflected in the following aspects.

Goal 1: Warm and affectionate

To construct a warm and affectionate service concept and overall framework, we need to fully consider the special traditional culture of China, different philosophies, cultural beliefs, and customs between the service provider and the service recipient. Only if the characteristics of both parties are fully considered, we can design and provide service contents that satisfy customers and guarantee service quality.

Goal 2: Clear organization and collaborated development

We need to build an efficient and effective organizational structure, with members at all levels defining the strategic goals of the organization, clarifying the division of internal responsibilities, and building a smooth and effective communication channel from top to bottom. On the other hand, from a professional point of view, we will fully consider the actual needs of the elderly, provide corresponding services from the demand and provide timely feedback, and finally achieve the goal of internal and external balance and collaborative development.

Goal 3: Efficient operation and effective supervision

To ensure that the process of home-based health care services is well supervised and the service system operates efficiently, it is necessary to establish a standardized system by combining various dimensions such as service personnel, service content and service equipment, in order to effectively guarantee that the elderly can obtain high-quality services.

Goal 4: Introduction of intelligence and the improvement of regulatory efficiency

The introduction of intelligent supervision equipment and technical method leads to accurately identifying the supervisory characteristics of home service scenarios, reducing the difficulties of multiparty supervision, enhancing supervisory efficiency, and simultaneously improving the overall service experience of service recipients.

3.3 Principles for selecting the indicator system

The construction of the home-based health care service process management system should follow the principles of comprehensiveness, independence, scientificity, and operability.

3.3.1 The principle of comprehensiveness

The indicators selected for this study are based on the principle of comprehensiveness. The indicators chosen for the study are based on a comprehensive and systematic analysis and consider the home-based medical health care service process, in order to fully understand the perceptions of the service recipients in all aspects of the home-based medical health care service through the research of this questionnaire, so as to objectively grasp the evaluation feedback of the service recipients on the quality of the service. The research subjects involve all stakeholders of home-based medical health care services, including the supervisor, the provider, and the receiver, to obtain relatively complete information by understanding the demands of stakeholders in different positions in the overall process of home-based health care services.

3.3.2 The principle of independence

In this study, the selection of indicators follows the principle of independence, and the indicators selected for the study are clearly bounded by their connotations. The indicators at each level are unique in their connotations, so that they cannot be substituted for each other. In addition, it ensures that the subjects' research results would not be affected by the confusion in the content of the references and the misunderstanding of the indicators. At the same time, the study would design different research tools for different subjects to ensure the reliability of the research results.

3.3.3 The principle of scientificity

In this study, the selection of indicators follows the principle of scientificity, and the indicators selected for the research are based on the SERVQUAL theoretical model to design the indicator hierarchy and construct the evaluation indicator system, so as to avoid large deviations in the research results caused by unscientific indicators. In the design process of the research tool, the author carried out a multi-dimensional verification of the reliability of the research tool to ensure its validity and credibility.

3.3.4 The principle of operability

The indicators of this study followed the principle of operability, and these indicators were selected from the obvious and significant dimensions of the quality of home-based health care service, so as to avoid excessive indexes affecting the accuracy of evaluation indicators. Meanwhile, the evaluation indicators selected in this study are measurable and quantifiable based on the actual perception of service objects.

3.4 The basis for selecting the indicator system

3.4.1 Customer perceived service quality theory and its limitations

The SERVQUAL model has been used for public service quality management for a long time. Initially, SERVQUAL was used in the fields of home appliances, banking, and telephone services. It evaluates service quality in five dimensions: reliability, assurance, responsiveness, empathy, and tangibility. As a special service product, using the SERVQUAL model as the basis of service quality evaluation has a certain degree of adaptability, but based on the special

characteristics of the home-based medical health care service products, the evaluation indicators and dimensions need to be adjusted accordingly to achieve the best evaluation dimensions.

Empathy mainly refers to whether the service personnel are attentive and courteous, respectful and considerate, and easy to contact in the service process; the home-based health care service product is the interactive feedback process between the service personnel and the service recipients in the service process. In this process, the service personnel need to maintain a certain degree of empathy for the customers, and can provide corresponding services according to the service needs shown by the elderly. In the process of service, it is necessary to communicate with the elderly according to their characteristics, and to understand their feedback on the service in time to ensure the continuity of the service process. Therefore, empathy is one of the indispensable indicator dimensions in the quality of home-based health care service.

In terms of responsiveness, it mainly examines the service personnel's communication and responsiveness to the service recipients. As the elderly is a special group of service recipients, their physical and psychological conditions are changing in the process of providing services. Therefore, home-based health care service personnel are required to have certain sensitivity, respond to the information sent by the elderly and give feedback in a timely manner. On the other hand, responsiveness requires the service personnel to communicate with the clients in a language that they can understand and accept. In the process of home-based medical health care service, most of the elderly people have certain obstacles in the process of communication as their cognitive condition declines, so it is especially important that the service personnel can use appropriate skills to understand the actual needs of the elderly and provide corresponding services.

In terms of assurance, it refers to the ability of the service provider to prioritize the interests of the client, trust the elderly, and perform the service according to professional standards. It can be seen that assurance is the most important indicator of service quality, and the professional knowledge and skills of service providers are the most important concern of the elderly in the process of home-based health care services.

In terms of reliability, it mainly refers to whether the service personnel can accurately and effectively fulfill the service promises, whether the service records are accurate and perfect, and whether the service organization is reliable. The most important aspect of this dimension is to examine the service organization itself. This is also an important reason for the varying quality of home-based medical health care services, so the management of the quality of home-based medical health care services is essentially determined by the reliability of the organization of

home-based medical health care services.

In terms of tangibility, it mainly refers to the perceptible content of the facilities and equipment provided in the service process and the grooming of service personnel. Emphasis is placed on the perceptual impressions produced by visual stimuli. Therefore, the indicator of tangibility can only be examined for the grooming of service personnel. Based on the research characteristics of this thesis, the author tries to introduce intelligent elderly equipment into the process of home-based health care service, and through intelligent supervision equipment, the scene of home-based health care can be restored in the non-traditional service environment. Therefore, the tangible indicators become the focus of this study.

Through the analysis of the interview data, the pain point of the service supervisory department is the process supervision of the home-based health care service, which by now is considered to be more traditional and less efficient. It concerns more on the effect of intelligent products on the compliance, validity and authenticity of service process management. The payers of the service are also concerned about the regulation of the home healthcare service process, but they are more concerned about the protection of privacy from the intelligent equipment. Based on the above, it can be found that the respondents have different perspectives on the process of home-based health care service supervision based on their own backgrounds, perceptions and experiences of the intelligent equipment. Therefore, in order to meet the pain points and needs of all parties, this thesis takes into account the views of all parties when selecting indicators, considering the applicability and limitations of the SERVQUAL model. In the end, the author believes that a more appropriate and comprehensive theory would be found to support the evaluation of the process management of home-based medical health care services.

3.4.2 Applicability of SPO quality assessment theory

With the analysis of the relevant literature in the field of service quality evaluation, the author found that the three-dimensional connotation of "structure", "process" and "outcome" of the SPO quality assessment model proposed by the Avedis Donabedian Model could be a suitable theoretical basis for the establishment of primary, secondary and tertiary indicators in this study (Dimick, 2010). The "structure" refers to all the hardware and software resources of the service organization, including physical and human resources, and organizational capacity. The "process" focuses on the supply behavior of the service, considering whether the service is carried out in the right way and in the right method. It mainly describes the content of the service, the time of the service, and the means of the service. The "outcome" mainly examines service

user satisfaction. The main hypothesis of this thesis lies in four aspects: personnel organization, service content, intelligent equipment, and the influence of Chinese elderly care concept on service quality. Therefore, the researcher believes that the Avedis Donabedian Model can provide sufficient theoretical support for the first-level indicators in this study.

First of all, home-based health care services are analyzed from the SPO dimension, which is a service model involving a wide range of areas and many stakeholders. On the other hand, the SPO quality assessment theory focuses more on the evaluation of service feelings, service experiences and service effects of service recipients in the service process, which can fully reflect the "person-centered" value of home-based medical health care services.

Secondly, the SPO quality assessment theory fully embodies the principle of comprehensiveness in service quality evaluation, and fully reflects the top-down, inside-out thinking dimension of the researcher. Therefore, the evaluation of service quality no longer only collects the evaluation of service results from service recipients, but also includes the internal personnel of service organizations, service payers, and the concerns of governmental regulatory authorities about the service.

Finally, the home-based medical health care service studied in this thesis has the basic attributes of health care service but is more complicated than that. The service quality management in the home service scenario is inherently complex and challenging, in contrast to the service model in a purely institutional scenario. How to use the lowest cost investment to obtain more effective service quality supervision has been the pain point that people engaged in home health care services have been trying to solve in recent years. Other issues include the provision of services based on special service scenarios, with the characteristics of invisibility, difficult to control, easy to pass away. Therefore, this study subdivides and dismantles the home-based health care service system from the SPO dimension to find measurable, quantifiable and traceable indicators, and constructs an overall home-based health care service process management system. Therefore, the theoretical basis of SPO quality assessment theory is considered to be operable.

3.4.3 Interview research

In order to ensure the validity of the indicators, the researcher used the method of qualitative research to further explore the indicators based on the indicators compiled by the author. Qualitative research is "an in-depth and holistic study of the research object using the researcher himself as the research instrument and a variety of data collection methods in a natural setting." (X. M . Chen, 2008). In this paper, we analyzed the textual information of the existing policies

related to home-based health care services, summarized the important issues on this basis, formed an interview outline, and conducted semi-structured interviews with the main regulators of home-based health care services to understand the pain points and difficulties of the regulators of home-based health care services on the quality management of home-based health care services.

In order to ensure the comprehensiveness and completeness of the study, the author selected the representative groups of home-based health care service regulators, namely, the leaders of the departments directly under the jurisdiction of home-based health care service, the professionals of health insurance departments and commercial insurance companies who are the regulators of home-based health care service payment, the practitioners of eldercare service organizations and professional scholars. A total of 20 people were interviewed in a semi-structured manner to facilitate the regulators of home-based health care services to fully express the pain points of the current quality regulation of these services (See Annex C: Additional table 1).

The interviews were designed to focus on four dimensions: the current situation of home-based medical health care services, the current situation of regulation of home-based medical health care services, the willingness to accept the process management products of home-based medical health care services, and the policy orientation of "Internet + health care". The interview outline was designed to facilitate the researcher's overall grasp and guidance of the interview process and topics. On the other hand, the interview outline was designed to be progressive, so that the participants could follow the interview process and discuss the topic in a consistent and progressive manner.

To ensure the smooth conduct of this study, the researcher used door-to-door visits out of respect for the interviewees, and selected the interviewees' workplace as the interview location. Each interview lasted approximately 50-60 minutes, and was recorded at the beginning of the interview with the consent of the interviewee, and transcribed to form a text file at the end of the interview.

The qualitative research materials for this study were selected for analysis using the Nvivo 12.0 tool, developed by QSR (Qualitative Solutions & Research) in Australia, which is primarily suitable for analyzing longitudinal studies, behavioral research, content analysis, conversation analysis, anthropology, literature review, and a mix of these methods. The use of this software increases the rigor and credibility of qualitative research. The tool is now widely used in the fields of psychology, education and public administration. By reading the content material imported into Nvivo 12.0 word by word, based on the research goals, the text is divided

into sentences, extracted semantic chunks, created free nodes, and named, compared and summarized the nodes separately to finalize the coding. Due to the specificity of the background of the regulator of home-based medical health care services, this study was coded uniformly according to the type of interviewees, interview time, interview date, and interview order. The interviewees were government officers, eldercare company owners (Coded as TBSB in Additional table 2, in Annex C), eldercare practitioners (Coded as TCYG in Additional table 2) and customers (Coded as TCJS in Additional table 2) for labeling, and among them, government officers were from two departments, which were Civil Affairs Bureau (Coded as TGMZ in Additional table 2) and Medical Insurance Bureau (Coded as TGYB in Additional table 2). With this coding, the results of the interviews were organized as shown in the following table (See Annex C: Additional table 2).

Through the combination and analysis of the interview data, the pain point of the service supervisory department is the process supervision of the home-based medical health care service, which is considered to be more traditional and less efficient. The payers of the service are also concerned about the regulation of the home healthcare service process, but they are more concerned about the protection of the privacy from the intelligent equipment and the technical issues about the equipment. Based on the above, we can find that the respondents have different backgrounds, different perceptions and experiences of the intelligent equipment, and different points of view on the supervision of the home-based health care service process. Therefore, in order to meet the pain points and needs of all parties, this paper takes into account the views of all parties when selecting the indicators.

3.5 Establishment of the indicator system

This study combines the results of the preliminary interviews and research, and integrates the needs and pain points of all parties to establish the indicator content of the home-based medical health care service operation system. The researcher believes that the four key factors for building the quality management of home-based medical health care services are affection, standardization, intelligence, and collaboration. According to the SPO health care service quality theory, service quality is influenced by the "structure-process-outcome" dimension, so this structure is also taken into account in the design of indicators for the key factors. In the process of constructing this indicator system, the researcher mainly hopes to solve the 5W2H problem, i.e., when to do (WHEN), where to do (WHERE), what to do (WHAT), who to do (WHO), whom to do (WHOM), and how to do (HOW) and how well to do (HOW MUCH) for

the process of home-based medical health care service management.

The framework of the process management system for home-based health care services is shown in Figure 3.1.
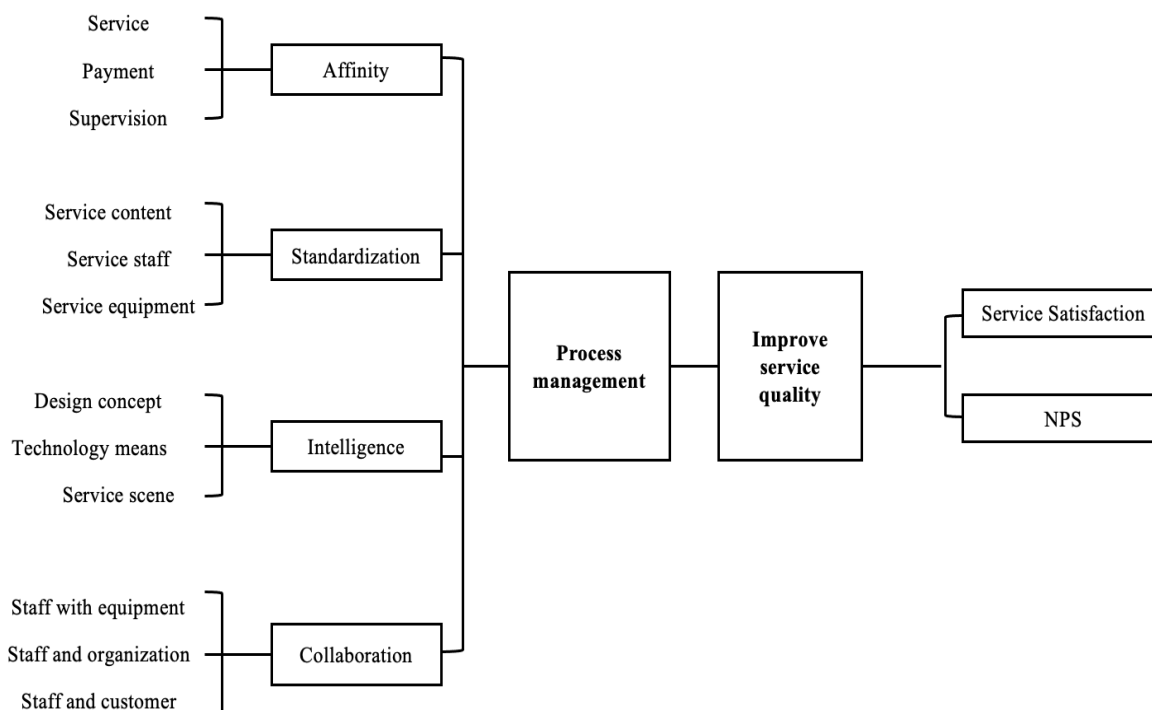
Figure 3.1 Framework of the process management system for home-based medical health care services

In order to ensure the stable and sustainable operation of the process management system of home-based medical health care services, the researcher, based on the preliminary interviews and thesis review, summarized the key factors for the construction of the process management system of home-based health care services and concluded that the above correlation exists among the four important indicators of the process management system of home-based health care services. Among them, standardization is the core element of the whole system operation, and the author believes that the basis for the quality of services is the establishment of standardization. The basis for ensuring service quality is the establishment of standardization, and the establishment of standardization cannot only be superficial, but also requires the organic combination of personnel, intelligent equipment and organization to be truly implemented. As the focus of attention of all parties in the field of home-based health care, intelligent equipment has an indispensable role in the operation of the entire system, the quality-of-service supervision in the home scene is often referred to as the "black box". With the help of intelligent supervision equipment, we can reduce the cost of manpower as well as supervising the service quality of home scene quickly and effectively. The indicators of affinity fully highlight the current

situation of home-based health care service with Chinese characteristics, and the special service concept, supervision method and payment method become important factors influencing the evaluation of home-based health care service quality. Only when the above three are fully integrated and reach synergistic development can the ultimate goal of home-based health care service process management be realized.

3.5.1 Affinity dimension

The participation of children in the evaluation and knowledge of the service process is crucial in the process of home-based health care services with Chinese characteristics. Therefore, in the process of planning the indicator dimensions, this study not only considers the evaluation of the service by the service recipients, but also takes into account the right to know of the children who are the payers. Under such a complex payment system, it is important to assess whether the needs of all parties can be fully considered and whether a more comprehensive and effective service feedback can be provided. Finally, from the perspective of the regulatory mechanism, it is necessary to fully consider the needs of different regulatory concepts, regulatory methods, and regulatory targets for obtaining different dimensions of information in the service process. To synthesize the above, this paper combines SPO quality assessment theory and decomposes the affinity indicator into details contents.

3.5.2 Standardization dimension

Standardization is the cornerstone of the quality assurance of home-based health care services. At present, this kind of services is still in the initial stage, with insufficient market supply, uneven quality of practitioners, and limited government financial investment, all of which restrict the quality of home-based medical health care services. Except for a few developed regions where home-based medical health care services are provided, the majority of regional service organizations have not yet paid attention to the construction of a standardized system. In this thesis, the researcher defines standardization as the core element of the whole system operation, and focuses on three perspectives: service content, service personnel, service equipment and environment, and believes that the standardization system can be put into practice only when the three dimensions are planned together. Firstly, from the perspective of personnel, the researcher follows the dimensions of SPO quality evaluation theory, starts from the overall personnel management process of recruitment, training and motivation, and aims to select service personnel who are "willing to work, good at work, eager to work, efficient,

energetic, with a smiling service attitude and high professionalism". From the perspective of service content, we focus on the degree of consistency between different areas of the same organization, so as to build a unified service evaluation indicator. From the role of service equipment and environment, we aim to build a standardized service scene with the goal of visualizing and restoring the home service scene. Integrating all factors, we jointly build standardized indicator dimensions. In the light of the above, the standardized indicators are decomposed into details contents.

3.5.3 Intelligence dimension

With the new elderly care mode of intelligent elderly care being proposed, more and more scholars focus on using intelligent equipment to provide high-quality and enjoyable elderly care services for the elderly. Moreover, in the continuous development of technology, intelligent elderly care equipment begins to enter every aspect of the elderly's life, in improving the quality of life and achieving friendly interaction between technology and people. In this study, we consider the service experience of users and important relations at the beginning of the design of the intelligent equipment, and the improvement of service quality and optimization of operational efficiency as the goal of the use of the equipment. In the design process, we consider the degree of support for the use of intelligent equipment within the organization to ensure the promotion mode of the use of intelligent equipment on the ground. Eventually, we hope to establish a complete solution of the trinity of software, hardware and scenarios. In the technical means, this study introduces advanced neural network and knowledge graph as the underlying algorithm logic of the system platform, combined with the latest ASR (Automatic Speech Recognition) technology and dynamic motion capture technology, to present the data results in the form of visualization. In the dimension of the service scene, we fully consider the characteristics of the service scene under the home scenario, such as light, acoustic environment, network environment and other factors on the use of intelligent equipment constraints, and select suitable technical means for service scene feature collection, and finally achieve remote home service scene rebuilding. The intelligence indicator is decomposed into the details content.

3.5.4 Collaboration dimension

Based on the above dimensions, the collaboration dimension mainly considers three aspects. Firstly, the human-machine collaboration dimension between the service personnel and the intelligent equipment within the organization. At this stage, the front-line practitioners of home-

based health care services do not have a high degree of recognition and compliance with the use of intelligent equipment. Therefore, the concept propagation and training of the service personnel from different dimensions become an important influence factor on the utilization rate of intelligent equipment. On the other hand, in the top-down collaboration dimension between employees and the organization, the introduction of intelligent equipment is the most important strategic goal and development direction of the study organization. However, the achievement of this strategic goal necessarily requires top-down communication within the organization to ensure that employees within the organization are aware of, understand, and agree with the development direction of the organization. The last one is the internal and external synergy dimension between employees and customers. In this study, we break away from the traditional single perspective of service quality evaluation from the customer's point of view only, and use the "Professional-Customer Relationship Dynamic Model" to perceive and analyze the needs of service recipients from the professional point of view and the employee's point of view, fully considering the employee's own experience and perception.

In summary, decomposed indicators of above four dimensions are shown in Table 3.1.

Table 3.1 Affinity, standardization, intelligence and collaboration indicator decomposition

Dimension	Indicator	Decomposition
A1-Affinity Service Concept	**Structural Dimension**	Internal "person-centered" care concept and internal staff awareness of the company
		Provide appropriate services based on the concept of "self-sustainable support".
		Leverage the design principle of "participatory" to give customers and families an affinity service experience
	Process Dimension	Designing the appropriate product portfolios according to customs, cultural beliefs, living style and environment
		Establish co-care relationships with family members, design service content for family participation, and regularly empower family members
		Provide information on the service experience of customers and family members using intelligent equipment combined with "service blue print" touchpoints
	Result Dimension	Internal staff and customers agreement on the corporate service principle
		Understand and respect the service feelings and feedback of customers and family members, and continuously adjust the service according to the feedback
		Make customers and family members identify with the brand, have loyalty and actively recommend it to partners (NPS)
A2 Payment Mechanism	**Structural Dimension**	Format an innovative commercial insurance service product mode with the concept of "protection as the core, integrating service and risk control"

A3 Supervision Mechanism	**Process Dimension**	Uphold the concept of "need-based, moderate and inclusive" to establish long-term care insurance system, and the innovate and optimize payment mode of socialized fund raising
		"Individualized", accepting customers to choose the payment mode according to their own situation
		Design commercial insurance service products for "claims service"
		Provide differential contribution treatment with reference to the "Long-term Care Insurance" assessment level
	Result Dimension	Self-pay service options based on "individualized" needs
		Productization of medical and health care services to meet customer needs (service matching rate)
		Enhance the satisfaction rate of customer purchasing
	Structural Dimension	Promote "command-based supervision" to "intelligent supervision" as the guiding direction for the design of the organization's internal supervision system
		Uphold the regulatory principles of "liberalizing the front end, coordinating the middle end, and controlling the back end", and explore the transformation from result regulation to process regulation
		Promote the use of service regulation based on caregiving relationships and residential settings in China
	Process Dimension	Use intelligent equipment to push service warning signals during the service process and organize management personnel to take corrective measures in a timely manner
		Use "service points-track-project scene confirmation" to achieve remote service scene restoration during service process
		Provide timely service information and feedback to customer's important contacts during the service process
	Result Dimension	The extent to which the regulatory principles is shared with in the organization and by customers
		The regulatory effectiveness of the Intelligent supervision tools
		The degree of recognition of service supervision by customers and important relations
B1 Service Staff	**Structural Dimension**	Hold recruitment guidelines of "willing to work, well on work, eager to work, efficient and energetic service attitude with a smile and high professionalism" for service personnel
		Uphold the principle of "all about staff progress" for service staff training
		Flexible use of positive and negative incentives to build a service personnel incentive system
	Process Dimension	Follow the C-SPI training system to develop service staffs' competency
		Establish a standard "star rating" career advancement path for service staff
		Qualification certificate of service staff in accordance with national requirements
		Regular training and assessment of service personnel according to specifications
	Result Dimension	Receive regular talent inventory and job promotion according to norms for the service staff
		Provide qualification materials according to the specifications during service process of the service staff
B2 Service Content	**Structural Dimension**	Consistent service offerings from different regional institutions of the service organization

B3 **Service** **Equipment and** **Environment**	**Process** **Dimension**	Standardized service processes provided by different regional organizations of the service organization
		Consistent service pricing across different regions of the service organization
		Ensure the service process is completed on time and in full according to the promised service time
		Sate the key guideline and key execution steps based on the requirement during the service process
		Have a standardized process for handling and reporting of emergencies in the service process
	Result **Dimension**	Unified service evaluation indicators
		Service adverse event rate
		Service error rate=0
	Structural **Dimension**	Build a remote home-based service scene with the goal of "visualizing and restoring"
		Service equipment configuration planning with the goal of "uniformity and ease of use" in the use of service equipment
	Process **Dimension**	Construct a standardized 3D data model of the home-based service environment with the help of VR technology
		Big data to collect service site information and establish a standard information base for home-based services
	Result **Dimension**	Use of standardized service equipment and service tools in the service process
		Carry out using standardized and regulated service procedures during the service process
C1 **Design** **Principle**	**Structural** **Dimension**	Build a process supervision system with the strategic goal of improving service quality and optimizing operational efficiency
		Design "5W2H" as the goal of the evaluation results supervision dimension
	Process **Dimension**	The extent to which the organization has actively invested internally to support the implementation of a digital intelligent regulatory system
		Provide mode training within the organization to ensure that the concept is recognized and can be implemented on the ground
	Result **Dimension**	Form a trinity of software, hardware and scenario solutions
C2 **Technology**	**Structural** **Dimension**	Expect to use the combination of intelligent hardware and software to solve the core goal of home service quality process supervision
		Expect the service process to use algorithmic models to achieve automatic pushing of service guidance to service personnel as the direction of thinking
		Look forward to the use of data analytics to show the service site supervision data in real time to solve the problem of health insurance supervision as an idea
	Process **Dimension**	Use neural networks and knowledge graphs to build the underlying algorithm logic of the system platform, and link the knowledge graph nodes to automatically push the underlying corresponding disease service operation guidance
		Utilize ASR speech recognition engine and dynamic motion capture technology as a means of on-site data collection
		Utilize health care regulatory cockpit to display regulatory design by way of a large data screen
	Result	Service personnel find the intelligent equipment operation friendly,

	Dimension	convenient and practical (usage rate)
C3 Service scene	**Structural Dimension**	Work order execution analysis: statistics on service time/ space compliance, service content compliance, and service satisfaction
		Fully consider the characteristics of the home service scene (light, acoustic environment, network environment) to choose the appropriate intelligent supervision means
		During the service process, fully consider customer privacy protection and information security
	Process Dimension	During the service process, timely and accurate identification of service scene signs and timely data transmission
		Service scenario design fully considers the service experience of customers and important relations
	Result Dimension	Identify effective service features (accuracy, effectiveness of service scenario reduction)
		Level of privacy protection
D1 Staff-equipment collaboration (human-machine collaboration)	**Structural Dimension**	Design intelligent equipment based on the concept of "user experience" for friendliness
		Design a path for employees to use intelligent equipment based on "standardized" service processes
		Design intelligence training programs for employees based on the results of the "competency" analysis
	Process Dimension	Regularly iterate on the interface design and functional modules of intelligent equipment based on employee experience
		Regularly collect feedback from employees on the use of intelligent equipment and optimize the usage path
		Use effective incentives to motivate employees to use intelligent aging equipment
	Result Dimension	Equipment utilization rate
D2 Employee-organization synergy (top-down collaboration)	**Structural Dimension**	Employees understand the organization's strategic goals, identify with the development goals, and see the organization's success as their responsibility
		Employees have open communication channels and can participate in the organization's strategic development planning
	Process Dimension	Communicate the organization's strategic goals and development direction to employees and channel their commitment to the goals
		Collect suggestions and satisfaction feedback from employees to optimize the management of the organization
	Result Dimension	Employee satisfaction
		Employee turnover rate
		Employee Human Performance Analysis
D3 Employee-customer synergy (internal and external collaboration)	**Structural Dimension**	Construct a "professional-client relationship dynamic model" to perceive and analyze client needs from a professional perspective
		Perceive and analyze customer needs by following the "end-to-end" process from customer needs
	Process Dimension	Staff provide services based on professional experience to identify customer needs in a timely manner
		Staff to provide services in the process of active communication with customers according to customer feedback to provide adjusted service content
	Result Dimension	Customer recognition of service personnel
		The degree to which service personnel perceive customers

Chapter 4: Questionnaire Survey and Indicators Verification

4.1 Indicator system survey questionnaire design

4.1.1 Calculation of weights for primary indicators

The research questionnaire was designed based on the indicator dimensions established by the preliminary interviews and the pre-survey results. Because different dimensions have different degrees of influence on the service process management, the researcher set the weights of the factors of different dimensions to ensure the reasonableness of the research results. Ultimately, through data analysis, the weights for primary indicators are determined. From Table 4.1, we can see that the weights of the indicators of home-based health care services are 32.56%, 31.02%, 18, 54%, and 17.89% respectively.

Table 4.1 Primary Indicator Weight Distribution Table

	Rotated Posterior Variance Explanation Ratio	Weights
Factor 1 – Standardization	21.737%	32.56%
Factor 2 -- Affinity	20.712%	31.02%
Factor 3 – Intelligence	12.379%	18.54%
Factor 4 -- Collaboration	11.942%	17. 89%

It can be seen from the above results that standardization is the most important in home-based health care services, followed by affinity, intelligence and collaboration. This result is also consistent with the reality of home care services. The author also believes that in the process of home-based health care services, service standardization will directly affect the quality of services.

4.1.2 Calculation of secondary indicator weights

Based on the data collected from the pre-survey, the weights of the secondary indicators were further analyzed and determined. The Analytic Hierarchy Process (AHP) decomposes the problem into different constituent factors according to the nature of the problem and the overall goal to be achieved, and then aggregates the factors into different levels according to their interrelationships and affiliations to form a multi-level analysis structural model, so that the problem ultimately boils down to the determination of the relative importance, or the ranking of relative priorities of the lowest level (the solution and measurements for decision making) versus the highest level (overall goal). The analysis of weights among the indicators is detailed

in Table 4.2.

Table 4.2 Results of Indicator Weighting Analysis

Indicators	Eigenvectors	Weights
Service Principle	0.722	0.04513
Supervision Principle	0.722	0.04513
Payment Principle	0.693	0.04332
Service Content	0.722	0.04513
Service Personnel	0.693	0.04332
Service Equipment and Environment	0.866	0.05415
Design Principle	0.823	0.05144
Technology	0.722	0.04513
Service Scenario	0.722	0.04513
Employee-equipment Collaboration	0.722	0.04513
Employee-customer Collaboration	0.722	0.04513
Employee-organizations Collaboration	0.722	0.04513

According to the results of the weighting analysis based on the AHP method, the weighting of the 12 dimensions of the secondary indicators is relatively balanced, but the overall weighting of the Service Equipment and Environment, and the Design Principle of the Intelligent dimension is relatively high, 0.05415 and 0.05144 respectively, which shows that in the pre-study stage, the people under investigation are more concerned about the design and use of intelligent equipment in the process of home-based health care service management.

4.1.3 Evaluation criteria determination

This research questionnaire is based on the SERVQUAL model and uses a 5-point Likert scale to evaluate service quality (See Annex C: Additional table 3).

4.2 Questionnaire survey on home-based health care service indicator system

4.2.1 Research areas

In China, there are many provincial areas facing the population aging. Over 13% of population in these areas are above 65 years old, and Shanghai is one of these provincial areas, reaching 16.3% (See Annex D: Additional figure 2). Further, the 16.3% of aging population made Shanghai become one of the top 5 cities (See Annex D: Additional figure 3) facing serious aging population problems in China (the average proportion of aging population in China is 13.5%). After choosing Shanghai as main area of study, author then selected six districts in Shanghai with a high proportion of ageing population, which are all over 27.5%. They are CN (Chang

Ning), XH (Xu Hui), JA (Jing An), MH (Min Hang), HP (Huang Pu), YP (Yang Pu), and PD (Pu Dong) districts respectively. These seven districts have a high percentage of aging population, a growing elderly population, and large differences in the economic and income status of elderly residents (See Annex D: Additional figure 4). More importantly, these districts were selected as pilot areas for long-term care insurance by the government of Shanghai. Therefore, these seven districts in Shanghai are of high value for exploring the needs of home-based health care for the elderly.

4.2.2 Research objects

The research population in this study mainly consists of seniors and their family members who receive the services, as well as front-line employees in the home-based health care industry. The elderly who receives home-based health care services in this study are mainly those who are covered by Shanghai's long-term care insurance. They receive different kinds of services according to their long-term care insurance assessment level.

4.2.3 Research methods

In this study, questionnaires were filled out by one-to-one interviews, with interviewers carrying uniform questionnaires into households and completing the questionnaires on the premises. A total of 2700 questionnaires were distributed in this study with a recovery rate of 99%, corresponding to 2429 valid questionnaires collected. Some questionnaires were excluded because of the missing values. The valid ratio of the questionnaire is 89.9%, which meets the requirements of the survey research. In order to ensure the validity of the research results and to ensure that the elderly can be sampled from various types of home-based health care services, the survey was conducted using a centralized whole-group sampling method.

The collected data were analyzed by using EXCEL and SPSS20.0, and the descriptive statistics and correlation analysis were applied to analyze the results.

4.2.4 Questionnaire design

Based on the pre-survey questionnaire, this study combined the dimensions and indicators of the questionnaire and finally formed a formal *Home-Based Intelligent Medical Care Service Questionnaire*. The questionnaire consists of two parts. The first part is the basic data, including name, gender, age, education level, monthly income, area of residence, and the care level assessed by the long-term care insurance. The second part of the questionnaire relates to the

satisfaction of the service users with the home-based intelligent medical care services, which contains four level indicators: affinity, standardization, intelligence and collaboration, with corresponding questions under each indicator. The rating standard is based on the gap between the perceived service and the expected service as an indicator of service users' satisfaction with home-based health care services.

4.3 Analysis of pre-test data for the home-based medical services indicator system

4.3.1 Basic information of sampling

Basic information indicators such as age, education level, and income status have a great influence on the perception of the quality of home-based care services. Therefore, this survey collected basic information on the respondents, including gender, age, education level, income status, and living area. The detailed information is displayed in Annex C (Additional table 4).

4.3.1.1 Gender distribution

The survey collected 2429 samples, of which 986 were male, accounting for 40.6% of the total, and 1443 were female, accounting for 59.4% of the total. From this, we can see that most of the people receiving home care services are women (See Annex D: Additional figure 5).

4.3.1.2 Age distribution

The most of the survey respondents are aged 80-89, accounting for 38% of the total, followed by those aged 70-79, accounting for 26% of the total. It should be emphasized that 11% of the survey respondents are aged 90 or older. The 60-69 age group accounts for 17% of respondents. This data further demonstrates the importance of home-based care services for the aging population (See Annex D: Additional figure 6).

4.3.1.3 Level of education

The research sample shows that the aged with junior high school education or above account for 82.1% of the total surveyed population. Among them, 36.2% of them has junior high school degree, 25% has technical secondary school/senior high school, 10.6% has college and 10.3% has bachelor's degree or above (See Annex D: Additional figure 7). Further analysis of the data reveals that the educational status of the elderly who receive home-based health care services is related to the special background of the era they experienced, with most of them not having

greater access to education.

4.3.1.4 Income status

The monthly income of the researched population was concentrated in the range of 3,000-5,999 yuan, accounting for 70.9% of the total number of people, followed by the elderly with incomes in the range of 5,999-8,999 yuan which accounted for 16.8%. The high-income elderly with monthly incomes over 9,000 yuan accounted for only 1.9%. Those with a monthly income of less than 2999 yuan accounted for 10.4% (See Annex D: Additional figure 8). It can be found that most of the elderly receiving home-based care services are concentrated in middle-income households.

4.3.1.5 Living mode

According to the survey results (See Annex D: Additional figure 9), 58.8% of the elderly in this survey live with their spouses, 23.6% live with their children, and 17.6% live alone. It can be seen that most of the elderly still follow the traditional Chinese principle of caring for the aged.

4.3.1.6 Residential area distribution

According to the survey results (See Annex D: Additional figure 10), most of the sample data came from the CN district, accounting for 43.6% of the total. It is mainly because CN is a pilot area for Shanghai's home-based health care services, where a relatively standardized operation mode of these services has been formed. It was followed by the XH region, which accounted for 19.6% of the total. This region is the center of Shanghai's urban area and has a high concentration of senior citizens. The third-largest region is JA, accounting for 17% of the total, where the economic status of the elderly population is significantly better than in other regions, and where the income gap between the elderly and the elderly is larger.

4.3.2 Service indicator result analysis

4.3.2.1 Comparative analysis of mean values of data

The results of the research between the different dimensions were mainly quantified by calculating the gap between the desired service quality and the perceived service quality, and the results were analyzed by comparing the mean values and effective percentages. The author selects indicators with obviously lower mean values than the overall mean value, as shown in Figure 4.1. These indicators would be evaluated after interventions.
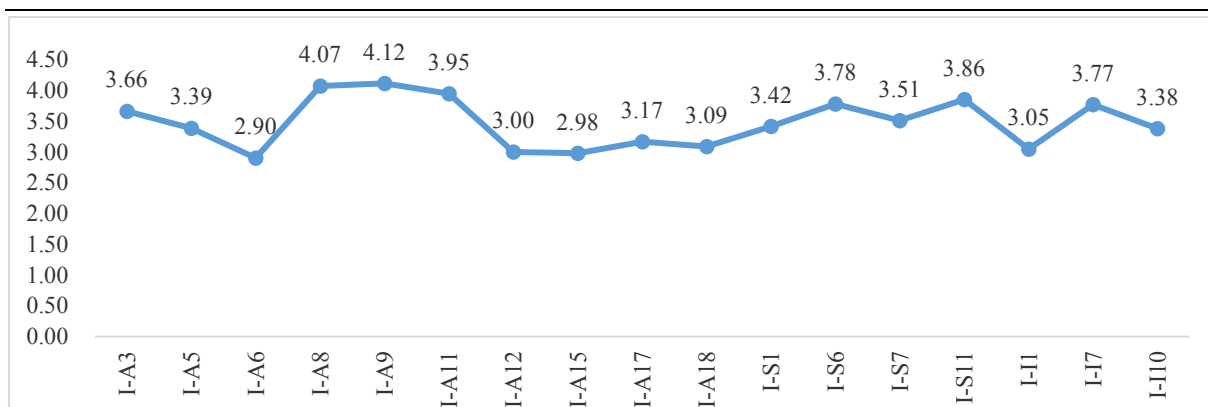
Figure 4.1 Comparison data of indicators with low mean values of the questionnaire on the operation and management of the home-based health care service process

According to the mean summary of data, the overall satisfaction level of respondents with the overall service quality of home-based health care services is moderate, with an overall mean value of 4.13. Most of the dimensions are in line with their own expectations, but there is still space for further improvement. Among the 52 indicators in this research, the results of three dimensions are significantly lower than the average value, which are:

- Indicator I-A6 - You expect the service personnel to explain the service principle to you and ensure that you know accurately, with a score of 2.903;

- Indicator I-A12 - You expect that the service provider will use intelligent monitoring equipment during the service, with a score of 3.0;

- Indicator I-A15 - You expect that the service staff will use intelligent equipment to send timely service warning signals in the service process and can take corrective measures in time, with a score of 2.978.

Through the above indicators, we can find that the interviewees' expectations of the actual service on the service personnel's promotion of service principle, the service personnel's use of intelligent equipment, and the service warning information pushing in the service process are all lower than the expectations. Further analysis of the remaining research indicators reveals that there are still six dimensions whose results are above the median but below the overall mean, namely:

- Indicator I-A3 - You expect that the service provider understands you and your family members' needs and concerns, with a score of 3.388;

- Indicator I-A17 - You expect the service personnel to provide timely service information and feedback to your important relations, with a score of 3.166;

- Indicator I-A18 - Your family expects the service personnel to explain the existing supervisory concept and method to them, with a score of 3.087;

- Indicator I-S1 - You expect that the service personnel meet the national requirements for credentials, with a score of 3.415;

- Indicator I-I1 – You expect the extent to which the organization actively invests internally to support the implementation of digital intelligent supervision system, with a score of 3.049;

- Indicator I-I10 - You expect the service process to fully consider the characteristics of the home service scene (light, acoustic environment, network environment) to choose the appropriate intelligent supervision means, with a score of 3.381.

Through the above, it can be found that the interviewees are more concerned about the participation of family members, the qualification of service personnel, and the degree of investment of the service organization in intelligent supervision equipment, the influence of the environment of the home scene on intelligent equipment. For the above, the researcher carried out further in-depth analysis and research on the above indicators.

4.3.2.2 Analysis of key dimensional indicators

1) Affinity Dimension

Table 4.3 shows three indicators (I-A6, I-A12, I-A15) have the lowest mean values in the affinity dimension, which are also significantly lower than the overall mean value 4.13. This indicates that the needs of " Informing customers of the service concept of affinity ", " using monitoring equipment in the service process ", and " sending timely service warning to customers and can take corrective measures in time " were unmet as expected. So, researcher chooses these indicators to analyze in detail.

Table 4.3 Affinity indicator analysis

Identifier	Affinity Indicator	Mean	Std
I-A1	You expect the provider to understand your existing abilities and strengths to provide a care plan	4.246	0.708
I-A2	You expect that the provider will encourage and support your family members to participate in care and activities.	4.497	0.549
I-A3	You expect that the provider selects services based on your customs, cultural beliefs, and interests	3.662	0.830
I-A4	You expect that the provider will work in partnership with your family's primary caregiver.	4.294	0.674
I-A5	You expect that the service provider understands you and your family members' needs and concerns	3.388	0.731
I-A6	You expect that the service provider will educate you about the service concept and ensure that you are prepared to know it	2.903	0.853
I-A7	You expect that the service provider will offer and recommend service business insurance products to you	4.427	0.727

I-A8	You expect that the service provider will provide you with differentiated premiums in strict compliance with the LTC (Long Term Care) insurance assessment requirements	4.072	0.833
I-A9	You expect that the service provider will provide you with self-pay service options based on your individual needs	4.115	0.797
I-A10	You expect that the services provided to you by the provider will meet your actual needs	4.637	0.482
I-A11	You expect that the service provider makes you will to consistently choose to purchase the service	3.946	0.832
I-A12	You expect that the service provider will use intelligent monitoring equipment during the service	3.000	1.003
I-A13	You expect the service personnel to provide regular feedback during the service process	4.437	0.617
I-A14	You expect that the service provider will choose the supervision method that is appropriate for your care relationship and living environment	4.377	0.698
I-A15	You expect that the service staff will use intelligent equipment to send timely service warning signals in the service process and can take corrective measures in time	2.978	0.883
I-A16	You expect the service personnel to provide facial recognition punching and service process prompting operation based on the equipment	4.216	0.797
I-A17	You expect the service personnel to provide timely service information and feedback to your important relations	3.166	0.879
I-A18	You expect that service personnel will tell you about existing supervision concepts and methods	4.689	0.463

Legend: Blue indicators have high mean values, and the reds have low mean values

About 74% (Strongly agree and Agree) of respondents hope that the service provider can explain the service concept to them; On the other hand, respondents have high expectations for the use of intelligent equipment in service process for supervision. About 71% (Strongly agree and Agree) of respondents hope to integrate intelligent supervision equipment into their services to ensure security. At the same time, 56% (Strongly agree and Agree) of respondents expect to use intelligent method to manage abnormal services and correct errors in real-time (See Annex D: Additional figure 11).

Based on the current situation, most of the organizations and institutions providing home-based health care services have not given much thought and exploration to the service principle, and only regard the provision of services as a simple supply-demand-sales relationship. However, as far as home-based health care service itself is concerned, its essence has certain public service or welfare service attributes. As for the organizations and practitioners who are involved in providing the service, they need to uphold their own sense of service mission and maintain the "people-oriented" service attitude and attributes, in order to play a certain role in guaranteeing the service quality to a certain extent. The author believes that the service principle plays a vital role in the improvement and development of service quality. It is necessary to establish the correct service principle of service personnel, and effectively ensure that service

practitioners implement it accordingly.

In addition, the results of the evaluation of the quality of home-based care services vary under different living styles, so the researcher believes that there is a degree of correlation between the evaluation of the quality of home-based care services based on the traditional Chinese principle of old age and the mode of support.

On the one hand, since most elderly people's pension income is in the range of RMB 3,000-5,999, there is a certain degree of pressure to pay for the full cost of home-based care services, so most of the elderly people's elderly service expenses are supported by their children. However, driven by the elderly people's beliefs of frugality and consideration for their children, most of the elderly people's feedback on service quality is significantly higher than their children's. At the same time, children, as the financial payer, have much higher expectations of home-based health care services than their parents based on their social and cultural background and their own education.

On the other hand, the overall economic and educational level in Shanghai is in the forefront of the country, and the traditional way of aging has gradually transformed into social aging. With the change of the overall consumption principle, the author believes that the evaluation of the quality of home-based health care services should not only focus on the satisfaction of the service needs of the elderly, but should further consider the needs and expectations of their children, so that the overall quality of home medical care services can be further improved. In this way, the overall quality of home-based health care services can be further improved.

In the course of the study, the important relatives of the elderly interviewed are much more concerned about the service process than expected. In the existing home-based health care services, the focus is always on the service recipients themselves, and the service contents and service plans are based on the traditional "people-oriented" care concept, ignoring the environment in which they live. Under the traditional Chinese culture, customs and ways of aging, most of the elderly people receiving services are not direct service payers, so their expectations of service quality are much lower than the actual situation. On the contrary, children, government and insurance agencies, who are the real payers, are the ones who should really pay attention to their feedback on the quality of the service, which directly affects the sustainability of the service. Therefore, how to pay attention to the feedback of service payers, establish an alliance with them, and jointly improve service quality has become an important direction for research and exploration.

2）Standardization Dimension

Table 4.4 shows three indicators (I-S1，I-S6, I-S7) have the lowest mean values in the standardization dimension, which are also significantly lower than the overall mean value 4.13. This indicates that the needs of "Service personnel meet the national requirements for credentials ", " Service organizations provide consistent service prices among different regions ", and " The service is completed on time and the service sustains sufficient time as promised" were unmet as expected. So, researcher chooses these indicators to analyze in detail.

Table 4.4 Standardization indicator analysis

Identifier	Standardization Indicator	Mean	Std
I-S1	You expect that the service personnel meet the national requirements for credentials	3.415	0.673
I-S2	You expect the service personnel to conduct regular training and assessment according to the norms	4.711	0.454
I-S3	You expect the service personnel to show the qualification materials according to the specification in the process of service provision	4.690	0.463
I-S4	You expect/perception service organization to provide consistent service products in different regional organizations	4.537	0.585
I-S5	You expect the service organization to provide a standardized service process in different regions	4.262	0.717
I-S6	You expect the service organization to provide consistent service prices among different regions	3.782	0.749
I-S7	You expect the service process to be completed on time and in full according to the promised service time	3.509	0.555
I-S8	You expect that the service process will be executed according to the key guideline and key steps	4.681	0.466
I-S9	You expect that there is a standardized process for handling and reporting of emergencies in the service process	4.244	0.695
I-S10	You expect the service organization to provide unified service evaluation indicators	4.593	0.500

Legend: Blue indicators have high mean values, and the reds have low mean values

The respondents pay high attention to the qualifications of service personnel, among which 41% (Strongly agree and Agree) of them hope to know the relevant qualifications of service personnel. At the same time, 47% (Strongly agree and Agree) of respondents expect service organizations and service personnel to provide professional and standardized services whenever and wherever possible. And 39% (Strongly agree and Agree) of respondents expect the service process to be completed on time and in full according to the promised service time (See Annex D: Additional figure 12).

The results indicate that respondents were very concerned about the service providers' qualifications and skills. And the main concerns are highly related to the education levels and professional training. So, the researcher investigated the background of eldercare service providers within the company and found that majority of them were farmers and laid-off

workers previously, who were not well-educated and trained. Moreover, the government also did not have a standard training system and certificated system for eldercare service providers, which led to their lack of professional skills. More, this situation may lead to customer's dissatisfaction.

After analyzing the survey result, the author believed that service providers were very crucial in service quality. So, the overall operational strategy took the human resource recruitment, training, assessment, and incentive system into consideration. And then, the service providers should have access to professional training in their organization and access to certificates of eldercare skills by governmental authority. Next, the organization should establish a transparent promotion mechanism for trained and certificated staff, and also set up the elimination mechanism according to the training assessment results. The author believed the above operational strategy and measures could contribute to employee management and standardization of home-based health care services. Eventually, it could benefit staff and customers.

3）Intelligence Dimension

Table 4.5 shows that three indicators (I-I1, I-I7, I-I10) have the lowest mean values in the intelligence dimension, which are also significantly lower than the overall mean value 4.13. This indicates that the needs of "organization's investment to support the implementation of digital intelligent supervision system", "Service personnel get real-time advices from equipment when facing problems in service", and "The intelligent supervision consider characteristics of home scenario " were unmet as expected. So, researcher chooses these indicators to analyze in detail.

Table 4.5 Intelligence indicator analysis

Identifier	Indicator	Mean	Std
I-I1	You expect the extent to which the organization actively invests internally to support the implementation of digital intelligent supervision system	3.049	0.942
I-I2	You expect the organization to provide model training internally to ensure the concept is recognized and can be implemented on the ground	4.451	0.657
I-I3	You expect the formation of a trinity of software, hardware and scenario solutions	4.298	0.762
I-I4	You expect the service organization to use the combination of intelligent hardware and software to solve the home-based service quality process supervision	4.171	0.829
I-I5	You expect the service process using algorithm model to achieve automatic pushing service guidance to service personnel	4.601	0.548
I-I6	You expect the use of data analysis means to show the service site supervision data in real time to solve the	4.55	0.587

	problem of health insurance supervision		
I-I7	You expect the service process to receive real-time guidance when service personnel encounter difficulties	3.768	0.815
I-I8	You expect that service personnel use voice input equipment to collect service data during the service process	4.363	0.751
I-I9	You expect that health insurance institutions can grasp service data in real time through the data screen during the service process	4.508	0.661
I-I10	You expect the service process to fully consider the characteristics of the home service scene (light, acoustic environment, network environment) to choose the appropriate intelligent supervision means	3.381	1.047
I-I11	You expect the process of service to fully consider customer privacy protection and information security	4.388	0.658
I-I12	You expect the service process to timely and accurately identify service scene signs and transmit data	4.227	0.794
I-I13	You expect the service scene design to fully consider the service experience of you and your important relations	4.358	0.730

Legend: Blue indicators have high mean values, and the reds have low mean values

About 88% of respondents concerned about the service organizations' investment in building of intelligent service supervision systems. And 94% of the respondents hope that the system can provide corresponding support and real-time guidance by intelligent equipment if they encounter difficulties in the service process (See Annex D: Additional figure 13).

Service quality supervision in the home scenario has always been the focus of attention of many parties, especially in the stage of rapid development of the elderly care industry. There are still a majority of elderly people choose home-based care services. In the traditional mode, it only relies on human resources to carry out home supervision and assessment of service quality, but the method can no longer meet the growing demand for elderly care. With the progress and development of technology and the principle of Internet+ care putting forward, more and more intelligent equipment is introduced into the home scenario, but there are still fewer tools and equipment for service quality supervision. During the research process, the interviewees generally showed high concern about the quality and service safety of home services. How to guarantee information security and privacy protection while taking into account supervision, and how to guarantee the validity and reliability of information collection in the home scenario are all important issues that need to be broken through and further investigated. On the other hand, the research on practitioners found that most of the respondents hope that the use of intelligent equipment can help them to improve their work efficiency, and others hope that the use of intelligent equipment can guarantee their own safety in the home environment. Only by designing intelligent elderly care service equipment that practitioners are willing to use and can actually help them in their work can we increase the willingness of elderly

care service practitioners to use it and ensure that the role of intelligent equipment is maximized in the service process. At the same time, as the two most important factors in the home-based care service management system, I believe that only the practitioners of the home-based care service and the intelligent service supervision equipment can play an effective synergistic role to ensure the stable operation of the home-based care service operation system, so that the quality of the home-based care service can be improved and the overall satisfaction of the elderly with the home-based care service can be improved.

4) Collaboration Dimension

Table 4.6 shows two indicators (I-C2, I-C3) have the lowest mean values in the collaboration dimension. This indicates that the needs of "service staff to identify customer's need based on professional experience and provide corresponding services ", and "Service providers can actively communicate with customers and provide adjusted services based on feedback " were unmet as expected. So, researcher chooses these indicators to analyze in detail.

Table 4.6 Collaboration indicator analysis

Identifier	Collaboration Indicator	Mean	Std
I-C1	You expect the service organization to perceive and analyze your needs from a professional perspective	4.338	0.729
I-C2	You expect the service staff to identify your needs in the service process based on professional experience and provide corresponding services in a timely manner	4.231	0.76
I-C3	You expect that the service staff will actively communicate with you during the service process and provide adjusted service content based on feedback	4.303	0.703
I-C4	You expect that the service staff will actively communicate with you during the service process and provide adjusted service content based on feedback	4.563	0.513

Legend: Blue indicators have high mean values, and the reds have low mean values

About 99% (Strongly agree and Agree) of respondents expect service personnel to identify and evaluate the actual service needs of customers based on their own professional skills. 78% (Strongly agree and Agree) of respondents expect service staff to adjust service content according to customers' needs. It can be found that the customer needs individualized service and this kind of need might change and customer expect their variable needs to be met by service personnel. So, real-time interaction between customers and service personnel is necessary in the service process. It is the foundation of quality service (See Annex D: Additional figure 14).

At the same time, home service quality management is a complex project that requires the collaboration and involvement of many parties. It is not possible to rely on a single party to achieve an overall improvement in service quality. The organizations should also optimize

service design and management system based above needs. In a word, in order to achieve a higher service quality, the customers, the service personnel and organizations should establish an effective collaboration mechanism in home-based health care service.

4.4 Questionnaire survey for practitioners of home-based health care services

The author believes that if we want to fundamentally solve the problems caused by the low satisfaction level of home-based care services presented in this study, we must build a home-based care service operation management system and ensure that all important components of the system can form an organic integration through the construction of a standard system, so as to achieve the purpose of common progress. In order to ensure the implementation of the home-based care service management system, further research has been conducted on the factors affecting the operation of home-based care service. The author believes that the crucial factor affecting the stable operation of the home-based care service operation system is the introduction of intelligent supervision equipment, and the willingness and recognition of the practitioners to use intelligent supervision equipment directly affects whether the equipment can be successfully introduced. Therefore, the author conducted in-depth research on the practitioners of home-based care service to understand their cognition of the intelligent supervisory equipment in order to ensure the smooth introduction of the intelligent equipment in the later stage.

4.4.1 Research subjects

This research mainly focuses on the practitioners of professional institutions engaged in home-based health care services in Shanghai, which mainly provide nursing care services, including daily care, pharmacy assistance, bathing assistance, meal assistance, living assistance. The practitioners of these institutions need to have a certain degree of professional ability compared with ordinary home-based health care institutions, and some of them even need to master rehabilitation massage and professional nursing skills. However, the workers in these agencies are generally older, less educated, and less conscious of service. A total of 600 questionnaires were distributed in this study, with a return rate of 99%, including 590 valid questionnaires. Some had missing values and were therefore excluded, so the effective rate of questionnaires was 98.3%, which was in line with the questionnaire return rate required for survey research.

4.4.2 Basic information on research subjects

4.4.2.1 Personnel structure

The author believes that the basic information indicators such as gender, age, education level, and years of experience of the practitioners in the home-based health care industry have a great influence on the overall promotion and implementation effect of the intelligent equipment, so this research analyzes the above information of the respondents. The result showed that about 62% of the people engaged in home-based health care services were in the age range of 41-50 years old, and only 14% of the total number of people below 40 years old. The results of this study are also in line with the overall situation of home-based health care workers in China. At the present stage, most of the people engaged in home-based health care services are laid-off workers and unemployed people, with female groups being the main service providers. This phenomenon is further confirmed by the fact that 94.6% of the total number of women in this study (See Annex C: Additional table 5). However, in home-based health care services, the clients are often totally or semi-disabled, which requires greater physical strength and energy, and on the other hand, when caring for male clients, female caregivers will face embarrassing situations such as exposure of private parts and disinhibition. These factors make the occupational safety and security of caregivers a major concern.

4.4.2.2 Educational level

In terms of educational level and job position, the result showed that about 61.4% of the research subjects for this study had less than junior high school education, 23.1% had high school education, and those with the college education and above only accounted for 15.6% of the overall. Because of the low level of education and inadequate professional skills, it becomes a major challenge for the researcher to train this group of people to master professional medical and nursing care service skills, ensure the delivery of service quality, and master the use and operation of intelligent equipment. At the same time, most of the research subjects are front-line service personnel, accounting for about 91.9% of the overall (See Annex C: Additional table 6), for this part of the population is more concerned about the salary and welfare protection, for this characteristic, how to design the staff incentive mechanism, staff promotion mechanism of the researcher becomes another key direction to consider.

4.4.2.3 Work stability

In terms of working experience, the result presented about 67.6% of the respondents of this research have worked in their current positions for one to three years, but only about 6.9% have

worked for more than three years (See Annex C: Additional table 7). In the field of home-based health care services, after having certain professional skills, health care service personnel have more choices when facing service targets and service contents. Most of them will choose relatively easy home management-type services to avoid elderly service projects, while the industry also faces factors such as low income, little training and unclear promotion paths, resulting in a high turnover rate and poor stability of health care service personnel.

4.4.2.4 Job performance expectations research

As for job performance expectations, the result showed that about 84.92% of the respondents value that they have consistent cultural values with the enterprise and become a community of interest with the enterprise; 63.76% of them attach importance to the development prospect of the industry and their own growth; It is generally believed that front-line employees value salary performance only in the third place, and front-line employees also pay much attention to the smoothness of the work process, accounting for 48.41% (See Annex C: Additional table 8).

4.4.2.5 Level of understanding of intelligent equipment

On the other hand, the researcher conducted preliminary research on the degree of understanding of intelligent equipment, through this research the researcher found that most practitioners have some understanding of intelligent equipment, in which 38.53% of the respondents said they have some understanding of intelligent-based elderly equipment, 31.19% said they know a lot, 28.44% of the respondents said they have heard of it but do not know a lot, and only 1.83% of the respondents said that they had no knowledge of intelligent-based elderly equipment at all (See Annex C: Additional table 9). This shows that with the rapid development of modern information technology, in an international city like Shanghai, the concept of intelligent-based elderly care has been known to a larger majority of people, and the public demand for this new medical and health care service model and content is increasing, and the degree of recognition is rising.

4.4.3 Analysis of research results

4.4.3.1 Comparative analysis of mean values of aggregated data

The results of the research between the different dimensions were mainly used to quantify the data by calculating the gap between the performance expectations and effort expectations of the home-based care practitioners. The results are analyzed by comparing the means, and effective percentages. The author selects the indicators with relatively low mean values and presents

them in Figure 4.2. These indicators would be evaluated after interventions.
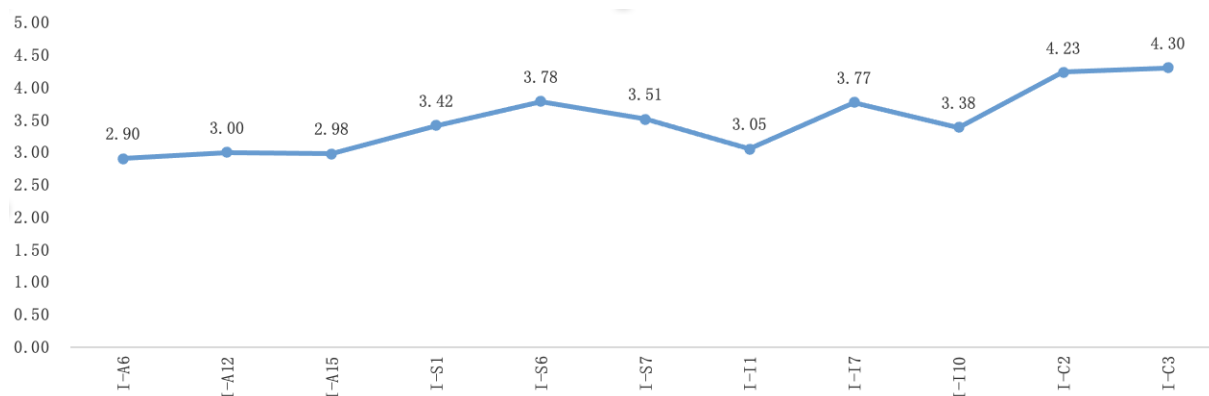
Figure 4.2 Comparison of indicators with low mean values in questionnaire survey for practitioners

According to the results of the research, it can be found that the overall performance expectations of home-based health care practitioners among the indicators of the service quality indicator system is 3.8, and they think that the existing home-based health care services are more in line with their own expectations. However, in the dimension of standardization it is obvious that the standardization of services at this stage is lower than expected, and the overall average value is 3.0, which is at an average level. Secondly, the use of intelligent equipment is also at a lower level than the other indicator dimensions, which is 3.9. Through the overall research situation, the researcher believes that too many departments exist in the home-based health care service institutions, and each is independent of each other, lacking the necessary communication and exchange channels. This situation causes confusion in the supervision of services, the service standardization system cannot be effectively established as an important reason. In view of this situation, it is important to establish a well-established standardized service system and to introduce effective means and methods of supervision to ensure that the quality of home-based health care services is effectively improved.

4.4.3.2 Analysis of the affinity dimension

Table 4.7 shows two indicators (I-A2, I-A5) that have the lowest mean values in the affinity dimension. This indicates that the needs of "Participation in the design of the service journey ", and " Consistency of organization's value and staff's personal value "were unmet as expected, from the practitioner's perspective. So, the researcher chooses these two indicators to analyze in detail.

Table 4.7 Results of the Practitioner Questionnaire on the Affinity Dimension.

Identifier	Affinity indicators	Mean value
I-A1	You expect the organization to embrace a "person-centered" philosophy of care internally and communicate it to you	4.664
I-A2	You expect to be invited to participate in the design of the service journey within the organization	4.317
I-A3	You expect the organization to design service offerings based on client characteristics	4.532
I-A4	You expect family members to be invited to participate in the service and be empowered on a regular basis	4.737
I-A5	The degree to which you expect the service principle within the organization to be consistent with your own	4.210

Legend: Blue indicators have high mean values, and the reds have low mean values

Through this survey, it can be found that 70% (Strongly agree) of practitioners are eager to keep their own value or service concept consistent with organization, and 74% (Strongly agree and Agree) of practitioners hope to participate in the design of service process, so that the service needs and humanistic care perceived from customers can be integrated into daily services (See Annex D: Additional figure 15)

4.4.3.3 Analysis of the standardization dimension

Table 4.8 shows three indicators (I-S2, I-S7, I-S9) have the lowest mean values in the standardization dimension, which are also significantly lower than the overall mean value 3.8. This indicates that the needs of "Optimizing the incentive system", "Establishment standardized handling and reporting process for emergency events", and "Building the supervision system also can ensure staff's safety" were unmet as expected, from the practitioner's perspective. So, the researcher chooses these indicators to analyze in detail.

Table 4.8 Results of the Practitioner Questionnaire on the Standardized Dimensions.

Identifier	Standardization indicators	Mean value
I-S1	You expect the partners within the organization to have a high degree of professionalism and good service attitude	2.983
I-S2	You expect the organization to establish an incentive system that combines positive and negative incentives	2.749
I-S3	You expect the organization to have a training concept based on employee progress	2.91
I-S4	You expect the organization to design a reasonable training plan according to your ability and quality	3.156
I-S5	You expect the organization to establish a reasonable promotion path	3.003
I-S6	You expect the service process to be executed according to the key guideline and key steps	3.392

I-S7	You expect the service process to have a standardized handling and reporting process for emergency events	2.644
I-S8	You expect to have a unified service evaluation indicator within the service organization	2.898
I-S9	You expect the organization to build a remote service scenario with the goal of "visualization and reversibility" of the home service scenario	2.829
I-S10	You expect service organizations to use cutting-edge technology to build process management models for home-based services	3.232
I-S11	You expect the service organization to uphold a service equipment configuration that aims for "uniformity and efficiency" in the use of service equipment	3.32
I-S12	You expect the service process to be performed using standardized and regulated service equipment and service tools	3.541

Legend: Blue indicators have high mean values, and the reds have low mean values

Through this survey, it can be found that the employees are very concerned about the remote supervision with the goal of "visualization and restoration" of home service, believing that it can promote the improvement of service standards, accounting for about 87%. At the same time, 73% (Strongly agree and Agree) of practitioners expect to be positively motivated to implement standardized service processes. In addition, 71% (Strongly agree and Agree) of practitioners hope that there can be an intelligent device in the service to assist the implementation of standardized service content and prompt abnormal situations (See Annex D: Additional figure 16).

In terms of service content, the respondents were mainly concerned about the pre, mid and post-service process. Before the service operation, whether the organization has established a standardized operation process internally and ensured that each practitioner is ready to master is the basis for service provision. During the service process, practitioners are more concerned about service safety and service risks. The home-based health care service is a service that takes place in a special setting, often with only two people at the service site, which poses greater safety risks and hazards for the female clients who are the primary caregivers. At the same time, clients receiving services in the home scenario are often elderly or chronically ill, and lack the necessary medical emergency equipment than in medical institutions, thus further increasing the risks and hazards associated with sudden illness. However, at this stage, service safety supervision and service emergency handling in the home-based health care scenario is still a difficult problem that is more difficult to break through and solve.

In terms of service equipment and environment, the respondents were mainly concerned about the configuration of service equipment and tools. At this stage, the content of home-based health care services covers a variety of aspects, including basic life care services, clinical care services, and rehabilitation and nutrition services. Different service contents and items are often

provided for different service recipients, which makes it difficult to provide uniform and standardized service tools, and at this stage, only the dress code, grooming, and basic service tools of service providers can be managed in a uniform and standardized manner. On the other hand, while new progress is being made in community health care services, it is possible to introduce intelligent tools to establish a database of the elderly in the community and to monitor and manage the health information and service contents of the elderly. Community health care service providers collect information through front-end intelligent equipment, establish standardized codes for service site environmental characteristics, and through the transmission of cloud data, can better standardize and restore realistic service scenarios.

4.4.3.4 Analysis of the intelligence dimension

Table 4.9 shows three indicators (I-I10, I-I12, I-I13) have the lowest mean values in the intelligent dimension, which are also significantly lower than the overall mean value 3.8. This indicates the need of "Provide intelligent supervision tools to fully consider the characteristics of home scenes ", "Provide intelligent supervision tools that can identify the characteristics of service scenarios in a timely and accurate manner", and "Provide intelligent supervision tools to fully consider the service experience of customers" were unmet as expected, from the practitioner's perspective. So, researcher chooses these indicators to analyze in detail.

Table 4.9 Results of the Practitioner Questionnaire on the Intelligence Dimension

Identifier	Intelligence indicators	Mean value
I-I1	You expect the organization to build a process monitoring system with the strategic goal of improving service quality and optimizing operational efficiency	4.505
I-I2	You expect the organization to design 5W2H" as the goal of the evaluation results supervision dimension	4.554
I-I3	You expect the organization to actively invest in ensuring the implementation of digital intelligence supervision	4.344
I-I4	You expect the organization to provide training on digital intelligent supervision content	4.502
I-I5	You expect the organization to provide digital intelligent supervision tools to solve the home service process supervision	4.107
I-I6	You expect the organization to provide digital intelligent supervision tools to push the service operation guidance in time	4.127
I-I7	You expect the organization to provide digital intelligent supervision tools to show the service site data in real time	4.586
I-I8	You expect the organization to provide digital intelligent supervision tool with voice recognition as input tool	4.561
I-I9	You expect the organization to provide digital intelligent supervision	4.503

Identifier	Indicator	Mean value
	tool with friendly operation and convenient use	
I-I10	You expect the organization to provide digital intelligent supervision tools to fully consider the characteristics of home scenes	2.837
I-I11	You expect the organization to provide digital intelligent supervision tools with full consideration of customer privacy protection and information security	3.231
I-I12	You expect the organization to provide digital intelligent supervision tools to identify the characteristics of service scenarios in a timely and accurate manner	2.956
I-I13	You expect the organization to provide digital intelligent supervision tools to fully consider the service experience of customers and their important relationships	3

Legend: Blue indicators have high mean values, and the reds have low mean values

Through this survey, it can be found that practitioners have high expectations for the use of intelligent equipment. Among them, 85% of practitioners hope that the company can provide intelligent equipment which can accurately identify service contents in real-time (See Annex D: Additional figure 17).

After in-depth analysis, it can be found that the strength of the organization's investment in intelligent equipment is a factor that users are more concerned about. It can be understood that users are more concerned about the social influence factor. It mainly comes from the acceptance of intelligent equipment by the social network around the users. If the service organization is actively engaged and the partners and colleagues around the user are clearly affirmative, this will significantly increase the user's willingness to use the intelligent equipment.

4.4.3.5 Analysis of the collaboration dimension

Table 4.10 shows two indicators (I-C3, I-C6) have the lowest mean values in the collaboration dimension, which are also significantly lower than the overall mean value 3.8. This indicates that the needs of " Design training programs based on the results of "competency" analysis of individual staff ", and " Setting up an effective incentive mechanism to motivate employees to use the intelligent equipment " were unmet as expected, from the practitioner's perspective. So, researcher chooses these indicators to analyze in detail.

Table 4.10 Results of the Practitioner Questionnaire on Collaboration Dimension.

Identifier	Collaboration indicators	Mean value
I-C1	You expect the organization to design digital intelligent equipment based on the concept of "user experience"	4.59
I-C2	You expect the organization to design the path of intelligent equipment based on "standardized" service processes	4.444
I-C3	You expect the organization to design training programs for intelligent equipment based on the results of	3.092

	"competency" analysis	
I-C4	You expect the organization to regularly iterate the interface design and functional modules of the intelligent equipment based on the experience of employees	4.569
I-C5	You expect the organization to regularly collect feedback from employees on the use of intelligent equipment and optimize the use path	4.537
I-C6	You expect the organization to use effective incentives to motivate employees to use the intelligent care equipment	2.812

Legend: Blue indicators have high mean values, and the reds have low mean values

Through the investigation of the collaboration indicators, it can be found that the expectation of the practitioners for the incentive mechanism for using intelligent equipment has not been met. 82% (Strongly agree and Agree) of them want to work through the use of intelligent equipment can increase revenue, and help to their own promotion within organization. And 89% (Strongly agree and Agree) of practitioners need the better training for intelligent device used and expect it can help to improve work efficiency (See Annex D: Additional figure 18).

Because many service providers have low income, low education level, and low social status. It is very hard to force them to embrace the new products and technologies. And direct incentive system might promote the use of intelligent equipment. Therefore, in order to better guarantee the input of intelligent equipment, the company should establish an effective incentive mechanism for staff. On the other hand, the home-based health care service is a job with high skill requirements, and practitioners need to continuously improve their professional abilities. This would also ensure the application of intelligent equipment in a real service situation.

4.5 Conclusion

In this study, the researcher clarifies the construction elements and builds the management and operation system of home-based health care services through the results of the preliminary research. The researcher believes that the quality of home-based health care services can be eventually improved after the interventions in four major directions: affinity, standardization, intelligence and collaboration. The researcher adopts different intervention strategies for the above elements. From the aspect of affinity, the researcher does not limit the focus to the organization of the service provider, but fully considered the family receiving home-based health care services, through the intervention of the relevant factors within the family, so as to achieve the improvement of the service model of the family organization from both internal and

external aspects. From the aspect of standardization, the researcher introduced the concepts of product design, user experience design, and user psychological analysis, based on the development of standardized service processes and the concept that services are designed, to redirect and reshape the key aspects of the home-based health care service process, and set different stimulation points to help improve the user service experience and thus enhance service quality. From the aspect of intelligence, on the premise that the affinity dimension and the standardization dimension are fully satisfied, the researcher uses intelligent supervision equipment, adopts the more advanced voice recognition technology and image recognition technology in the industry, combines wireless communication and advanced positioning technology, establishes a standard corpus of home medical care services through data algorithms, and uses cloud platform data transmission to create the first IoT equipment and monitoring system for privacy and security of home services. From the aspect of collaboration dimension, it is suggested that to establish a "people-oriented" service management system, not only focus on the service object, but really implement "people-oriented" to all aspects. The "people-oriented" corporate culture is unanimously recognized and adhered to within the company, integrating the "people-oriented" concept into the organization's vision, values and experience philosophy, striving to care for service personnel, striving to create a harmonious and comfortable working environment, establishing a perfect internal communication mechanism to ensure that employees can participate in the development of the company. A perfect internal communication mechanism will be established to ensure that employees can participate in the development of the company, make decisions, maintain positive upward and downward communication, ensure that every employee can communicate and exchange on an equal footing, truly respect employees, care for them and encourage participation. The company will give full play to the subjective initiative, stimulate the enthusiasm of the staff in the organization to serve and continuously improve the quality of service.

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Chapter 5: Operation Strategy and Implementation Effect Evaluation

5.1 Operational intervention strategy design

Through a preliminary study of the different groups of people receiving home-based health care services in Shanghai, it is easy to see that these services in Shanghai are still facing great difficulties and challenges. The problem of "having place for aging" will become extremely prominent in the next decade or two. To solve this problem, we must have a strategic vision and prepare for the future. The home-based health care service industry varies with national conditions and economic income. In addition to promoting the virtue of filial piety at the social and cultural level, it is also important to speed up the establishment of a perfect management system as an important support to ensure the home-based health care of the elderly, as shown in Figure 5.1. Based on the author's own practical experience, we believe that the essence of improving home-based health care service lies in establishing a perfect service system. To this end, we have explored and studied the framework and operation mode of home-based health care service system from different perspectives, and initially constructed a community-and-home-based health care service operation system suitable for Chinese local communities.
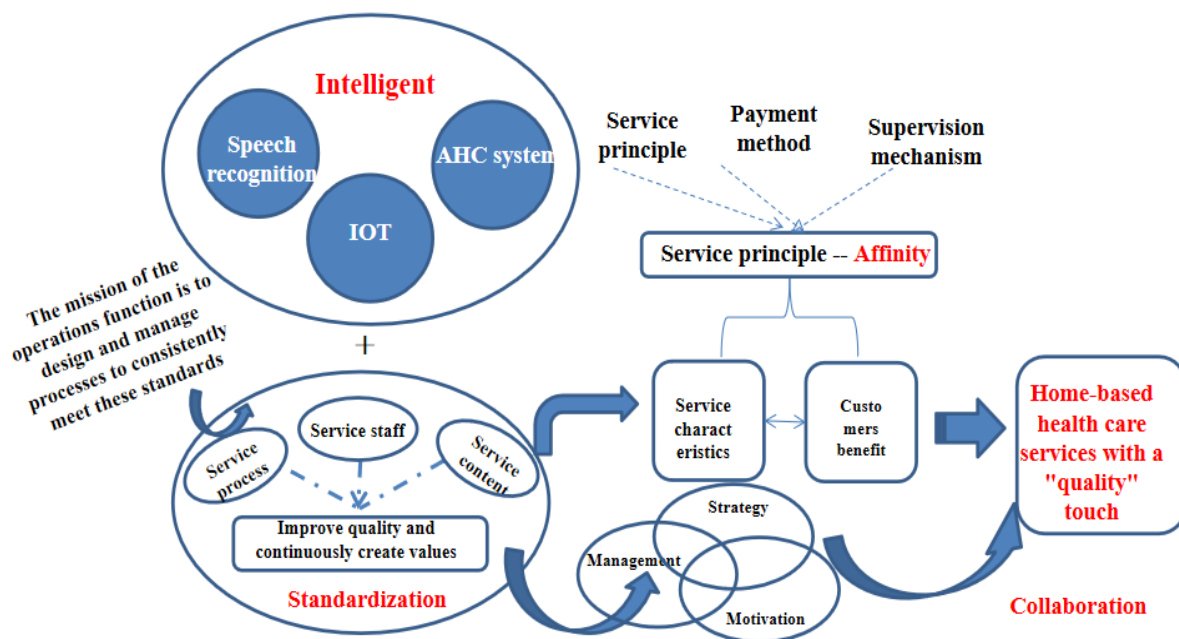
Figure 5.1 Operation system for home-based health care service process management

5.1.1 "Affinity" service concept is the foundation of meeting the new demand for health care services

From the perspective of policy, the "people-oriented" service concept is the root of affinity. The Communist Party of China insists on the fundamental purpose of people-oriented and wholehearted service, so the development of medical and health care industry with Chinese characteristics must insist on people-oriented. Further, it is necessary to respect the traditional Chinese culture, respect the elderly and respect the characteristics of the Chinese society. The culture of filial piety is an inseparable topic in Chinese medical care. In order to adapt to this change, more attention should be paid to the emotional feedback of the families of the service recipients in the process of home-based health care services, and the implementation of the concept of affinity services should be guaranteed. All services should be developed around the needs of service recipients, with customer satisfaction as the ultimate goal of the service. The other group of people is the service personnel who provide services, they are the main body of service implementation, and their service willingness and service ability directly affect the results of service quality. Being "people-oriented" means to establish a service consciousness in which the customer comes first, but also entails the need to create a pleasant working environment and atmosphere for the service personnel, stimulating their enthusiasm and vitality, so as to provide high-quality services that meet customer needs.

5.1.1.1 People-oriented" service concept from the perspective of service recipients

First of all, we understand the likes and dislikes, temperament, hobbies and habits of each elderly person and family, and actively integrate them into every aspect of the home health care service. Different people have different needs, according to different needs to provide different medical care services to make the service recipients feel care and understanding. Secondly, the service should not only focus on the physiological and physical level, but also on the various social relationships and social positions of the elderly, and grasp their new needs from the social relationships they are in, so as to improve the quality of the service and ensure the continuous improvement of the service satisfaction.

5.1.1.2 People-oriented" service concept from the perspective of service personnel

First of all, we should pay attention to the participation and self-identity of all employees, and provide service personnel with the ability to empower and enhance their skills, and promote the willingness of employees to achieve their goals. The ability, authority and willingness of employees to show excellent performance are essential prerequisites, while the willingness is

more important than others, and the mobilization of willingness is the key to improve service efficiency and service quality, so we can help mobilize the willingness of employees by recognizing and valuing them. Secondly, building people-oriented communication channels, doing a good job of professional communication and timely psychological guidance to relieve work pressure and fear, can maintain a positive attitude of employees, maintain a full work ethic, and fully stimulate the service motivation of employees. From the perspective of payment and regulation methods, the main service payment method in Shanghai area as a pilot city of long-term care insurance is still long-term care insurance. Although the long-term care insurance has achieved great success in the early stage, with the weakening of family care capacity, the increasing of average life expectancy, the frequency of chronic diseases and other factors, the existing long-term care insurance to a certain extent can no longer effectively solve the service needs of long-term care for the elderly. This situation motivated the introduction of commercial insurance services, "tailor-made " to promote exclusive medical and health care service products that meet the needs of service recipients, and further optimize the service content and service payment methods. On the other hand, before carrying out the service, professional assessors conduct a comprehensive assessment of the physical health condition of the elderly in advance and use the assessment results as the basis for selecting different care plans and rehabilitation plans, and add the assessment of mental condition and communication ability to the assessment content, so as to grasp the real condition of the service recipients more precisely and provide flexible service plans for the service recipients. In terms of supervision methods, the participation of service recipients is enhanced, and service recipients are guided to actively participate in service evaluation during the service process, and feedback from the elderly and their families is fully valued to give full play to their subjective initiative. Additionally, we actively introduce the advantages of Internet technology and create an intelligent medical and health care system to supervise the service process. In order to guarantee the acceptance of the elderly, the organization continuously strengthens the publicity of Internet, AI, 5G and other technologies, explains the use of service supervision equipment to the elderly and their families, establishes service and health alarm systems, and guarantees all-round and multi-level service supervision.

5.1.2 "Standardized" service system is a grip for a comprehensive quality management process

In the quality management of home-based health care services, we use the process approach, treating health care services as a complete process, setting key control nodes in the process, and

forming a closed-loop management model.

From the macro level, the objectives of the standardization construction are mainly based on the principles of target, wholeness, structure, stability and openness. First of all, it is clear that the overall goal of the standardization system is to establish a reasonable and efficient coordination of the whole. The standard system of medical and health care services is not just a simple stacking of sufficient service objectives, nor is it increased according to the will of decision makers, but after multiple studies and after combining theory and concrete practice, the objectives are reasonably distributed among various parts to derive the functions and tasks undertaken by each part. After the goal is established, the overall goal cannot be achieved without the joint action of all parts. In terms of content structure, the health care service standard system is composed of several subsystems in accordance with a certain hierarchy and logical or intrinsic relationship. Only by fully grasping the relationship between each component of the system can the overall target function be formed through organic combination.

At the very beginning of the establishment of medical and health care service standards, attention should be paid to the issue of stability, as any slight adjustment can have a huge impact on normal operation and development. As a complete system, the standard system of health care service is open, so it needs to exchange information and materials with the environment in the process of operation, and the process of revising and improving the relevant standards should be fully integrated with the reality of the social environment, based on information exchange, supported by scientific theories and combined with specific practices to make improvements to the original standards.

At the micro level, the standardization needs to focus on: service process, service content and service personnel. As for the service process, the company should take branch organization and customer's need into consideration, and analysis the real service scenario to establish a series standard for personnel, equipment, operating environment, materials and method of service. After the standards have been formulated, a training of standards needs to be conducted within the whole company to reach a consensus. So that employee can clearly understand the service process standards and related requirements, consciously work in accordance with the standard requirements, self-discipline, self-control, take the initiative to propose improvements in the process, and develop themselves into quality controllers in the service process. On the other hand, standard guidelines for handling and reporting emergencies and accidents should be developed, and data should be collected and analyzed at each level within the company as a basis for revising the standards. The opinions and feedback of service recipients and their families are regularly collected and shared, and the effectiveness of the initial input, service

process, expected service output and measures are continuously evaluated, so that the standardized service process can be continuously improved and adjusted.

In terms of service content design, service standards should include:

- service foundation general standards;
- daily service standards;
- service management standards;
- service quality standards, and
- service guarantee standards.

Service foundation general standards should include terminology standards, guideline standards, logo standards, classification standards, naming standards, and capability assessment standards. Daily service standards should include daily service content such as daily life care, meal care, medical care, rehabilitation care, spiritual comfort services. Service management standards should include safety management standards, administrative management standards. Service quality management should include service evaluation and improvement, service satisfaction research, complaints and rectification. Finally, service guarantee should include talent standard, information standard, facility and equipment standard.

From the aspect of service personnel, we should focus on strengthening the construction of standardized personnel training system, strengthening the training of basic service personnel standardization knowledge. The company could provide lectures and service specification training to improve the awareness of service personnel standardization and increase comprehensive skills, and constantly explore the improvement of the construction of the talent team. At the same time, we should also encourage service personnel to participate in the professional qualification certification system, the implementation of the card to enhance the overall professional level.

5.1.3 "Intelligent" innovation technology is a method to stimulate new vitality of health care services

The intelligent medical care model refers to the integration of intelligent devices and systems with existing standardized services. In the service process, IoT devices upload the sensed and collected data to the cloud platform for processing. Applying machine learning theory to the cloud can efficiently process the large amount of data on the platform to support on-site services (including service content and supervision) in real time, and anticipate subsequent customer needs to help service providers continue to deliver high quality services. Also, intelligent

technology enables instant information exchange between multiple parties, connecting service providers, users, their families and government regulators, facilitating the efficient operation of home care services and meeting the needs from multiple parties.

In the real situation of service, this research applied an intelligent equipment —SHC (Smart Home Care) and a SHC system to improve process management. The equipment and the system can make the home-based health care service smarter, and can integrate the standardized service content and individual's need.

The SHC system assigns the service content to personnel according to the detailed information on the work order, and the service personnel is able to start the door-to-door service for the elderly at the exact time and place by checking work order information in the SHC equipment. Then, equipment uses voice recognition to collect information on the characteristics of the service throughout the service process. And intelligent equipment also tracks and record the service status. After the service is completed, regular service visits are performed to investigate the satisfaction level of the service recipients and evaluate the service personnel according to the customer satisfaction level, so as to complete the performance assessment of the service personnel.

The SHC equipment and its system filled the gap of service process management in home-based health care service industry. The whole solution is highly based on the innovate technologies, like cloud computing, machine learning, ASR. It can collect data from service sites and share the crucial information between customers` family members, eldercare companies and government authorities. Moreover, this intelligent equipment and system make services more suitable for customers and make workflow easier for service providers.

5.1.4 "Collaboration" development is a goal for building a new pattern of health care services

With the impetus of intelligent technology, the health care service industry will continue to optimize the supply structure, improve the supply capacity, enhance the accuracy and applicability of services, and gradually form a reasonable service system that covers the whole life cycle and institutions. The goal of collaboration development needs to focus on two different levels: human-machine collaboration and institutional collaboration.

From the perspective of institutional collaboration, intelligent medical and health care services realize real-time data collection and information interconnection by means of information technology and improve the utilization rate of resources while avoiding resource waste through efficient collaboration operation. It ensures that communities and institutions can

respond to demands quickly, promoting the efficient operation of each link in the upper, middle and lower reaches of the senior care industry chain, so that the industry may no longer be developed in a fragmented manner and with poor synergy. In addition, intelligent products have the characteristics of "non-differentiated" and "standardized" services, which are not restricted by environmental conditions and can effectively avoid human errors and differentiated services led by different people, and are conducive to the formation of uniform standard services.

From the perspective of human-machine cooperation, intelligent terminals and monitoring equipment can realize supervision automation, replacing simple and repetitive labor with the intelligent operation, saving manpower and alleviating the problem of insufficient manpower and high turnover rate of service personnel. Using wireless network and implementation of positioning technology, service personnel can be into accurate positioning, tracking and trajectory mapping to achieve security management services, relying on sensor technology and wireless transmission technology, real-time remote monitoring, once there is an accident, the first time to link the relevant personnel to effectively protect security. On the other hand, machines cannot completely replace people. The more friendly and person-centered care are the core elements of high-quality elderly services. In order to implement "human-machine collaboration" better, organization should analyze the service process and add intelligent equipment in a proper way, which can make workflow easier. So that service personnel can focus on humane, personalized and emotional services more to improve the service experience and quality of life for the elderly.

5.2 Implementation of operation intervention strategy

The home-based health care service process management system firstly started to be used in author's company in December 2020, in Shanghai. Then, the author conducted follow-up research using the Community Home Intelligent Health Care Service Questionnaire for 12 months after implementation of the system, and the specific research data are as follows.

5.2.1 For service objects

5.2.1.1 Overall intervention result

As for the service recipients and their family members, after implementing the process management system for home-based health care services for 12 months, their satisfaction with each indicator dimension of home-based health care services has increased to different degrees.

The author used paired t-test method to analysis, found the 70.4% of paired data has the difference ($P<0.05$).

5.2.1.2 Affinity indicators

Table 5.1 is the result of the comparison of the affinity indicators after intervention, and the method paired t-test is used in the analysis.

Table 5.1 Before and after test and comparative analysis of the service object affinity indicator

Paired t-test analysis result – detailed format						
Pair No.	Indicator	Mean	Std	Mean gap	t	p
Pair 1 (I-A1)	Pre-test - You expect the provider to understand your existing abilities and strengths to provide a care plan	4.00	1.01	-0.68	-4.056	0.000**
	Post-test - You expect the provider to understand your existing abilities and strengths to provide a care plan	4.68	0.51			
Pair 2 (I-A2)	Pre-test - You expect that the provider will encourage and support your family members to participate in care and activities.	4.56	0.58	-0.22	-2.526	0.015*
	Post-test - You expect that the provider will encourage and support your family members to participate in care and activities.	4.78	0.42			
Pair 3 (I-A3)	Pre-test - You expect that the provider selects services based on your customs, cultural beliefs, and interests	3.46	1.37	-1.24	-6.293	0.000**
	Post-test - You expect that the provider selects services based on your customs, cultural beliefs, and interests	4.70	0.46			
Pair 4 (I-A4)	Pre-test - You expect that the provider will work in partnership with your family's primary caregiver.	4.18	0.72	-0.10	-0.636	0.528
	Post-test - You expect that the provider will work in partnership with your family's primary caregiver.	4.28	0.86			
Pair 5 (I-A5)	Pre-test - You expect that the service provider understands you and your family members' needs and concerns	3.34	1.39	-1.16	-5.408	0.000**
	Post-test - You expect that the service provider understands you and your family members' needs and concerns	4.50	0.68			
Pair 6 (I-A6)	Pre-test - You expect that the service provider will educate you about the service concept and ensure that you are prepared to know it	2.68	1.81	-1.34	-4.585	0.000**
	Post-test - You expect that the service provider will educate you about the service concept and ensure that you are prepared to know it	4.02	1.02			
Pair 7 (I-A7)	Pre-test - You expect that the service provider will offer and recommend service business insurance products to you	4.58	0.50	0.36	2.585	0.013*
	Post-test - You expect that the service provider will offer and recommend service business insurance products to you	4.22	0.89			

Pair 8 (I-A8)	Pre-test - You expect that the service provider will provide you with differentiated premiums in strict compliance with the LTC insurance assessment requirements	4.02	1.10	-0.14	-0.562	0.577
	Post-test - You expect that the service provider will provide you with differentiated premiums in strict compliance with the LTC insurance assessment requirements	4.16	1.17			
Pair 9 (I-A9)	Pre-test - You expect that the service provider will provide you with self-pay service options based on your individual needs	4.24	0.69	-0.06	-0.387	0.700
	Post-test - You expect that the service provider will provide you with self-pay service options based on your individual needs	4.30	0.91			
Pair 10 (I-A10)	Pre-test - You expect that the services provided to you by the provider will meet your actual needs	4.74	0.44	0.30	2.278	0.027*
	Post-test - You expect that the services provided to you by the provider will meet your actual needs	4.44	0.88			
Pair 11 (I-A11)	Pre-test - You expect that the service provider makes you will to consistently choose to purchase the service	3.66	1.12	-1.22	-7.188	0.000**
	Post-test - You expect that the service provider makes you will to consistently choose to purchase the service	4.88	0.33			
Pair 12 (I-A12)	Pre-test - You expect that the service provider will use intelligent monitoring equipment during the service	2.68	1.79	-1.94	-6.951	0.000**
	Post-test - You expect that the service provider will use intelligent monitoring equipment during the service	4.62	0.49			
Pair 13 (I-A13)	Pre-test - You expect the service personnel to provide regular feedback during the service process	4.54	0.71	-0.06	-0.503	0.617
	Post-test - You expect the service personnel to provide regular feedback during the service process	4.60	0.64			
Pair 14 (I-A14)	Pre-test - You expect that the service provider will choose the supervision method that is appropriate for your care relationship and living environment	4.54	0.65	-0.14	-1.265	0.212
	Post-test - You expect that the service provider will choose the supervision method that is appropriate for your care relationship and living environment	4.68	0.55			
Pair 15 (I-A18)	Pre-test - You expect that service personnel will tell you about existing supervision concepts and methods	4.94	0.24	0.06	1.000	0.322
	Post-test - You expect that service personnel will tell you about existing supervision concepts and methods	4.88	0.33			
Pair 16 (I-A17)	Pre-test - You expect the service personnel to provide timely service information and feedback to your important relations	2.76	1.71	-1.38	-5.473	0.000**

	Post-test - You expect the service personnel to provide timely service information and feedback to your important relations	4.14	0.88		
Pair 17 (I-A16)	Pre-test - You expect the service personnel to provide facial recognition punching and service process prompting operation based on the equipment	4.12	0.77	-0.36	-2.483 0.017*
	Post-test - You expect the service personnel to provide facial recognition punching and service process prompting operation based on the equipment	4.48	0.65		
Pair 18 (I-A15)	Pre-test - You expect that the service staff will use intelligent equipment to send timely service warning signals in the service process and can take corrective measures in time	3.34	1.45	-1.20	-5.715 0.000**
	Post-test - You expect that the service staff will use intelligent equipment to send timely service warning signals in the service process and can take corrective measures in time	4.54	0.58		

$p<0.05$ ** $p<0.01$

From results, we can see that the differences in the experimental data were investigated using paired t-tests, and from the above table, we can see that out of the total 18 sets of paired data, 12 sets of paired data showed differences ($p<0.05$). The most significant differences were found in the following indicators: choosing service contents according to your customs, cultural beliefs and interests, explaining the service concept to you and ensuring that you are prepared to know it, and using intelligent supervision equipment in the service process. The above is a good example of how the introduction of care-oriented services has improved the quality of services.

We concluded through preliminary research that the elements of family organization are not simply understood as home-based health care service enterprises, but also include the families receiving the services, and the core concept of home-based health care services is family, and the degree of harmony of the family, the filial piety of family members, and the economic environment of the family all affect the effect of home health care services. We believe that this dimension will directly affect the quality of home health care services (See Annex D: Additional figure 19), thus indirectly affecting the integrity and stability of the home health care service system. In the overall service process, we take into full consideration the traditional Chinese family culture and establish an online platform for family communication for those whose children pay for the services, so that we can provide timely feedback to the family on the service situation. We also provide regular offline family support group activities during the service period to keep abreast of family needs and troubles and arrange for dedicated staff to follow up.

5.2.1.3 Standardization indicator

Table 5.2 is the result of the comparison of the standardization indicators after intervention, and the method paired t-test is used in the analysis.

Table 5.2 Before and after test and comparative analysis of the service object standardization indicator

Pair No.	Indicator	Mean	Std	Mean gap	t	p
Pair 1 (I-S1)	Pre-test - You expect that the service personnel meet the national requirements for credentials	3.40	0.79	-1.15	-18.316	0.000**
	Post-test - You expect that the service personnel meet the national requirements for credentials	4.55	0.57			
Pair 2 (I-S2)	Pre-test - You expect the service personnel to conduct regular training and assessment according to the norms	4.90	0.31	0.00	0.153	0.879
	Post-test - You expect the service personnel to conduct regular training and assessment according to the norms	4.89	0.31			
Pair 3 (I-S3)	Pre-test - You expect the service personnel to show the qualification materials according to the specification in the process of service provision	4.87	0.34	0.22	4.814	0.000**
	Post-test - You expect the service personnel to show the qualification materials according to the specification in the process of service provision	4.65	0.62			
Pair 4 (I-S4)	Pre-test - You expect/perception service organization to provide consistent service products in different regional organizations	4.66	0.47	-0.07	-1.461	0.145
	Post-test - You expect/perception service organization to provide consistent service products in different regional organizations	4.73	0.53			
Pair 5 (I-S5)	Pre-test - You expect the service organization to provide a standardized service process in different regions	4.30	0.72	0.35	4.270	0.000**
	Post-test - You expect the service organization to provide a standardized service process in different regions	3.96	1.14			
Pair 6 (I-S6)	Pre-test - You expect the service organization to provide consistent service prices among different regions	3.74	1.08	-1.04	-14.394	0.000**
	Post-test - You expect the service organization to provide consistent service prices among different regions	4.78	0.42			
Pair 7 (I-S7)	Pre-test - You expect the service process to be completed on time and in full according to the promised service time	3.48	0.90	-1.03	-13.788	0.000**
	Post-test - You expect the service process to be completed on time and in full according to the promised service time	4.51	0.74			
Pair 8 (I-S8)	Pre-test - You expect that the service process will be executed according to the key guideline and key steps	4.84	0.37	-0.00	-0.119	0.905
	Post-test - You expect that the service process will be executed according to the key guideline and key steps	4.84	0.36			
Pair 9 (I-S9)	Pre-test - You expect that there is a standardized process for handling and reporting of emergencies in the service process	4.20	0.98	-0.44	-6.361	0.000**
	Post-test - You expect that there is a standardized process for handling and reporting of emergencies in the service process	4.65	0.61			
Pair 10 (I-S10)	Pre-test - You expect the service organization to provide unified service evaluation indicators	4.69	0.55	-0.14	-3.282	0.001**
	Post-test - You expect the service organization to provide	4.83	0.37			

Pair No.	Indicator	Mean	Std	Mean gap	t	p
	unified service evaluation indicators					
Pair 11 (I-S11)	Pre-test - You expect the service organization to build a remote service scene with the goal of "visualization and reversibility" of the home-based service scene	4.75	0.43	0.47	8.163	0.000**
	Post-test - You expect the service organization to build a remote service scene with the goal of "visualization and reversibility" of the home-based service scene	4.28	0.73			
Pair 12 (I-S12)	Pre-test - You expect the service organization to uphold the service equipment configuration planning with the goal of "uniformity and ease of use" in the use of service equipment	3.80	1.14	-0.33	-3.554	0.000**
	Post-test - You expect the service organization to uphold the service equipment configuration planning with the goal of "uniformity and ease of use" in the use of service equipment	4.13	1.05			
Pair 13 (I-S13)	Pre-test - You expect the service organization to build a standardized three-dimensional data model of the home-based service environment with the help of VR technology	4.21	0.97	-0.46	-6.742	0.000**
	Post-test - You expect the service organization to build a standardized three-dimensional data model of the home-based service environment with the help of VR technology	4.67	0.47			
Pair 14 (I-S14)	Pre-test - You expect the service organization to establish a standard information database for in-home services	4.54	0.61	0.31	4.584	0.000**
	Post-test - You expect the service organization to establish a standard information database for in-home services	4.23	0.78			
Pair 15 (I-S15)	Pre-test - You expect the use of standardized service equipment and service tools in the service process	4.68	0.47	0.23	4.210	0.000**
	Post-test - You expect the use of standardized service equipment and service tools in the service process	4.44	0.70			
Pair 16 (I-S16)	Pre-test - You expect the operation of standardized service process in the service process	4.11	1.05	-0.68	-9.958	0.000**
	Post-test - You expect the operation of standardized service process in the service process	4.79	0.41			

p<0.05 ** p<0.01

From the result, we can see that the differences in the experimental data were investigated by using paired t-test, and it can be seen from the above table that among the total 16 sets of paired data, 13 sets of paired data showed differences (p<0.05). The specific analysis shows that the service organization is expected to provide consistent service prices among different regions, to build a remote service scene with the goal of "visualization and reversibility" of the home service scene, to build a standardized three-dimensional data model of the home service environment with the help of VR technology, and to use a standardized service process in the service process. The service process is expected to be operated by standardized and standardized service process. From the above table, we can see that the differences of the experimental data were investigated by using paired t-test, and from the above table, we can

see that there are 13 groups of paired data out of 16 groups of paired data (p<0.05). The specific analysis shows that the service organization is expected to provide consistent service prices among different regions, to build a remote service scene with the goal of "visualization and reversibility" of the home service scene, to build a standardized three-dimensional data model of the home service environment with the help of VR technology, and to use a standardized service process in the service process. The service process is expected to be operated by a standardized service process.

According to the evaluation of the intervention effect (See Annex D: Additional figure 20), the establishment of service standards in the process of home-based health care services is of great significance to a stable development in long term. Therefore, the researcher of this paper believes that a complete service system cannot be built without the development of service specification, and the service specification contains a wide range of contents, including service standard, service process, service content and other dimensions. The design of the service process can effectively plan the people, equipment, interaction methods and materials involved in the service, and improve the experience of service users and the overall service quality through the design of the above link design activities.

5.2.1.4 Intelligent indicator

Table 5.3 is the result of the comparison of the intelligent indicators after the intervention, and the method paired t-test is used in the analysis.

Table 5.3 Before and after test and comparative analysis of the service object intelligent indicator

Paired t-test analysis result – detailed format						
Pair No.	Indicator	Mean	Std	Mean gap	t	p
Pair 1 (I-I1)	Pre-test - You expect the service organization to build a process monitoring system with the strategic goal of improving service quality and optimizing operational efficiency	4.43	0.74	-0.17	-2.646	0.009**
	Post-test - You expect the service organization to build a process monitoring system with the strategic goal of improving service quality and optimizing operational efficiency	4.60	0.66			
Pair 2 (I-I2)	Pre-test - You expect the service organization to design "5W2H" as the goal of the evaluation results of the regulatory dimension	4.63	0.48	-0.19	-5.048	0.000**
	Post-test - You expect the service organization to design "5W2H" as the goal of the evaluation results of the regulatory dimension	4.82	0.38			
Pair 3 (I-I3)	Pre-test - You expect the extent to which the organization actively invests internally to support the implementation of digital intelligent supervision system	2.99	1.61	-1.37	-12.876	0.000**
	Post-test - You expect the extent to which the organization	4.36	0.72			

Pair No.	Indicator	Mean	Std	Mean gap	t	p
	actively invests internally to support the implementation of digital intelligent supervision system					
Pair 4 (I-I4)	Pre-test - You expect the organization to provide model training internally to ensure the concept is recognized and can be implemented on the ground	4.58	0.66	0.09	1.695	0.091
	Post-test - You expect the organization to provide model training internally to ensure the concept is recognized and can be implemented on the ground	4.49	0.66			
Pair 5 (I-I5)	Pre-test - You expect the formation of a trinity of software, hardware and scenario solutions	4.42	0.64	0.18	2.712	0.007**
	Post-test - You expect the formation of a trinity of software, hardware and scenario solutions	4.24	0.81			
Pair 6 (I-I6)	Pre-test - You expect the service organization to use the combination of intelligent hardware and software to solve the home-based service quality process supervision	4.22	1.00	-0.04	-0.438	0.662
	Post-test - You expect the service organization to use the combination of intelligent hardware and software to solve the home-based service quality process supervision	4.26	0.97			
Pair 7 (I-I7)	Pre-test - You expect the service process using algorithm model to achieve automatic pushing service guidance to service personnel	4.78	0.47	0.47	7.328	0.000**
	Post-test - You expect the service process using algorithm model to achieve automatic pushing service guidance to service personnel	4.31	0.90			
Pair 8 (I-I8)	Pre-test - You expect the use of data analysis means to show the service site supervision data in real time to solve the problem of health insurance supervision	4.70	0.51	0.31	5.180	0.000**
	Post-test - You expect the use of data analysis means to show the service site supervision data in real time to solve the problem of health insurance supervision	4.38	0.80			
Pair 9 (I-I9)	Pre-test - You expect the service process to receive real-time guidance when service personnel encounter difficulties	3.70	1.37	-0.93	-9.888	0.000**
	Post-test - You expect the service process to receive real-time guidance when service personnel encounter difficulties	4.62	0.48			
Pair 10 (I-I10)	Pre-test - You expect that service personnel use voice input equipment to collect service data during the service process	4.52	0.71	0.12	1.763	0.079
	Post-test - You expect that service personnel use voice input equipment to collect service data during the service process	4.40	0.79			
Pair 11 (I-I11)	Pre-test - You expect that health insurance institutions can grasp service data in real time through the data screen during the service process	4.71	0.54	0.19	3.489	0.001**
	Post-test - You expect that health insurance institutions can grasp service data in real time through the data screen during the service process	4.52	0.65			
Pair 12 (I-I12)	Pre-test - You expect the service process to fully consider the characteristics of the home service scene (light, acoustic environment, network environment) to choose the appropriate intelligent supervision means	3.34	1.22	-1.16	-13.043	0.000**
	Post-test - You expect the service process to fully consider the characteristics of the home service scene (light, acoustic environment, network environment) to choose the appropriate intelligent supervision means	4.50	0.69			

Pair No.	Indicator	Mean	Std	Mean gap	t	p
Pair 13 (I-I13)	Pre-test - You expect the process of service to fully consider customer privacy protection and information security	4.44	0.74	0.16	2.129	0.034*
	Post-test - You expect the process of service to fully consider customer privacy protection and information security	4.28	0.97			
Pair 14 (I-I14)	Pre-test - You expect the service process to timely and accurately identify service scene signs and transmit data	4.32	0.80	0.11	1.542	0.124
	Post-test - You expect the service process to timely and accurately identify service scene signs and transmit data	4.21	0.83			
Pair 15 (I-I15)	Pre-test - You expect the service scene design to fully consider the service experience of you and your important relations	4.46	0.75	-0.13	-2.106	0.036*
	Post-test - You expect the service scene design to fully consider the service experience of you and your important relations	4.59	0.61			

Paired t-test analysis result – detailed format

p<0.05 ** p<0.01

From the result, we can see that the paired t-test was used to study the variability of the experimental data, and it can be seen from the above table: there are 15 sets of paired data in total, of which 11 sets of paired data will show variability (p<0.05). Specific analysis shows that there is a large significant difference in the degree of expectation of active input within the organization to support the implementation of digital intelligent supervision system, the expectation of real-time guidance for service workers when they encounter difficulties in the service process, and the expectation of the service process to fully consider the characteristics of the home service scene (light, acoustic environment, network environment) to select appropriate intelligent supervision means.

According to the evaluation of the intervention effect (See Annex D: Additional figure 21), the introduction of intelligent equipment in the process of home-based health care services will have a significant correlation between service quality. In essence, the core focus of this study is to introduce intelligent service monitoring equipment to help achieve real-time monitoring of service quality and service safety in home-based health care service scenarios. In this paper, the researcher and related research team introduced SHC (smart home care) advanced MEMES (Micro-Electro-Mechanical System) acoustic sensor chip and system integration application products, through voice recognition, satellite positioning, face recognition and other technologies to achieve local service scene restoration, trajectory tracking, service data timely display and other purposes, so as to try to open the service of home scene "Black box", through intelligent means to achieve home service scenes in the restoration, so that you can achieve the ultimate goal of home service quality supervision.

5.2.1.5 Collaboration indicator

Table 5.4 is the result of the comparison of the collaboration indicators after intervention, and the method paired t-test is used in the analysis.

Table 5.4 Before and after test and comparative analysis of the service object collaboration indicator

Paired t-test analysis result – detailed format						
Pair No.	Indicator	Mean	Std	Mean gap	t	p
Pair 1 (I-C1)	Pre-test - You expect the service organization to perceive and analyze your needs from a professional perspective	4.42	0.71	0.02	0.242	0.809
	Post-test - You expect the service organization to perceive and analyze your needs from a professional perspective	4.40	0.77			
Pair 2 (I-C2)	Pre-test - You expect the service staff to identify your needs in the service process based on professional experience and provide corresponding services in a timely manner	4.26	0.83	0.35	3.979	0.000**
	Post-test - You expect the service staff to identify your needs in the service process based on professional experience and provide corresponding services in a timely manner	3.90	1.16			
Pair 3 (I-C3)	Pre-test - You expect that the service staff will actively communicate with you during the service process and provide adjusted service content based on feedback	4.33	0.80	0.12	1.772	0.078
	Post-test - You expect that the service staff will actively communicate with you during the service process and provide adjusted service content based on feedback	4.21	0.78			
Pair 4 (I-C4)	Pre-test - You expect the level of recognition of the service staff	4.57	0.64	0.34	5.202	0.000**
	Post-test - You expect the level of recognition of the service staff	4.23	0.79			
p<0.05 ** p<0.01						

From the result, it can be seen that the paired t-test was used to study the variability of the experimental data, and from the above table, it can be seen that there are 4 sets of paired data in total, and 2 sets of paired data showed variability (p<0.05). The specific analysis shows that there is a 0.01 level of significance (t=3.979, p=0.000) between the pre-test-you expect the service staff to identify your needs in a timely manner during the service process based on professional experience and the post-test-you expect the service staff to identify your needs in a timely manner during the service process based on professional experience to provide the corresponding service. A 0.01 level of significance (t=5.202, p=0.000) was observed between the pre-test-your expectation of service staff approval and the post-test-your expectation of service staff approval.

According to the evaluation of the intervention effect (See Annex D: Additional figure 22), it can be seen that technology cannot completely replace people. Compared with time and physical investment, communication and emotional care are really important factors that cannot be acquired, and only by achieving good human-machine collaboration can we really make intelligent senior care have a temperature, and a warm intelligent senior care system needs to

rely on a people-oriented senior care management model for coordination, relying on big data analysis and multi-dimensional and multi-level senior care. We can realize precise and personalized service dynamic management, and have a more comprehensive, accurate and real-time understanding of the living condition and actual needs of the elderly, so as to support further improvement of senior care service quality and community management level. Thus, it can avoid the "one-size-fits-all" management requirements that are out of touch with reality.

5.2.2 For service personnel

5.2.2.1 Overall intervention result

As for service personnel, after implementation of the process management system for home health care services for 12 months, the respondents' satisfaction with each indicator dimension of home health care services has increased to varying degrees. The author used paired t-test method to analysis, found the 63.8% of paired data has the difference ($P<0.05$).

5.2.2.2 Affinity indicators

Table 5.5 is the result of the comparison of the affinity indicators for service personnel after intervention, and the method paired t-test is used in the analysis.

Table 5.5 Before and after test and comparative analysis of the service giver affinity indicator

Paired t-test analysis result – detailed format						
Pair No.	Indicator	Mean	Std	Mean gap	*t*	*p*
Pair 1 (I-A1)	Pre-test –You expect the organization to embrace a "person-centered" philosophy of care internally and communicate it to you	4.84	0.37			
	Post-test -You expect the organization to embrace a "person-centered" philosophy of care internally and communicate it to you	4.76	0.56	0.08	0.850	0.399
Pair 2 (I-A2)	Pre-test –You expect to be invited to participate in the design of the service journey within the organization	4.32	0.77			
	Post-test -You expect to be invited to participate in the design of the service journey within the organization	4.56	0.73	-0.24	-1.661	0.103
Pair 3 (I-A3)	Pre-test –You expect the organization to design service offerings based on client characteristics	4.32	0.84			
	Post-test -You expect the organization to design service offerings based on client characteristics	4.56	0.81	-0.24	-1.520	0.135
Pair 4 (I-A4)	Pre-test –You expect family members to be invited to participate in the service and be empowered on a regular basis	4.76	0.43			
	Post-test -You expect family members to be invited to participate in the service and be empowered on a regular basis	4.66	0.66	0.10	0.927	0.358
Pair 5	Pre-test –The degree to which you expect the	4.34	0.82	-0.34	-2.307	0.025*

		Mean	SD	Diff	t	p
(I-A5)	service principle within the organization to be consistent with your own					
	Post-test -The degree to which you expect the service principle within the organization to be consistent with your own	4.68	0.59			
Pair 6 (I-A6)	Pre-test –You expect to move away from the traditional regulatory concept of service regulation within your organization	4.40	0.93	-0.24	-1.572	0.122
	Post-test -You expect to move away from the traditional regulatory concept of service regulation within your organization	4.64	0.60			
Pair 7 (I-A7)	Pre-test –You expect the service regulation within your organization to incorporate real-life scenarios	4.48	0.71	0.00	0.000	1.000
	Post-test -You expect the service regulation within your organization to incorporate real-life scenarios	4.48	0.71			
Pair 8 (I-A8)	Pre-test –You expect the service supervision within the organization to make use of intelligent equipment	4.64	0.63	-0.22	-2.037	0.047*
	Post-test -You expect the service supervision within the organization to make use of intelligent equipment	4.86	0.35			
Pair 9 (I-A9)	Pre-test –You expect the service supervision within the organization to achieve scenario restoration.	4.30	0.81	-0.18	-1.294	0.202
	Post-test -You expect the service supervision within the organization to achieve scenario restoration.	4.48	0.71			
Pair 10 (I-A10)	Pre-test –You expect the supervision information can get timely feedback.	4.38	0.75	-0.28	-2.042	0.047*
	Post-test -You expect the supervision information can get timely feedback.	4.66	0.52			

p<0.05 ** p<0.01

From the result, it can be seen that the paired t-test was used to investigate the variability of the experimental data, and from the above table, it can be seen that out of a total of 10 sets of paired data, 3 sets of paired data showed variability (p<0.05). Specifically, the mean of the pre-test (4.34) is significantly lower than the mean of the post-test (t=-2.307, p=0.025). The mean value of the post-test is significantly lower than the mean value of the post-test (4.68). A 0.05 level of significance (t=-2.037, p=0.047) between the pre-test you expect your organization to use smart equipment internally for service supervision and the post-test you expect your organization to use smart equipment internally for service supervision1, as well as specific comparison differences, shows that the mean of the pre-test you expect your organization to use smart equipment internally for service supervision (4.64), will be significantly lower than the mean of the post-test you expect your organization to use smart equipment internally for service supervision (4.64). The mean of the post-test you expect the organization to utilize smart equipment for service regulation within the organization1 (4.86). A 0.05 level of significance (t=-2.042, p=0.047) was observed between the pre-test you expect timely feedback on regulatory information and the post-test you expect timely feedback on regulatory information1,

as well as a specific comparison difference that shows that the mean of the pre-test you expect timely feedback on regulatory information (4.38) is significantly lower than the mean of the post-test you expect timely feedback on regulatory information1. feedback1 (4.66).

According to the evaluation of the intervention effect (See Annex D: Additional figure 23), it is clear that the humanistic consciousness of "the elderly first" is enhanced, and the practitioners are required to take into account the different needs of the elderly when providing services, to ensure that every elderly person can enjoy the elderly services, and to fully affirm and respect the elderly service practitioners. In addition to ensuring that every elderly person can enjoy senior care services, we should also give full recognition and respect to senior care workers, so that more people can understand the hard work and efforts of senior care workers, and lead the community to understand and affirm senior care workers, so as to create a good atmosphere of understanding, affirmation and respect for senior care workers in society. In terms of salary and welfare, we will continue to improve the treatment to increase the sense of belonging of the elderly service workers. In terms of work pressure, we will moderately reduce the intensity of work, reasonably arrange the ratio of nursing clients and caregivers, and the organization will regularly provide psychological stress reduction services for the employees and carry out recreational activities from time to time to strengthen the communication between the service workers and the caregivers.

5.2.2.3 Standardization indicator

Table 5.6 is the result of the comparison of the standardization indicators for service personnel after intervention, and the method paired t-test is used in the analysis.

Table 5.6 Before and after test and comparative analysis of the service giver standardization indicator

Paired t-test analysis result – detailed format					
Pair No.	Indicator	Mean Std	Mean gap	t	p
Pair 1 (I-S1)	Pre-test –You expect the partners within the organization to have a high degree of professionalism and good service attitude	3.16 1.48	-1.30	-4.957	0.000**
	Post-test -You expect the partners within the organization to have a high degree of professionalism and good service attitude	4.46 0.79			
Pair 2 (I-S2)	Pre-test –You expect the organization to establish an incentive system that combines positive and negative incentives	2.80 1.31	-1.82	-9.637	0.000**
	Post-test -You expect the organization to establish an incentive system that combines positive and negative incentives	4.62 0.70			
Pair 3 (I-S3)	Pre-test –You expect the organization to have a training concept based on employee progress	2.86 1.48	-1.74	-7.875	0.000**
	Post-test -You expect the organization to have a training	4.60 0.67			

Pair No.	Indicator	Mean	Std	Mean gap	t	p
	concept based on employee progress					
Pair 4 (I-S4)	Pre-test –You expect the organization to design a reasonable training plan according to your ability and quality	3.58	1.47	-0.82	-3.438	0.001**
	Post-test -You expect the organization to design a reasonable training plan according to your ability and quality	4.40	0.93			
Pair 5 (I-S5)	Pre-test –You expect the organization to establish a reasonable promotion path	3.24	1.38	-1.52	-7.432	0.000**
	Post-test -You expect the organization to establish a reasonable promotion path	4.76	0.43			
Pair 6 (I-S6)	Pre-test –You expect the service process to be executed according to the key guideline and key steps	3.38	1.46	-1.44	-6.913	0.000**
	Post-test -You expect the service process to be executed according to the key guideline and key steps	4.82	0.48			
Pair 7 (I-S7)	Pre-test –You expect the service process to have a standardized handling and reporting process for emergency events	2.72	1.21	-2.04	-10.532	0.000**
	Post-test -You expect the service process to have a standardized handling and reporting process for emergency events	4.76	0.43			
Pair 8 (I-S8)	Pre-test –You expect to have a unified service evaluation indicator within the service organization	3.04	1.63	-1.76	-7.667	0.000**
	Post-test -You expect to have a unified service evaluation indicator within the service organization	4.80	0.40			
Pair 9 (I-S9)	Pre-test –You expect the organization to build a remote service scenario with the goal of "visualization and reversibility" of the home service scenario	3.06	1.54	-1.60	-6.791	0.000**
	Post-test -You expect the organization to build a remote service scenario with the goal of "visualization and reversibility" of the home service scenario	4.66	0.59			
Pair 10 (I-S10)	Pre-test –You expect the organization to build a service quality control service scenario with the goal of "visualization and reversibility" of the home service scenario	2.98	1.68	-1.60	-6.147	0.000**
	Post-test -You expect the organization to build a service quality control service scenario with the goal of "visualization and reversibility" of the home service scenario	4.58	0.67			
Pair 11 (I-S11)	Pre-test –You expect the service organization to use state of art technology to construct home-based service process management model	3.46	1.18	-1.14	-5.947	0.000**
	Post-test -You expect the service organization to use state of art technology to construct home-based service process management model	4.60	0.67			
Pair 12 (I-S12)	Pre-test – You expect the service organization to uphold the goal of "uniformity and efficiency" in the use of service equipment	3.18	1.44	-1.02	-4.553	0.000**
	Post-test – You expect the service organization to uphold the goal of "uniformity and efficiency" in the use of service equipment	4.20	0.88			
Pair 13	Pre-test – You expect using standardized service	3.52	1.36	-1.10	-5.788	0.000**

Paired t-test analysis result – detailed format

Pair No.	Indicator	Mean Std	Mean gap	t	p
(I-S13)	equipment and service tools for service P-test – You expect using standardized service equipment and service tools for service	4.62 0.60			
	p<0.05 ** p<0.01				

From the result, we can see that the paired t-test was used to investigate the differences of the experimental data. The specific analysis shows that there is a 0.01 level of significance between your expectation of a combination of positive and negative motivation system and your expectation of a combination of positive and negative motivation system (t=-9.637, p=0.000). (t=-9.637, p=0.000), as well as the specific difference in comparison, the mean value of your expectation of having a combination of positive and negative incentives within your organization (2.80) is significantly lower than the mean value of your expectation of having a combination of positive and negative incentives within your organization (4.62). There is a 0.01 level of significance (t=-7.875, p=0.000) between your expectation of employee advancement as a training goal within your organization and your expectation of employee advancement as a training goal within your organization, as well as a specific comparison difference, which shows that the mean value of your expectation of employee advancement as a training goal within your organization (2.86) is significantly lower than the mean value of your expectation of employee advancement as a training goal within your organization (4.60). The difference between your expectation of having a uniform service evaluation indicator within your service organization and your expectation of having a uniform service evaluation indicator within your service organization is significant at the 0.01 level (t=-7.667, p=0.000), as well as the difference in specific comparisons shows that the mean of having a uniform service evaluation indicator within your service organization (3.04) is significantly lower than the mean of having a uniform service evaluation indicators (4.80).

According to the evaluation of the intervention effect (See Annex D: Additional figure 24), it can be seen that standardization is the systematic work, a tool for the management of medical and health care services, a work to guide the formation of a closed-loop continuous improvement of services and management, but it cannot exist independently from administration and business, it must be integrated with daily management and service work, quality cannot be separated from operational management and decision-making, the focus of attention on quality is the service recipients, for the needs of different service recipients, it should be clear The pursuit of goals and guidelines, the need to invest sufficient resources to stabilize and improve quality, the process requires standardized management methods as a

support. Standardization in institutional management as a support tool for stable improvement of service quality, in practice, can be considered with the enhancement of information network technology, management and quality control informatization, more efficient collection of information data in the process of service and management through information technology, sharing information data, shortening time of the process, providing more adequate information data for decision-making to make judgments, can add wings to efficient service and management, which is also an important direction for the development of service management.

5.2.2.4 Intelligent indicator

Table 5.7 is the result of the comparison of the intelligent indicators for service personnel after intervention, and the method paired t-test is used in the analysis.

Table 5.7 Before and after test and comparative analysis of the service giver intelligent indicator

Paired t-test analysis result – detailed format						
Pair No.	Indicator	Mean	Std	Mean gap	t	p
Pair 1 (I-I1)	Pre-test –You expect your organization to build a process monitoring system with the strategic goal of improving service quality and optimizing operational efficiency	4.34	0.80	-0.14	-0.880	0.383
	Post-test -You expect the organization to build a process monitoring system with the strategic goal of improving service quality and optimizing operational efficiency	4.48	0.76			
Pair 2 (I-I2)	Pre-test –You expect the organization to design clear evaluation indicators for service process management	4.66	0.63	-0.10	-1.151	0.255
	Post-test -You expect the organization to design clear evaluation indicators for service process management	4.76	0.43			
Pair 3 (I-I3)	Pre-test –You expect the organization to actively invest in ensuring the implementation of digital intelligent supervision	4.36	0.88	-0.10	-0.538	0.593
	Post-test -You expect the organization to actively invest in ensuring the implementation of digital intelligent supervision	4.46	0.86			
Pair 4 (I-I4)	Pre-test –You expect the organization to provide training on the content of digital intelligent supervision	4.40	0.78	-0.28	-1.958	0.056
	Post-test -You expect the organization to provide internal training on the content of digital intelligent supervision	4.68	0.59			
Pair 5 (I-I5)	Pre-test –You expect the organization to provide digital intelligent supervision tools to solve the home service process supervision	3.94	1.13	-0.82	-4.804	0.000**
	Post-test -You expect the organization to provide digital intelligent supervision tools to solve the process of home service supervision	4.76	0.43			
Pair 6 (I-I6)	Pre-test –You expect the organization to provide internal digital intelligent supervision tools to	3.52	1.45	-1.28	-5.830	0.000**

Pair No.	Indicator	Mean	Std	Mean gap	t	p
	push the service operation guidance in time Post-test -You expect the organization to provide internal digital intelligent supervision tool to push the service operation guidance in time	4.80	0.40			
Pair 7 (I-I7)	Pre-test –You expect the organization to provide digital intelligent supervision tools to show the service site data in real time	4.40	0.67	-0.24	-1.769	0.083
	Post-test -You expect the organization to provide digital intelligent supervision tool to show the service site data in real time	4.64	0.63			
Pair 8 (I-I8)	Pre-test –You expect the organization to provide digital intelligent supervision tool with voice recognition as input tool	4.52	0.71	-0.20	-1.429	0.159
	Post-test -You expect the organization to provide digital intelligent supervision tools with voice recognition as input tool	4.72	0.61			
Pair 9 (I-I9)	Pre-test –You expect the organization to provide digital intelligent supervisory tools with user-friendly and easy-to-use operation	4.74	0.63	0.44	3.200	0.002**
	Post-test -You expect the organization to provide digital smart supervision tools that are user-friendly and easy to use	4.30	0.74			
Pair 10 (I-I10)	Pre-test –You expect the organization to provide digital intelligent supervision tools to fully consider the characteristics of the home scenario	2.78	1.02	-1.62	-9.335	0.000**
	Post-test -You expect the organization to provide digital intelligent supervision tools to fully consider the characteristics of the home scenario	4.40	0.78			
Pair 11 (I-I11)	Pre-test –You expect the organization to provide digital intelligent supervision tools to fully consider customer privacy protection and information security	3.44	1.50	-0.88	-4.286	0.000**
	Post-test -You expect the organization to provide digital intelligent supervision tools within the organization to fully consider the protection of customer privacy and information security	4.32	0.82			
Pair 12 (I-I12)	Pre-test –You expect the organization to provide digital intelligent supervision tools to identify the characteristics of service scenarios in a timely and accurate manner	3.20	1.29	-1.44	-6.666	0.000**
	Post-test -You expect the organization to provide digital intelligent supervision tools within the organization to timely and accurately identify the characteristics of service scenarios	4.64	0.63			
Pair 13 (I-I13)	Pre-test –You expect the organization to provide digital intelligent supervision tools within the organization to fully consider the service experience of customers and important relations	2.96	1.38	-1.70	-7.423	0.000**
	Post-test -You expect the organization to provide digital intelligent supervision tools within the organization to fully consider the service experience of customers and important relationships	4.66	0.66			

Paired t-test analysis result – detailed format						
Pair No.	**Indicator**	**Mean**	**Std**	**Mean gap**	*t*	*p*
	p<0.05 ** p<0.01					

From the result, it can be seen that the paired t-test was used to investigate the variability of the experimental data, and from the above table, it can be seen that there are 13 sets of paired data in total, of which 7 sets of paired data will show variability (p<0.05). The specific analysis shows that: you expect the organization to provide timely push service operational guidance of digital smart supervision tools within the organization and you expect the organization to provide timely push service operational guidance of digital smart supervision tools within the organization1 show a 0.01 level of significance (t=-5.830, p=0.000), as well as the specific comparison of the difference shows that you expect the organization to provide timely push service operational guidance of digital smart supervision tools within the organization The mean value of pushing service operational guidance (3.52) is significantly lower than the mean value of pushing service operational guidance (4.80) that you expect to provide timely service operational guidance1 from within your organization. A 0.01 level of significance (t=-9.335, p=0.000) is presented between your expectation that the organization will provide digital smart supervision tools in-house with full consideration of home scenario features and your expectation that the organization will provide digital smart supervision tools in-house with full consideration of home scenario features1, as well as a specific comparison difference that shows that your expectation that the organization will provide digital smart supervision tools in-house with full consideration of home scenario features (2.78), would be significantly lower than the mean (4.40) that you would expect your organization to provide digital smart supervision tools within your organization that adequately take into account home scenario features1. There is a 0.01 level of significance (t=-7.423, p=0.000) between the service experience of customers and key relationships that you expect your organization to provide in-house digital intelligence supervision tools to fully consider and the service experience of customers and key relationships that you expect your organization to provide in-house digital intelligence supervision tools to fully consider1 , as well as a specific comparison difference that shows that you expect your organization to provide in-house digital intelligence supervision tools to fully consider the service experience of customers and key relationships Smart Supervision tool to fully consider the service experience of customers and key relationships (2.96) would be significantly lower than the mean (4.66) that you would expect your organization to provide a digital Smart Supervision tool internally to fully consider the service experience of customers and key relationships1.

According to the evaluation of the intervention effect (See Annex D: Additional figure 25),

intelligent medical care is the main tool for solving the increasingly serious elderly care problem in China in the future, and its standardization is not only to provide corresponding protection for the elderly groups, but also to provide the basis and standard for enterprises to enter the emerging field of intelligent medical care. As an issue that affects the whole society, medical care needs not only the supervision of community organizations, related enterprises and government departments, but also the supervision of all walks of life and elderly groups and their families. Only through mutual cooperation and collective efforts of all walks of life can we better build a scientific and perfect standardized system of community intelligent health care, smoothly start the standardized construction work, and promote the orderly development of the intelligent health care industry.

5.2.2.5 Collaboration indicator

Table 5.8 is the result of the comparison of the collaboration indicators for service personnel after intervention, and the method paired t-test is used in the analysis.

Table 5.8 Before and after test and comparative analysis of the service giver collaboration indicator

Paired t-test analysis result – detailed format						
Pair No.	**Indicator**	**Mean**	**Std**	**Mean gap**	**t**	**p**
Pair 1 (I-C1)	Pre-test –You expect to design digital smart equipment based on the concept of "user experience" within your organization	4.60	0.70	0.16	1.071	0.290
	Post-test -You expect the organization to design digital smart equipment based on the concept of "user experience "1	4.44	0.93			
Pair 2 (I-C2)	Pre-test –You expect the organization to design smart equipment based on "standardized" service processes	4.36	0.83	-0.14	-0.817	0.418
	Post-test -You expect the organization to design smart equipment based on "standardized" service processes1	4.50	0.74			
Pair 3 (I-C3)	Pre-test –You expect the organization to design the training program of smart equipment based on the results of "competence quality" analysis	3.14	1.54	-1.30	-5.048	0.000**
	Post-test -You expect the organization to design intelligent equipment training programs based on the results of the "competency" analysis	4.44	0.73			
Pair 4 (I-C4)	Pre-test –You expect the organization to regularly iterate the interface design and functional modules of smart equipment based on the experience of employees using them	4.60	0.64	0.52	3.205	0.002**
	Post-test -You expect the organization to regularly iterate the interface design and functional modules of smart equipment based on the experience of employees1	4.08	0.83			
Pair 5 (I-C5)	Pre-test –You expect the organization to regularly collect feedback from employees on the use of smart	4.70	0.58	0.34	2.836	0.007**

		Mean	SD			
	equipment and optimize the usage path					
	Post-test -You expect the organization to regularly collect feedback from employees on the use of smart equipment and optimize the usage path	4.36	0.80			
Pair 6 (I-C6)	Pre-test –You expect the organization to use effective incentives to motivate employees to use the smart senior care equipment	2.76	0.98	-1.98	-11.975	0.000**
	Post-test -You expect the organization to use effective incentives to motivate employees to use the smart senior care equipment	4.74	0.53			
Pair 7 (I-C7)	Pre-test –You expect to have a smooth communication channel up and down	3.56	1.20	-1.20	-6.481	0.000**
	Post-test -You expect to have a smooth communication path	4.76	0.43			
Pair 8 (I-C8)	Pre-test –You expect to collect employee satisfaction with the organization on a regular basis	3.16	1.38	-1.52	-7.158	0.000**
	Post-test -You expect to collect employee satisfaction with the organization on a regular basis	4.68	0.47			
Pair 9 (I-C9)	Pre-test –You expect the organization to give full consideration to the extent to which the service personnel feel about the customers	4.56	0.81	-0.12	-0.814	0.420
	Post-test -You expect the organization to give full consideration to the extent to which the service personnel feel about the customers	4.68	0.65			
Pair 10 (I-C10)	Pre-test –You expect the service personnel within the organization to identify the needs of customers in the service process based on professional experience and provide corresponding services in a timely manner	4.78	0.46	0.08	0.753	0.455
	Post-test - Post-test -You expect the service personnel within the organization to provide corresponding services based on professional experience and timely identification of customer needs in the service process	4.70	0.58			
Pair 11 (I-C11)	Pre-test –You expect the service process of internal service personnel to actively communicate and adjust the service based on feedback	4.38	0.78	-0.32	-2.266	0.028*
	Post-test -You expect the internal service personnel to actively communicate during the service process to adjust the service based on feedback	4.70	0.58			
	p<0.05 ** p<0.01					

From the result, we can see that the paired t-test was used to investigate the variability of the experimental data. Specifically, there is a 0.01 level of significance between your expectation of designing a smart equipment training program based on the results of the "competency-based" analysis and your expectation of designing a smart equipment training program based on the results of the "competency-based" analysis1 within your organization ($t=-5.048$, $p=0.000$), as well as the specific comparison difference, you expect that the mean value of "competency-based" analysis within the organization to design smart equipment training programs (3.14), will be significantly lower than you expect the "competency-based" analysis within the organization to design smart equipment training programs The mean value (4.44) of

the design of intelligent equipment training programs within your organization based on the results of the "competency" analysis1 is significantly lower. There is a 0.01 level of significance between your expectation of designing intelligent equipment training programs within your organization based on the results of "competency-based" analysis and your expectation of designing intelligent equipment training programs within your organization based on the results of "competency-based" analysis1 (t=- 5.048, p=0.000), and the specific comparison difference shows that you expect the mean value (3.14) of the design of intelligent equipment training programs based on "competency" within your organization to be significantly lower than the mean value (3.14) of the design of intelligent equipment training programs based on "competency" within your organization. The mean value (4.44) of designing intelligent equipment training programs within the organization based on the results of the "competency" analysis1 is significantly lower. A 0.01 level of significance (t=-7.158, p=0.000) is shown between your expectation of regular collection of employee satisfaction with the organization and your expectation of regular collection of employee satisfaction with the organization1, as well as a specific comparison of the differences shows that the mean value of your expectation of regular collection of employee satisfaction with the organization (3.16), would be significantly lower than the mean value of your expectation of regular collection of employee satisfaction with the organization1 mean (4.68).

According to the evaluation of the intervention effect (See Annex D: Additional figure 26), it can be seen that the organization's support and skills training for service practitioners have an important impact on the stability of service personnel, and it is crucial to cultivate professional skills of medical and nursing service practitioners, help them to apply what they have learned, improve the scientific, professional, refined and scale level of medical and nursing services, and promote the services to a new level. The construction of a multi-faceted synergy mechanism should not only play the role of the government and non-profit organizations, but also the role of market mechanisms to provide diversified elderly services and build professional health care service practitioners teams.

5.3 Summary of implementation effect of operation intervention strategy

After twelve months of actual operation, we analyzed the process quality management of home-based health care services from four different dimensions and analyzed the influencing factors from different dimensions, and based on the conclusion of the analysis, we proposed rationalized strategies and suggestions to improve the process management of home-based

health care services. The findings are used to propose rationalized strategies and suggestions for improving the process management of home-based health care services.

Through the method of before and after comparison study, we further analyzed the indicators of different dimensions in the process of home-based health care service, and the analysis results concluded that: for the element of affinity, the author believes that it is not only understood as the home-based health care service enterprise, but also the family receiving the service. The core concept of home-based health care service is the family, and the degree of harmony of the family, the filial piety of family members, the family economic environment, The core concept of home-based health care service is family, and the degree of family harmony, family members' filial piety, family economic environment, all affect the effect of home-based health care service. The author believes that this dimension will directly affect the quality of home-based health care services, and thus indirectly affect the integrity and stability of the home-based health care service system. In the overall service process, we take into full consideration the traditional Chinese family culture and establish an online platform for family communication for service recipients whose children pay for the services. feedback with families, and provide regular offline family support group activities during the service period to keep abreast of family needs and troubles, and arrange for dedicated personnel to follow up. For the elements of intelligence, the introduction of intelligent equipment in the process of home-based health care services will have a more significant correlation between service quality. In essence, the core focus of this study is to introduce intelligent service monitoring equipment to help achieve real-time monitoring of service quality and service safety in the home-based health care service scenario. In this paper, the researcher and related research team introduced SHC (smart home care) advanced MEMES(Micro-Electro-Mechanical System) acoustic sensor chip and system integration application products, through voice recognition, satellite positioning, face recognition and other technologies to achieve local service scene restoration, trajectory tracking, service data timely display and other purposes, so as to try to open the service of the home scene " Black box", through intelligent means to achieve home service scenes in the restoration, so that you can achieve the ultimate goal of home service quality supervision. For standardization elements, in the process of home-based health care service, the establishment of service specifications is of great significance for the long-term stable development of home elderly care service. Therefore, the researcher of this paper believes that the construction of a complete service system is inseparable from the formulation of service specification, which contains a wide range of contents, including service standards, service process, service content and other dimensions. The design of service process can effectively

plan the people, equipment, interaction methods and materials involved in the service, and improve the experience of service users and the overall service quality through the design of the above link design activities. For the collaboration elements, in the process of home-based health care service, service personnel are the key to the implementation of service specification, including home visiting service time, service content provided at home, the process of home visiting service, service personnel grooming, are all inseparable from service personnel, which is a crucial part of a perfect social elderly service system. Therefore, this paper designs a complete on-the-job training system for this aspect, hoping to improve the professional level of home-based health care service practitioners and improve the service experience of service recipients, so as to achieve the purpose of improving the service standard and service experience. The in-service training system is based on a competency-based model, which analyzes the competencies of home-based health care workers, understands the general competencies and the unique competencies required for caregiving positions, explores the personal conditions and behavioral characteristics that can affect performance, and establishes a competency-based model for home-based health care workers in the hope of improving the overall organizational performance of home-based health care services.

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Chapter 6: Operation Strategy of Process Management in Home Health Care Service

This study takes the process management of home-based health care services as the entry point, solves the operational problem of supervision, takes the improvement of customer satisfaction as a goal, and studies the operational strategy of using intelligent means to solve the process management of home-based health care services. A four-pronged home-based health care service process management "ISAC" intervention strategy model is established, consisting of:

- An "intelligent" solution, to assist with home-based health care service process management;

- The Chinese "Affinity" service concept, to integrate with service process reengineering;

- "Standardization", to build a trinity system of people, object and product for enhancing service value; and

- "Collaboration", to connect intelligent equipment, customers, and service personnel to effectively improve the customer satisfaction and the net promoter score (NPS).

By using the Smart Home-based care (hereinafter referred to as SHC) service process supervision digital system, it can meet the needs of multiple stakeholders, organizations, staff, customers and government authorities. And SHC adopted ASR technology and AI algorithm to describe the holistic service process in real-time, which were unseen before in this industry. It helps all stakeholders to regulate service and improve service quality.

Moreover, the established model might contribute to providing quality service for the home-based eldercare market (This kind of quality service was in short supply) by standardization in every aspect of service. According to the "9073" elderly care pattern in China (90% of elderly choose home-based eldercare service, 7% choose community service and 3% choose institutional care, which is called 9073 model). So, this research and operational interventions benefit majority of the elderly in China.

6.1 Analysis of the characteristics of home-based health care services

6.1.1 Home-based health care services are in line with Chinese culture

Home-based health care service is an organic combination of aging in place and socialized professional services, allowing the elderly to stay in their familiar environment and receive

health care services that were previously only available in hospital geriatric wards or nursing homes. In order to implement the various models of medical care integration, there is an urgent need for the interconnection of various information systems. For the "home-based care" mode, there is a need to build a suitable service content and platform for medical care integration. Therefore, there is a type of service carrier in Chinese communities and homes, such as "Nursing bed at home", which integrates home doctor visits, nurse specialist care services, and medical caregiver services into a "health care service package", providing one-stop services for seniors in need at home. The quality assurance and process management of such services cannot rely solely on the "prudence" of professionals, but also require a standardized process and intelligent process supervision.

6.1.2 Home-based health care services are complex services

As an elderly care mode with Chinese characteristics, the combination of medical and care is receiving more and more attention from the government and society. However, this mode is still in its initial stage, and some problems have been exposed during the exploration and practice carried out in this study. In summary, three main difficulties were encountered, related to the evaluation, the service provision and the supervision.

The door-to-door service mode refers to the medical and care integration into the community and into the family to carry out services, that is, community-and-home-based health care mode. Medical care integration is a comprehensive form of care for the elderly.

Home-based health care service includes nursing services, care services, and rehabilitation services for people in need at home (service recipients) to solve difficulties in their daily life. The operation is highly specialized and complex. From the process point of view, complex services have some common features: the output is intangible, and the evaluation of its quality is highly subjective. The process of value transformation includes information screening, human judgment and comprehensive analysis of data. It is difficult to evaluate the standardization of the service process, as the people involved are all professionals who feel that they should act according to their own judgment rather than rules and regulations. In addition, the service process is difficult to quantify and judge as the people served are non-professionals in health care. Especially in the scene of home-based care, service process is in the recipient's home, with only the service provider and the person being served, so the implementation of the on-demand home-based health care service process is undoubtedly a "regulatory black box". The home-based health care is characterized by such a complex professional service. This kind of service is a complex service provided by professional technicians. The figure in Annex D

has a system view of home-based health care service provision process (See Annex D: Additional figure 27). Complex professional services need to be guaranteed by the overall system.

6.2 Intelligence helps the process management of home-based health care services

In home-based health care services, due to the privacy of the service environment and the content involved in the services, the supervision of the process is very difficult to achieve. How to accurately identify the service items, determine the service length, and judge whether the service is compliant, so as to ensure the service quality has become a pain point for every service regulator. Nowadays, the supervision program is usually carried out through door-to-door random inspection and telephone call-backs. However, the above-mentioned methods do not directly monitor the service quality of the service provider, they do it indirectly, by asking the elderly about their satisfaction. This approach is not conducive to grasping the true quality of home-based services and is not effective in avoiding adverse events. At the same time, most of the people who provide home-based health care services are female, and in the private environment of a home, the personal safety of the female service providers needs effective measures to ensure safety.

In the process of practice, the author has developed an intelligent digital system of service process supervision during home-based health care services - SHC (smart home-based care), which is a solution for home-based service quality assessment and supervision based on advanced technologies such as voice recognition and voice print recognition. It includes: an intelligent IoT terminal equipment, using its voice recognition equipment to obtain the voice data of service characteristics in the process of home-based service, converting the voice data into corresponding text data, and building a data analysis model based on semantic recognition; sending the text data into data analysis model for analysis and processing, obtaining one or more home-based service items and the service quality correspondingly. The home-based service is "restored" to produce a 5W+2H evaluation report, so that stakeholders such as payers (government, insurance, families), service providers (enterprises, caregivers), and the served can understand and grasp the service dynamics in real-time and monitor, discipline and evaluate.

6.2.1 Combined intelligent equipment

The SHC intelligent IoT hardware terminal is the combined electronic equipment, which includes a main unit and a secondary unit. They can be assembled together and used in combination, while the main unit and the secondary unit can also be detached from each other and used separately (See Annex D: Additional figure 28). The combined electronic equipment can be a combined cell phone, in which the main unit can be the main body of the phone and the secondary unit can be an extended function module of the main body of the phone (e.g., camera module, speaker module, or battery module.). For example, in an application scenario, when the main unit is separated from the secondary unit, the secondary unit can collect the surrounding acoustic signals and transmit the acoustic signals to the main unit for reporting to the backend server (See Annex D: Additional figure 29), and when the main unit is assembled with the secondary unit, the main unit can directly collect the acoustic signals and report them to the backend server. The technology has been widely used in Shanghai, China (See Annex D: Additional figure 30) and about 10000 elderly people have benefited from it.

6.2.2 Intelligent equipment identification logic

The SHC intelligent IoT hardware terminal feeds the recognized voice data into the home-based service item cut-off model for analysis and processing, and eventually obtains one or more home-based service items correspondingly. It is specifically including: setting corresponding start identifiers and end identifiers for each home-based service item; semantically recognizing the voice data in chronological order, and using the voice data between the start identifiers and end identifiers of the same home-based service project as the voice data of the current home-based service item.

The start identifier and the end identifier are identified in pairs. When the start identifier and the end identifier are identified in pairs, the voice data between the start identifier and the end identifier is identified as a home-based service item. According to the service specification requirements of each home-based service project, the content of the voice data is analyzed separately to obtain the service quality of one or more home-based service projects. Each home-based service project includes multiple project sessions, set the project session identifier, cuts the project into multiple project sessions according to the project session identifier, and evaluates each session in the home-based service project (See Annex D: Additional figure 31).

This home-based service quality assessment system based on speech recognition and semantic analysis can also be applied to the scenario in that the home-based service process

includes multiple home-based service projects. The evaluation system also includes several modules: a recording acquisition module for acquiring voice data during the service process; a keyword word setting module for setting keyword words for the beginning and end of the project; a segmentation module for segmenting the voice data into individual home-based service project according to start and end markers; a quality assessment module for comparing the service order and service time of each project segment with the preset order and duration to obtain a first assessment score as well as for assessing the quality of each project segment according to project segment key content markers and obtains a second assessment score; obtains the service quality situation after weighting first assessment score and second assessment score. In addition, it includes an output module for displaying the service quality situation of each project session and each home-based service project.

Different from the existing indirect ways to obtain the quality of home-based service (door-to-door random inspection, telephone return visit, satisfaction survey.), the intelligent SHC system analyzes and processes the acquired service characteristics data through speech recognition and voice recognition to achieve the direct assessment of the quality of the home-based service process. This study builds a data analysis model based on semantic recognition and uses deep learning and other neural network algorithms to achieve automated and efficient processing.

6.2.3 Speech recognition analysis processing

The data analysis model described above includes a home-based service item segmentation model and a project content specification model. The data analysis model described above uses deep learning for semantic analysis.

Acoustic sub-model is a model used to describe the connection between speech features and speech modeling units, which is an important part of speech recognition system. This system uses Convolutional Neural Networks-Hidden Markov Model (CNN-HMM) for the acoustic modelling, which is a deep model that can adaptively fit arbitrary data distribution by its own parameter tuning, and thus can achieve a high recognition accuracy.

After obtaining the speech fragments, the acoustic sub-model extracts feature from the fragments and recognizes the speech based on the extracted feature information to obtain the pinyin sequence corresponding to the speech to be recognized. For example, when the speech to be recognized is "Wash your hair, okay", the pinyin sequence obtained by the acoustic submodel is "xi ge tou hao ma" (Chinese pronunciations for "wash your hair, okay").

The language sub-model is used to predict the occurrence probability of the candidate

character sequence corresponding to the pinyin sequence, generating an indicator network based on the occurrence probability. Due to the existence of homophonic characters, when the pinyin sequence is obtained, the language sub-model determines N-1 characters from the pinyin sequence and predicts the probability of occurrence of the next character based on N-1 characters, so that one or more candidate text sequences corresponding to the pinyin sequence are obtained and the indicator network is generated based on the obtained candidate text sequences. For example, when the pinyin sequence is "xi ge tou hao ma", the characters corresponding to "xi" can be "洗" (wash) and " 西" (west) (both has the same pronunciation of 'xi' in Chinese, like "meat" and "meet"), the predicted characters based on "洗" (wash) and "ge tou" can be " 个头" (your hair), and the predicted characters based on "西" (west) and "ge tou" can be "跟头" (somersault). The character of "hao ma" predicted based on "洗"(wash), "个头"(your hair) as well as "西"(west), "跟头"(somersault) are both "好么"(okay). The generated indicator network is a schematic diagram of the indicator network in one embodiment (See Annex D: Additional figure 32). The candidate text sequence is a sequence of characters connected by nodes and lines with the start node as the starting point and the end node as the end point, for example, "Wash your hair okay" is a candidate text sequence. Through the analysis and processing of voice data, the automated management of home-based service process quality assessment is realized, and the data is more accurate, reliable, and intuitive and time-sensitive. It is conducive to the standardized and unified management of home-based service and promotes the development of home-based service industry.

6.2.4 The evidence of violations in service process

Currently, there are various forms of payment for home-based health care services in China. Some of the universal care services and life care services can be paid by China's national long-term care insurance, while some individual health care services can be paid by commercial insurance or paid by the individuals and families of the people served. However, whether the payment is made by long-term care insurance, commercial insurance or even individual payment, the payer wants the service to be genuine and effective, and also wants the quality of the service to be guaranteed.

However, some practitioners or individual operators may have irregularities in the execution of services in order to obtain more payments. For example, fraudulent acts of service recipients and service personnel signing to confirm that the service has been completed when the actual service has not been provided in order to obtain the service subsidy corresponding to

the service; service personnel inducing service recipients to purchase financial products or other insurance products in the process of providing the service; the fraudulent act of providing over-limit services beyond the scope of service payment, It is difficult to obtain evidence of the above-mentioned violations of home-based health care because there is no effective supervision of the service process during the execution of the service.

Based on this, the SHC intelligent service process supervision system purposely solves the technical problem that it is more difficult to forensically identify violations of home-based care, and provides an identification system of forensic method, equipment, apparatus and storage medium for forensically identifying violations of home-based care, applied to a home-based care service site. The method includes: collecting voice data during the process of performing home-based care services; performing keyword recognition on voice data by a voice recognition model to obtain recognition keywords; sending recognition keywords to a home-based care server; and receiving violation identification results returned by home-based care server. If it is determined that the home-based care service has a violation based on violation identification results then recording a preset length of forensic sound data, and quality control staff would get involved in this case immediately, they would contact service providers and customers to ensure security, and if the violation identification results are severe, quality control staff would come to service site as soon as possible. This method enables the forensic examination of irregularities in the process of home-baes care services (See Annex D: Additional figure 33).

6.2.5 Adopting "5w+2h" regulation model to promote "panoramic insight" of service

In the home-based health care service scenario, the service is provided by professionally trained service personnel to provide medical care services with specified service length and defined service content. The quality supervision and evaluation of the complex professional technology in the home scenario is a very difficult matter to quantify. If we want to achieve "panoramic insight (refer to knowing every detail of service in the process)" of service without supervisors on that site and with full protection of client privacy, we need to use "intelligent" tools to assist in implementation. Through the intelligent home-based care (SHC), a digital system developed in this study, we can identify the key elements of the home-based health care service as "5W+2H" (See Annex D: Additional figure 34). These include: Where? When? What? Who? Whom? How? And How much?

When the service personnel provide home-based health care services, firstly, the service manager needs to confirm whether the service personnel are providing pre-defined health care service contents according to the agreed time and length. Currently, video surveillance

equipment is mainly used to continuously monitor the behavior of service providers. Identifying the service content by video monitoring is affected by the initiative of the service personnel. For instance, if the service personnel do not take the initiative to record using video, it is difficult to monitor the service site. There are also additional difficulties when implementing services involving privacy, such as bathing. At the same time, because the storage space occupied by the surveillance video is large, it requires a large storage space to determine the content of the service. Based on this, it is necessary to provide an intelligent service content method, equipment, electronic equipment and storage media service process supervision system that can save storage space, and protect user privacy while effectively collecting "5W2H" contents (See Annex C: Additional table 10) for the service features identification and analysis to address the above technical problems.

The intelligent equipment obtains a service phrase set as well as a voice and analyzes the information by using voice recognition algorithms. The standardized service phrase set includes a plurality of service phrases; an indicator network is obtained by recognizing recorded voice based on a pre-trained voice recognition model; in this model the voice would be transcribed into a large amount of text; then extracting target keywords from the service phrases matching said speech to be recognized; and determining the service content based on said target keywords (See Annex D: Additional figure 35).

The specific operation is as follows: when the service personnel enters the household, the equipment wakes up using voice recognition, and then after facial recognition, the service starts. The equipment will then broadcast service content. The identification (capture service keywords, identify voice) will be offline for the whole service process to prove the authenticity of the service. At the same time, one-touch alarm can be triggered if there is an abnormal situation (such as customer dissatisfaction complaints, SOS one-touch alarm for the dangerous situations). At the end of the service, the customers conduct a service satisfaction evaluation, provide feedback and schedule the next time reservation (See Annex D: Additional figure 36).

6.3 "Affinity" Chinese service concept is integrated into service process reengineering

In practice, home-based health care services are usually organized by service companies to provide various types of services, with multiple payment channels such as the government, commercial insurance, family members, and themselves. Its complexity is manifested in the fact that it involves multiple stakeholders such as the government, elders, family members and

insurance companies. To carry out the service process reengineering of home-based health care services, the concerns and importance of all stakeholders must be considered, and the service design, service standards and service notification must be carried out in multiple aspects. In particular, family members, who are most concerned about the physical condition of the elderly and recovery from illness, have an urgent desire to participate in matters related to service informing, somatic recovery, and emergencies. The above theories and needs should be included in the blueprint design and process reengineering.

6.3.1 Integrating "affinity" into the design of service blueprint

Home-based health care is a complex professional service. In the process of service, there is not only the participation of the user - the elderly, but also the participation of paying customers - children, health insurance, commercial insurance and other payers. In the context of the experience economy, what customers and users really buy and what companies need to actually deliver is the "Customer eXperience (CX)", besides just the product or service itself. Unlike the visible and tangible business or actual services, experience is a subjective, immediate and personalized feeling from customers and users. The formation of "experience" is a complex process, which needs to be analyzed from different dimensions in conjunction with the actual services.

By introducing the service blueprint as one of the most important tools for service design, through systematic process management and service process design, the system relationship between customers, objects, behaviors, environment, and society is sorted out. The blueprint is user-centered, re-planned around the user to improve user experience, and ultimately improve service efficiency and service profitability in order to solidify the designed service into a standardized service process. Based on the understanding of the home-based health care service business, in conjunction with the actual business, the following "home-based health care service blueprint" is drew.

By analyzing the specific needs of the customer (diagnosis), a service plan is tailored for the customer, and only through multiple "touch points", the service provider provides them with a service package that includes multiple services in the best interest of the customer. The path to establish standardized services should be based on service scenarios, establishing service concepts that customers can perceive, combing service contacts from the perspective of the customer to sort out the service journey, refining the key contacts, combining customer pleasure and problem-solving to create a golden memory point for services, and finally forming implementation standards for service behavior, service content and service actions, so that the

end of the service can be effectively perceived.

The service organization starts service design from the policy class of long-term care insurance home-based health care business, splitting the regular service process into different segments, analyzing the customer's demand points in each segment, and thus designing it to increase the delicacy of the service in the overall service process, such as providing a glass of water after bathing and providing skin moisturizing care during Winter, which was well received by customers. Based on this experience, the service design was used for other payment types of service offerings, aiming to solve customer pain points and improve customer perception in the overall service process. At the same time, we invited customers to co-create the designed service process and implemented "user empathy" in the real sense. Service design focuses on the "before, during and after" service occurrence.

6.3.2 Service design focus on the entire Process

Before the service takes place (beforehand), professionals deal with the customer's "expectations", while afterwards, they deal with the customer's "feelings". The actual service experience, including the details of use of language or behaviors that the customer perceives during the service, affects the customer's perception of quality (what he or she thinks afterwards). Likewise, if a customer does not get the desired result due to a service error, a perfect remedy as an integral part of the service experience has a decisive impact on the quality of the service. It will give customer expectations for the future, thus he or she can overlook the previous displeasure and repurchase again. It illustrates the "time" relationship between customer satisfaction and technical quality (See Annex D: Additional figure 37). The gray "tunnel zone" in the figure shows the evolution of customer expectations and perceptions of the service over time. There is initially a large gap between the expectations of different customers for the same service, which decreases as customers become more aware of their needs and the service provider. The service encounter allows the client to adjust to initial expectations and to convert them into (afterthought) feelings. The magnitude of the difference in perception is smaller than the magnitude of the difference in expectation and closer to technical quality. The gap between perception and technical quality can be quite large when the service first occurs, but it will narrow as the customer's knowledge (from experience or others) builds up or some "lag effect" occurs.

In the quality management of home-based health care services, we use the process management method, treating health care services as a complete process, setting key control nodes in the process - that is, "contact points". A closed-loop model is formed by managing well

each "contact point". Customer satisfaction is important, but it is not a complete measurement indicator of professional service quality. Professional managers should know clearly that only by combining "service perception" and "technical quality", can we continuously build and strengthen the core competitiveness of company. Therefore, if the service meets the latest technical standards in the relevant field, professional services with "technical quality" characteristics will reduce the complexity of complex service quality for customers to identify and promote the quality of service improvement.

6.3.3 Service process monitoring system customer privacy protection

6.3.3.1 The disadvantages of the currently adopted technical methods

Promoted by the era of big data, the introduction of intelligent equipment for process identification, quality assurance, risk control, and improving regulatory efficiency, reducing regulatory manpower at home-based service scene has been the trend. While in the private environment of the home, how to protect personal privacy and security is also particularly important.

In order to protect the quality of home-based services, reduce service risks, improve regulatory efficiency and reduce regulatory manpower, there are also a variety of solutions placed in the home environment for exploration and trial. Several of the more common solutions are video supervision, thermal imaging supervision and full recording. All of the above programs have their advantages and disadvantages. Although video supervision program can restore the home scene more comprehensively, home-based services mostly involve customer body exposure, such as bathing, perineal care, and video "volume" is relatively large with higher requirements for transmission and storage. Thermal imaging supervision can hide customer appearance compared to video, but the actual application found that the imaging quality decreases and even blurs when the weather conditions of rain and low temperature. Recording supervision will generate other sounds during the service process besides the sound for service, and it lacks AI algorithm support. The above options still need a large number of regulatory manpower investments, which does not solve the fundamental problem of home-based service supervision.

6.3.3.2 SHC combines original solutions to form customer privacy protection measures

Integrating the advantages and disadvantages of the above solutions, SHC adopts the solution of service process voice recognition, which can maximize the goal of service quality management and risk control, as well as protect the security of customers' personal privacy.

It is important to first understand the client's concerns, such as why is the service process being recorded? "Will everything I say be recorded? Will data be leaked and who will have access to my service data?" Customers are often skeptical before implementation. The design of the service process should be optimized. Firstly, before starting to use the equipment, customers and their families will be informed, indicating the purpose of data collection, how the data will be applied, and the scope of application. Only after obtaining the customer's consent will the SHC intelligent supervision equipment be applied.

During the service, edge computing is performed at the intelligent hardware equipment end for data desensitization processing. Sensitive content not related to the service is processed in the service process, such as automatically deleting long strings of numbers, phone numbers, social security card numbers, and bank card number, so as to protect users' privacy. Then, the service data is uploaded to the cloud for analysis and processing, and finally aggregating and displaying the service content and quality in the system supervision background.

After the service completion, in addition to the government regulators, the development company's R&D staff will be able to review the service data to build and improve the home-based service process identification of AI models to improve the accuracy. Undoubtedly , all the relevant employees need to sign a confidentiality agreement before they review the data, protecting privacy and personal information security using laws and regulations.

6.3.3.3 Technology support for SHC to protect the privacy

The SHC system is built with a secure B/S/S three-tier structure, eliminating the possibility of direct client access to the database server. In order to ensure the system security to the greatest extent, the "three horizontal and three vertical" mesh security scheme is designed by combining the characteristics of the three-layer structure and the actual requirements. The "three horizontal" refers to user representation layer authentication, business logic layer authentication, and data service layer authentication; the "three vertical" refers to secure transmission, security audit, and limited-time security access.

SSL (Secure Sockets Layer) protocol, PKI (Public Key Infrastructure) technology, and digital certificates are used to establish secure connections between browsers and servers to prevent information leakage, and tampering, It also provides audit functions for security control and events, and the audit results can be regularly reported to management and used to update and improve security policies. The three-dimensional anti-virus system is deployed in the internal network to realize real-time virus defense for servers and clients. It enables the servers and management workstations of each system/platform to have virus defense capability.

6.4 "Standardization" service establishment to enhance service value

In order to apply intelligent technology in home-based health care service process supervision, the standard for the overall service should be established. The standard includes three aspects: the first is the standard of objects; the second is the standard of people; the third is the standard of the process. The standardized system needs to focus on - service process, service content and service personnel aspects.

From the aspect of service process setting, the home-based health care service process management system in the front end takes the service organization's mission as the goal, focusing on the needs of service recipients, analyzing the reality of the service process to format a series of standards for service personnel, service facilities and equipment, service environment, service materials, service methods, After the summary of the original system, the establishment of the internal operation of the organization in line with the environment, personnel requirements, operating habits is sorted out. Secondly, after the completion of the standard, adequate training is needed to reach a consensus of consistency within the organization.

6.4.1 Service process standardization

The perfect service process serves every customer and enhances customer satisfaction. For those service personnel, like nurses, caregivers, rehabilitation therapist, they can also improve the efficiency and service effectiveness according to the standardized service process, such as the home-based service process. The service organization, according to the home-based service session, splits the home-based service process into different stages of sub-session according to the customer service contact points and determines the service in each step of the sub-session process standards, thus clarifying how personnel implement and the customer's concerns.

In terms of service process standardization, the service organization is combined with the "customer-centric" service design concept. The overall service process is from the customer's point of view, designing multi-dimensional service contact points, to ensure that service personnel in all aspects of the smooth process at the service front, middle and back office, so as to be able to constantly push the envelope. The service scripts can be combined with the operation process to design replicable service scripts. Through stage review from optimization to solidification, a standardized service process that can be implemented on the ground is formed.

6.4.2 Standardization of service content

The Standard Operating Procedure (SOP) is formulated for professional and technical service items, with clear and standardized requirements regarding specific service items, service time and service effect. For example, according to different clients' physical and care plans, the corresponding care modules are provided. The service time is executed according to the service plan and confirmed by phone the day before. Service etiquette and affectionate care are integrated throughout the service process, including greetings before service, attention during communication, warm service in special scenarios, such as hand cream in winter and a glass of warm water. Customer satisfaction inquiries and demand confirmation are made at the end of the service to provide professional health care, like a courteous seneschal.

6.4.3 Standardization of service personnel

For the front-line service personnel, instruments, grooming, language, attitude, behavior are standardized. The enterprises equipped exclusive work clothes and backpacks for each front-line service personnel. Meanwhile, the personnel grooming instrument has clear requirements, from clothing, hair style, and nails. Personnel needs to dress in line with the norms, no revealing clothing, no skirts, high heels, leather shoes, and have proper hair style and hair color, no exaggerated hair style, no colorful hair, no shaved hair, no men's hair over the ear; no nail polish. For service etiquette, it requires personnel to keep in mind the "ten forbidden". In terms of service language and attitude, according to the business process, combined with the key sessions, the service dialects and action behavior are regulated, such as greeting, inquiring about the needs of the household, ending words, reception words, health promotion, so that the customer has a pleasant perception and emotional resonance for the whole service process, thus establishing the image of professional caregivers of health butler level.

At the same time, various types of training, such as online cloud training and offline practice are applied, so that the service providers can keep the standards in mind and be reflected in the specific services. In order to promote the standardization of service implementation, the SHC system will also be used to record the standardization of service content. Therefore, before each step of operation there will be hardware equipment for information prompts, applicable to the level of education and literacy of the service providers who perform home-based services.

6.4.4 Intelligent and standardization combination in services

In the service implementation standards, the integration of "human behavior standards +

intelligent technology standards, the so-called "human-machine combination", will promote service efficiency. Intelligent equipment could make workflow easier and standardized service could make the service details easier to be checked, the combination of them can optimize the home-based health care service. WHO (service provider), can be service personnel, also could be the equipment, like a rehabilitation robot. WHEN (service time), changes from the traditional timed service to intelligent real-time service. WHAT (service content), forms service standards by extracting the customer satisfaction behavior from the service behavior and customer evaluation using data platforms as well as forms service warnings by extracting the behavior of customer complaints in order to constantly optimize the service content. HOW (service process), enhances customer perception and makes the service process more visual and simple, combining it with intelligent equipment. Service providers have already combined these standardized processes with intelligent supervision equipment. Therefore, home-based care no longer becomes a difficult supervision point. In summary, through the combination of intelligent applications, better services can be provided to customers. Combined with intelligent standardized services, a more comprehensive, better quality and better service experience can be provided to customers.

6.4.5 Standardization promotes the creation of service value

Service quality means meeting the needs of customers – it is a key part of value. The customer's needs motivate them to take action, resulting in certain activities. These activities, in turn, lead customers to seek "help", or what we call service, to meet their needs, which is what is meant by "quality". At the same time, customers want to get the most out of every dollar they spend, and this is called "value". The enterprise provides customers with valuable services, and hopes that customers can clearly benchmark the feeling and design the relevant "service concept", in order to be able to provide super high "value". In this process, the employees who provide services are the key. Therefore, carefully selecting the right people, instilling in them a high "work philosophy", and making them feel "valued and happy" is as important as the customer. In addition, the shareholders need to be satisfied. All of these needs are part of a business strategy that forms a harmonious whole with the rest of the company.

One of the important benefits of service standardization is the continuous emergence and enhancement of customer service value, thus forming a service profit chain. Customer service value is generally divided into four levels. First, to meet the basic needs of customers. Second, to meet the expectations of customers. Third, to meet the wishes of customers. Fourth, to meet the "unexpected" needs of customers. In order to continuously improve and achieve these four

values, it is necessary to build on the standardized and effective basis of the aspects of process, service, language, action and attitude. In the service industry, customer orientation is at the core. Therefore, the establishment of service standardization needs to be combined with customer-level service contact point design, around the key contact points, and all-around fit customer demands. Through the five senses and deep customer interaction, the golden memory moments are created and strengthened. The service blueprint is created around the service concept, with a variety of service details throughout the service to practically improve the quality of life of customers. Its own brand label is created with standardized behaviors and actions, gaining customer service value, reaching or even exceeding customer expectations from the combination of customer demand for service, previous service experience and corporate service reputation impressions. In the continuous improvement of customer service value so as to form a service profit chain, forming a superposition effect of two positive cycles inside and outside. That is, from the internal level, through the implementation of service standardization, the internal service quality is improved, and the positive cycle of internal caregiver satisfaction is reached from the front-line service personnel's ability, service force, service personnel satisfaction, service personnel commitment, service personnel loyalty. It promotes the continuous improvement of service capability, thus affecting the external level, which is, the continuous improvement of external service quality, from customer retention, customer referral, customer satisfaction, customer loyalty, customer unit price, which promotes the long-term growth of revenue and profitability.

6.5 "Collaboration" effectively combines to promote customer satisfaction

In China, the provision of home-based health care services is inextricably linked to the work and support of governmental, community self-governing organizations and industry technical groups. In the enterprise, the front-line service providers cannot provide quality services to customers without the collaboration and support of the middle and back office of the organization, as well as the service principle and overall culture.

6.5.1 The mission of process management: linking strategy and operations

To achieve consensus of process management in the whole company, the board should firstly set up the mission or strategy, and then deliver it to the operators of the company. Further, deliver it to working staff (service providers). So, the mission statement is key to ensuring the integrity of the "strategy-process design" connection and promoting alignment between

processes. The use of a range of methods is realistic, rigorous, and perfectly integrated with the "do the right thing" approaches. Then, CEO and service providers could all make effort together for the mission.

The service blueprint design and service touch point creation described above are applied to "Customer eXperience Management". Customer experience is a strategic transformation of the company as well as a change in the thinking and concept of service provision, that adjusts the presentation, content and process of the service provided from the customer's perspective to meet the customer's needs. This kind of adjustment and transformation needs to mobilize all departments of the enterprise, not only the front desk business department that deals with customers. Customer experience management is the process of managing the overall experience, not just the single experience of certain behavioral touchpoints or channels. Specifically, customer experience is a subjective, immediate and personalized overall feeling, and needs to be managed in conjunction with subjective feelings and customer feelings as a whole. Forming customer experience into objective and quantifiable indicators is also an important grip for operation management, such as customer satisfaction, customer NPS, customer churn rate, customer repurchase rate, customer retention rate, and customer life cycle value.

6.5.2 Customer satisfaction and technical quality collaboration

The figure in Annex D illustrates four possible outcomes resulting from the combination of different levels of technical quality and client satisfaction, with the first and third quadrants being of particular interest from the perspective of home-based health care services (See Annex D: Additional figure 38). The first quadrant suggests that professional services are highly technical, and the clients are not satisfied. This tends to occur in professional service organizations that focus on technical precision and standardization but disregard the expectations and feelings of the client. That is, the professional is competent and proposes appropriate measures, but fails to make the client understand what they really need and lead them to the right conclusions. If there is a lack of trust between the client and the professional, no value can be developed.

The situation in the third quadrant is the opposite of the first quadrant, where the factors affecting customer satisfaction in the service process are handled well, but the customer is essentially deceived, i.e., they do not receive the service they should have received, and in an uninformed scenario. Sometimes this scenario is fraudulent, but most of the time it may be simply due to complacency, carelessness, hassle or negligence, making the customer feel duped. At this time, the company's reputation is also fragile and greatly affected. In order to move to

the fourth quadrant, professionals need to change their mindset and be able to listen to customers and be willing to let them know what they are doing and why they are doing it. Only then can they help customers make the appropriate adjustments in their expectations and feelings to achieve the desired results.

6.5.3 "Three offices collaboration" of enterprise to enhance customer satisfaction

The prerequisite for front-line service providers to provide good service is that the middle-office support departments and back-office functions can work together to establish a cross-departmental "customer consensus". In the actual process of providing services to customers and users, it is not only the front-line nurses, caregivers and rehabilitation therapists who deliver a good service experience, but also the linkage and collaboration of many departments in the middle of the enterprise, including marketing, quality, operation, R&D, IT and human resources, as well as the overall corporate strategy, cultural atmosphere, values and caregiver growth at the bottom. Even though many processes and standards are well-designed, they are not implemented by frontline caregiver because of poor implementation, or because of the lack of behavioral guidelines and effective linkage due to the support of the middle and back office, and cannot be adhered to. Therefore, providing more shared corporate values, clear and visible information, proper education and training, and awareness-raising can lead to better execution and effective enforcement. Regarding of the organization as a process system, we can view the organization as a complex system of interrelated processes (See Annex D: Additional figure 39).

6.5.4 Intelligent equipment "human-machine" collaboration

Typically, service equipment cannot work alone in service without any service personnel. Only service providers really use the equipment, their function can be maximized. And the feedback in actual use can also improve and optimize equipment and system. It is the same to SHC intelligent supervision system and equipment in this research. It requires service providers to use it in real service scenarios so that this system and equipment can promote the standardization of service and truly improve the goal of customer satisfaction. By "human-machine" collaboration, the process management solution (SHC system) can achieve the goal we set up.

6.5.4.1 Combination of Intelligent Equipment and Users

In the initial design of the built-in software of the smart device, considering the levels of education of the home medical caregivers, which are relatively lower, a questionnaire survey

of the service personnel was conducted in the early stage of software development, to improve the overall acceptance in the service provider group. Service scenarios and processes are adequately considered to design the operation steps of the equipment, and a preliminary test was conducted on front-line staff as well. Finally, an optimized interface suitable for the operation habits of service personnel was established. The one-click operation process ensures that each user can quickly understand how to use the equipment.

Of course, simplified application and a friendly interface are not the ultimate goals. The service process generated by the smart devices is set according to "regulatory rules", aiming at actively reminding users of key service points and risk points, therefore reducing human negligence and service risks through the human-computer interaction. Furthermore, these errors notice in each service, gradually stimulate the users to develop "muscle memory (refers to form a habit for users)" to achieve standardized service.

6.5.4.2 Combination of Intelligent Equipment and Customer

The customers of the home health care service are generally the elderly, who presumably have no objective basis to evaluate service standards. Through the introduction of intelligent equipment, customers are provided with principles to refer to when receiving standardized services. At the same time, intelligent service supervision runs through the whole service process to control service quality and service risks and to protect the rights and interests of customers.

In addition, service supervision agencies analyze service data obtained by smart devices and other comprehensive information about the elderly to predict physical health trends and behavior characteristics of the elderly and eventually achieve the goal of risk management. This information comprises past medical history, medical conditions, medication history, and pattern of diet, sleep state, vital signs, and so forth. On the other hand, based on those multi-dimension data and information, it is possible to customize services that are more appropriate to meet the actual needs of customers, and improve their satisfaction.

6.5.4.3 Intelligent technology and organization combination

With the wide use of SHC intelligent equipment, the supervision and quality control of the process of the home-based health care service, which is likely to be difficult to achieve even with heavy manpower, are potential to be solved. This approach is hopefully to remarkably reduce the manpower and resources investment of organizations for service supervision.
In the process of "human-computer interaction", gradually replacing human labor with equipment and reducing labor input seems like a tendency. Meanwhile, "service data and

service analysis" are exploited to help managers summarize management knowledge, to improve business processes, and finally to form a new situation in which human-machine co-creation is being actualized.

Chapter 7: Conclusions

7.1 Research conclusions

As China's population is rapidly aging and the society as a whole showing an overall trend of aging before it gets rich, the Chinese government's planning and practice of aging in place has revealed that hundreds of millions of ordinary families in China are indeed choosing to "aging in place", i.e., home-based aging. In particular, the Chinese government introduced long-term care insurance 2016 to pay for home-based health care services, and has gradually covered 49 cities in the following years. In order to make the health insurance funds controllable and also to make the elders receive high-quality services, the relevant payers and the served parties are increasingly demanding for service quality supervision. The research also found that service providers need to use intelligent technology to manage the process of providing home-based health care services, as it is a complex service and a medical-related professional service, combined with standard manual services. It also requires the integration of Chinese service concepts to enable the elderly and their families or other payers to participate in the supervision of the service, making it more controllable and accessible. This research investigates the key strategies of operation in the process management of home-based health care services, which is rarely seen in previous domestic and international studies. In particular, the integration of intelligent IoT equipment for process supervision, which fills the gap in this area.

Complex services provided by professional and technical staff, such as the customer having a good experience of the service process (operational level), require a perfect tactical level (including quality management, employee relations, professional training, and organizational management) to support and operate. At the same time, it also needs to combine the external environment to develop an overall strategy in line with the business development. Without the combination of internal and external overall operational strategy, even the best customer process cannot be implemented. Therefore, this study not only constructs a short-term solution for operational implementation (multiple executions), but also conducts a tactical-level medium-term operational plan (6-12 months) to continuously meet service standards, safety and security and contingency plans, which can reduce the risk of imbalance due to process control. In the long term, it is necessary to combine the external environment, industry policies, and the concept of retirement with the strategic level (12-18 months) to build the service model. so that the company can form its own core competitiveness and have the ability to survive in

the market competition and development. The standardized service process will be integrated into the process management and operation system construction in order to realize the process management improvement of home-based health care service.

From the strategic level, the four-pronged "ISAC" intervention strategy model of home-based health care service process management is clearly defined to effectively improve customer satisfaction. From the tactical level, the industry general indicator evaluation system to improve home-based service process supervision is established. From the practical level, the SHC home-based health care service process management intelligent system is innovatively developed to effectively solve the problem of process supervision. The intelligent process management and operation system of home-based medical health care services is established at the strategic, tactical and practical levels in line with China's national conditions. It is undoubtedly a major breakthrough in the improvement of home-based health care service quality. This is the significance of this in-depth study. The specific research findings are as follows.

7.1.1 "Intelligent" SHC system promotes the process management

By analyzing the characteristics of home-based health care services, combining the actual pain points of industry practitioners on the difficulty of home-based service process supervision, and analyzing the actual business scenarios through questionnaire research and personnel interviews, this study innovatively developed the SHC (Smart Home Care) service process supervision intelligent digital system. By combining with AI technology, the service features identified by the IoT hardware at the service site are analyzed by voice recognition and semantics, so as to identify the "5W+2H (Where, When, What, Who, Whom, How and How much)" issues in the supervision of home-based health care service process. The service analysis report is subsequently transmitted to the cloud and shared with the service organization, the user's family and the government regulator. By integrating intelligent solutions into the service implementation process, it effectively opens and restores the "black box" of home-based health care service process management. Moreover, it is worth mentioning that this effective restoration and supervision of the service process not only protects the rights and interests of customers to receive good services, but also fully protects the rights and interests of the service personnel who provide home-based care services by reengineering the service process and activating the SOS one-touch call function on the SHC when necessary, which achieves a two-way protection effect and makes it easier to be adopted, implemented and implemented by service providers. It is easy to be adopted and implemented by the service provider.

So, this result addressed the first research question— how to apply AI, IoT, informatization and other "intelligent" aids to improve the quality of process management based on the operation management problem of difficult supervision of home-based health care service.

7.1.2 "Affinity" concept improves customer's experience

The integration of China-specific care concepts into home healthcare services, focusing on combining traditional culture, payment principle, policy system and other dimensions make it easier for the elderly and their families to recognize and accept the services provided by the organization. The overall service blueprint is designed with the customer in mind, and the service touch points are optimized to enhance the customer experience, customer satisfaction and net promoter satisfaction (NPS). In home-based health care with Chinese characteristics, there is a separation of roles between the elderly who actually receive the services and the families or government who pay for the services.

Starting from the perspective of "affinity", the stakeholders around the service provision are involved in the overall supervision process of the intelligent service process. They share the feelings of the customers from service information sharing, service evaluation participation, service effect interaction and other content. Based on the concept of " affinity " service, service providers balanced various payment methods and supervision mechanisms, continuously optimize and iterate, and strive to meet the new needs of home-based health care services.

They also focus on protecting the full range of personal privacy of their customers from the technical design of the intelligent supervision platform, the overall construction of the service process, and the related dimension of humanistic ethics, and effectively integrate the Chinese "affinity" care concept into the intelligent methods to improve the process management of home-based health care.

So, this result addressed the second research question—how to integrate the concept of service care into the quality improvement management of home-based health care services in accordance with China's national conditions.

7.1.3 "Standardization" is basis of intelligent regulation in service

The development of the industry cannot be separated from the "standardized" service system, "there are standards before there is business". However, because the home-based health care service industry has just started, and most of its practitioners are less educated and older, there are practical difficulties in the implementation of standardized services. In this study,

standardization is implemented in three aspects: the first is the standard of service content; the second is the standard of service personnel; the third is the standard of service process. Combined with the basic situation of the actual operators, the standard process, content, and discourse are integrated into the intelligent equipment. Through the text and voice prompts on the screen of the intelligent hardware terminal, the service personnel follows the map and implement it in order, which becomes a habitual action over time, effectively improving the quality of service, also enhancing the customer experience and improving customer satisfaction.

The standardized service processes are constructed and integrated into the process management and operation system construction, in order to display and improve the value of customer service, thus forming a service profit chain to achieve home-based health care service process management improvement.

So, this result addressed the third research question—how to integrate the standardized service process into the process management operation system construction to realize the process management improvement of home-based health care service.

7.1.4 "Collaboration" accelerates the practice of operation strategy

Even the best intelligent technology tools need to be used by people and play a role through continuous iteration. Therefore, how to achieve the collaboration between staff and technology, users and technology, organization and technology in the scenario of home-based health care services is particularly important. This research applies operational interventions like integrating process management and customer experience, integrating front, middle and back offices within the company, and integrating humans and machines to achieve the collaboration of the organization, staff, customers, and intelligent system. The traditional manual home-based health care service is upgraded to "digital service" combined with intelligent system, thus building a four-pronged home-based health care service process management "ISAC" intervention strategy model. It consists of "Intelligent", to assist with home-based health care service process management; Chinese "Affinity" service concept, to integrate with service design; "Standardization" process, to improve service value and "Collaboration", to effectively improve customer satisfaction. Through the collaboration effect of various aspects, the research focuses on the balance of advantages and strives to build a new pattern of home-based health care service.

So, this result addressed the fourth research question—how to effectively improve the quality of home-based health care services in an intelligent scenario through the collaboration of organization, staff, customers and systems.

7.2 Research contribution

Based on the analysis of the sample of home-based health care service in Shanghai, China, this research studies the overall operation strategy of home-based health care service process management in line with Chinese culture. At the same time, the research perspective is put on the home-based elderly care service chosen by 90% of the Chinese elderly, focusing on the core management key point of the home-based health care service, which is the management control in the process of home-based service. Finally, the research establishes a set of operation system with general value, which can be applied by most Chinese eldercare enterprises.

7.2.1 Developed an operational model of home-based health care service process management.

The complex service process management is rarely seen in the management field and service field. On the one hand, the service is provided by professionals with professional skills. On the other hand, the service is received by elderly people who have deteriorated human functions and do not recognize whether the service received meets the standards. There is a gap in the complex service knowledge such as proprietary skills and expertise. The input and output of such services are in non-professional institutions, which is, in the home of the elderly. Therefore, the "process management" of such complex services is particularly important to ensure greater value for the client.

7.2.2 Established a quality evaluation indicator system for the process management of home-based health care services.

In the past, the quality management of the elderly service system was mostly concerned with the quality of the long-cycle services. However, if the service quality was not good, then it could only be evaluated afterwards, and the results were already formed. The perspective of this study changes the quality control to focus on the process management of one short-cycle service, i.e., the service quality of each time. If the services for the elderly are adjusted from process control of one long cycle to each short cycle, i.e., process control of each service cycle, then eventually each service was excellent and constituted a good care service effectiveness. Nevertheless, there is a lack of quality evaluation indicator system for this in the medical and health care industry. This indicator system can be a significant reference and a driving force for the development of the home-based health care industry.

7.2.3 Constructed a digital system of intelligent home-based health care service process management in accordance with Chinese condition.

The system combines intelligent IoT hardware equipment, information software, cloud platform, AI algorithm model, with traditional front-line personnel of elderly service enterprises, forming complex backstage technology, foolproof interface operation, truly applying cutting-edge technology to the front business implementation, thus restoring home-based health care service process content. It opened the "black box" of complex home-based professional service, enabling Chinese elders to receive quality, standard and guaranteed senior care services.

By focusing on the strategic, tactical and operational dimensions in business, this research creates an overall operational intervention strategy for the process management of home-based health care services. It also combines the current more cutting-edge information technology and intelligent tools to assist in enhancing the quality of operations. To best of our knowledge, similar research at home and abroad has yet to produce results. The author develops a feasible and universal methodology through this study, with strong pragmatic and operational guidance, to maximize the value of the enterprise while benefiting hundreds of millions of Chinese elders and their families with quality home-based health care services.

7.3 Research implications

The study results filled the gap in the field of home-based health care service process management in China and changed the existing single research dimension that only focuses on service content and service effect evaluation, and further explored the operation and management strategy of home-based health care service from the unique perspective of service system construction, service process management, and intelligent system application. From the perspective of research method, this study applied quantitative and qualitative research to verify the interrelationship between research hypotheses, changing the way that most of the previous studies only carry out single-factor correlation verification, making the data verification results more scientific. From the perspective of the research object, this research broke through the previous study that was only from the service recipient, but to the whole process of the service of all relevant parties to carry out research, from the service demand side, service supply side, service supervision side and other aspects of perspective, with an integrated perspective on the service system to consider, as far as possible to meet the needs of all parties, in order to finally achieved a balance between all parties, and finally achieved the ultimate purpose of building a

complete service system.

This study was not only at the theoretical level, but also considered the practical implementation, combining the study of service system with intelligent system and IoT intelligent hardware equipment, and taking the complete service system as the theoretical basis, transforming the information of "service characteristics" which cannot be easily retained in the service process of home health care into the "digital language" which can be recognized into the intelligent equipment. The service process scenario information was matched with service standardization process through the cloud-based voice recognition tool, which eventually formed a complete service process management evaluation report. In this way, the pain points of difficult supervision, evaluation and proof of service scenarios in home scenarios were solved, and the quality of home-based health care services can be further promoted, which also made the industry have the basic conditions to gradually commercialize from relying on the government to purchase services, so as to finally promoted the development of home-based care service industry.

7.4 Limitations and further research

As for the limitation, this research focuses on Shanghai, where has a high level of aging in China. However, the uneven level of economic development in China and the different resources invested by the government require caution in the generalization of the research findings. Future research could focus on a more diverse sample with multiple levels and geographic regions to obtain generalized and generalized conclusions.

Home-based health care services industry has only been developing in China for 10 years, so this research has a limited observation window. Future research should focus on the systematization of this industry in the longer term.

This study only focuses on the intelligent process management of home-based health care services, and future research can be expanded to the intelligent management of the whole process of home-based health care and recreation services based on this research, which is believed to have a more holistic effect on the promotion of industry development.

The development of China's home-based health care service industry is in the early stage of the industry, but it is also getting more and more attention from the knowledgeable people at home and abroad with the rapid aging of China, the introduction of various national policies, and the trillion-dollar market scale of the industry in the future. This study focuses on solving the industry pain points and difficulties of home-based health care service process supervision,

and innovatively proposes the SHC intelligent service process supervision digital solutions. Nevertheless, because of the limited time and money invested by the individual team, the countermeasures proposed for the existing problems are certainly imperfect and incomplete, especially in effectively solving the hardware cost investment problem, personnel and equipment results in improving the effectiveness of the problem, and customer service value enhancement problems. The author hopes that more scholars will study the problem in depth, and we also hope that the Chinese government and regulatory authorities will learn from the experience from the implementation of the pilot cities when establishing the elderly care policy in more cities, so as to reduce the detours and make good use of the funds.

There is still a long way to go to study on home-based health service system. It is believed that with the advanced and effective operation models in economically developed cities like Shanghai, China, the system can be gradually extended to other multi-level development cities and less economically developed rural areas in China, so that more Chinese elders can enjoy better quality health care services through effective home service operation and management strategies, and truly provide them with a sense of being supported and security in their old age.

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Annex A: Service Quality Evaluation Research Questionnaire (Clients and family members)

Service Quality Evaluation Research Questionnaire (Clients and Family Members)

In order to accurately grasp our service quality and level, understand the current service quality deficiencies and better improve service quality, this questionnaire is based on the SERQUAL scale. Each question of the questionnaire is some description of service quality, please check the number to indicate how strongly you agree or disagree with each view (5=strongly agree 4=more agree 3=fairly 2=less agree 1=strongly disagree)

SQ=PS-ES

SQ>0, service exceeds expectations

SQ=0, service satisfactory

SQ<0, service unsatisfactory

Evaluation indicators		Desired service quality (ES)					Service satisfaction (SQ)	Remarks
Number	Affinity	5	4	3	2	1		
A1-1	You expect/perceive the provider to understand your existing abilities and strengths to provide a care plan							
A1-2	You expect/perceive that the provider will encourage and support your family members to participate in care and activities.							
A1-3	You expect/perceive that the provider selects services based on your customs, cultural beliefs, and interests							
A1-4	You expect/perceive that the provider will work in partnership with your family's primary caregiver.							
A1-5	You expect/perceive that the service provider understands you and your family members' needs and concerns							
A1-6	You expect/perceive that the service provider will educate you about the service concept and ensure that you are prepared to know it							
A2-1	You expect/perceive that the service provider will offer and recommend service business insurance products to you							
A2-2	You expect/perceive that the service provider will provide you with differentiated premiums in strict compliance with the LTC insurance assessment requirements							
A2-3	You expect/perceive that the service provider will provide you with self-pay service options based on your individual needs							
A2-4	You expect/perceive that the services provided to you by the provider will meet your actual needs							
A2-5	You expect/perceive that the service provider makes you will to consistently choose to purchase the service							
A3-1	You expect/perceive that the service provider will use intelligent monitoring equipment during the service							
A3-2	You expect/perceive the service personnel to provide regular feedback during the service process							
A3-3	You expect/perceive that the service provider will choose the supervision method that is appropriate for your care relationship and living environment							

A3-4	You expect/perceive that the service staff will use intelligent equipment to send timely service warning signals in the service process and can take corrective measures in time							
A3-5	You expect/perceive the service personnel to provide facial recognition punching and service process prompting operation based on the equipment							
A3-6	You expect/perceive the service personnel to provide timely service information and feedback to your important relations							
A3-7	You expect/perceive that service personnel will tell you about existing supervision concepts and methods							
A3-8	Your family expects the service personnel to explain the existing supervisory concept and method to them							
A3-9	You/your family expects the effectiveness of the existing intelligent supervision tools							
Number	**Standardized**	5	4	3	2	1		
B1-1	You expect/perceive that the service personnel meet the national requirements for credentials							
B1-2	You expect/perceive the service personnel to conduct regular training and assessment according to the norms							
B1-3	You expect/perceive the service personnel to show the qualification materials according to the specification in the process of service provision							
B2-1	You expect/perception service organization to provide consistent service products in different regional organizations							
B2-2	You expect/perceive the service organization to provide a standardized service process in different regions							
B2-3	You expect/perceive the service organization to provide consistent service prices among different regions							
B2-4	You expect/perceive the service process to be completed on time and in full according to the promised service time							
B2-5	You expect/perceive that the service process will be executed according to the key guideline and key steps							
B2-6	You expect/perceive that there is a standardized process for handling and reporting of emergencies in the service process							
B2-7	You expect/perceive the service organization to provide unified service evaluation indicatores							
B3-1	You expect/perceive the service organization to build a remote service scene with the goal of "visualization and reversibility" of the home-based service scene							
B3-2	You expect/perceive the service organization to uphold the service equipment configuration planning with the goal of "uniformity and ease of use" in the use of service equipment							
B3-3	You expect/perceive the service organization to build a standardized three-dimensional data model of the home-based service environment with the help of VR technology							
B3-4	You expect/perceive the service organization to establish a standard information database for in-home services							
B3-5	You expect/perceive the use of standardized service equipment and service tools in the service process							
B3-6	You expect/perceive the operation of standardized service process in the service process							
Number	**Intelligent**	5	4	3	2	1		

Number		5	4	3	2	1		
C1-1	You expect/perceive the service organization to build a process monitoring system with the strategic goal of improving service quality and optimizing operational efficiency							
C1-2	You expect/perceive the service organization to design "5W2H" as the goal of the evaluation results of the regulatory dimension							
C1-3	You expect/perceive the extent to which the organization actively invests internally to support the implementation of digital intelligent supervision system							
C1-4	You expect/perceive the organization to provide model training internally to ensure the concept is recognized and can be implemented on the ground							
C1-5	You expect/perceive the formation of a trinity of software, hardware and scenario solutions							
C2-1	You expect/perceive the service organization to use the combination of intelligent hardware and software to solve the home-based service quality process supervision							
C2-2	You expect/perceive the service process using algorithm model to achieve automatic pushing service guidance to service personnel							
C2-3	You expect/perceive the use of data analysis means to show the service site supervision data in real time to solve the problem of health insurance supervision							
C2-4	You expect/perceive the service process to receive real-time guidance when service personnel encounter difficulties							
C2-5	You expect/perceive that service personnel use voice input equipment to collect service data during the service process							
C2-6	You expect/perceive that health insurance institutions can grasp service data in real time through the data screen during the service process							
C3-1	You expect/perceive the service process to fully consider the characteristics of the home service scene (light, acoustic environment, network environment) to choose the appropriate intelligent supervision means							
C3-2	You expect/perceive the process of service to fully consider customer privacy protection and information security							
C3-3	You expect/perceive the service process to timely and accurately identify service scene signs and transimit data							
C3-4	You expect/perceive the service scene design to fully consider the service experience of you and your important relations							
Number	**Collaborated**	5	4	3	2	1		
D1-1	You expect/perceive the service organization to perceive and analyze your needs from a professional perspective							
D1-2	You expect/perceive the service staff to identify your needs in the service process based on professional experience and provide corresponding services in a timely manner							
D1-3	You expect/perceive that the service staff will actively communicate with you during the service process and provide adjusted service content based on feedback							
D1-4	You expect/perceive the level of recognition of the service staff							

Pre-test

Service Quality Evaluation Research Questionnaire

The Operation Strategies with Chinese characteristics on the Intelligent Process Management of Home-based Health Care Service

In order to accurately grasp our service quality and level, understand the current service quality deficiencies and better improve service quality, this questionnaire is based on the SERQUAL scale. Each question of the questionnaire is some description of service quality, please check the number to indicate how strongly you agree or disagree with each view (5=strongly agree 4=more agree 3=fairly 2=less agree 1=strongly disagree)

Evaluation indicators		Perceived service quality (PS-1)					Remarks
Number	**Affinity**	5	4	3	2	1	
A1-1	You perceive the provider to understand your existing abilities and strengths to provide a care plan						
A1-2	You perceive that the provider will encourage and support your family members to participate in care and activities.						
A1-3	You perceive that the provider selects services based on your customs, cultural beliefs, and interests						
A1-4	You perceive that the provider will work in partnership with your family's primary caregiver.						
A1-5	You perceive that the service provider understands you and your family members' needs and concerns						
A1-6	You perceive that the service provider will educate you about the service concept and ensure that you are prepared to know it						
A2-1	You perceive that the service provider will offer and recommend service business insurance products to you						
A2-2	You perceive that the service provider will provide you with differentiated premiums in strict compliance with the LTC insurance assessment requirements						
A2-3	You perceive that the service provider will provide you with self-pay service options based on your individual needs						
A2-4	You perceive that the services provided to you by the provider will meet your actual needs						
A2-5	You perceive that the service provider makes you will to consistently choose to purchase the service						
A3-1	You perceive that the service provider will use intelligent monitoring equipment during the service						
A3-2	You perceive the service personnel to provide regular feedback during the service process						
A3-3	You perceive that the service provider will choose the supervision method that is appropriate for your care relationship and living environment						
A3-4	You perceive that the service staff will use intelligent equipment to send timely service warning signals in the service process and can take corrective measures in time						
A3-5	You perceive the service personnel to provide facial recognition punching and service process prompting operation based on the equipment						
A3-6	You perceive the service personnel to provide timely service information and feedback to your important relations						
A3-7	You perceive that service personnel will tell you about existing supervision concepts and methods						
A3-8	Your family expects the service personnel to explain the existing supervisory concept and method to them						
A3-9	You/your family expects the effectiveness of the existing intelligent supervision tools						
Number	**Standardized**	5	4	3	2	1	
B1-1	You perceive that the service personnel meet the national requirements for credentials						
B1-2	You perceive the service personnel to conduct regular training and assessment according to the norms						

B1-3	You perceive the service personnel to show the qualification materials according to the specification in the process of service provision						
B2-1	You perception service organization to provide consistent service products in different regional organizations						
B2-2	You perceive the service organization to provide a standardized service process in different regions						
B2-3	You perceive the service organization to provide consistent service prices among different regions						
B2-4	You perceive the service process to be completed on time and in full according to the promised service time						
B2-5	You perceive that the service process will be executed according to the key guideline and key steps						
B2-6	You perceive that there is a standardized process for handling and reporting of emergencies in the service process						
B2-7	You perceive the service organization to provide unified service evaluation indicatores						
B3-1	You perceive the service organization to build a remote service scene with the goal of "visualization and reversibility" of the home-based service scene						
B3-2	You perceive the service organization to uphold the service equipment configuration planning with the goal of "uniformity and ease of use" in the use of service equipment						
B3-3	You perceive the service organization to build a standardized three-dimensional data model of the home-based service environment with the help of VR technology						
B3-4	You perceive the service organization to establish a standard information database for in-home services						
B3-5	You perceive the use of standardized service equipment and service tools in the service process						
B3-6	You perceive the operation of standardized service process in the service process						
Number	**Intelligent**	5	4	3	2	1	
C1-1	You perceive the service organization to build a process monitoring system with the strategic goal of improving service quality and optimizing operational efficiency						
C1-2	You perceive the service organization to design "5W2H" as the goal of the evaluation results of the regulatory dimension						
C1-3	You perceive the extent to which the organization actively invests internally to support the implementation of digital intelligent supervision system						
C1-4	You perceive the organization to provide model training internally to ensure the concept is recognized and can be implemented on the ground						
C1-5	You perceive the formation of a trinity of software, hardware and scenario solutions						
C2-1	You perceive the service organization to use the combination of intelligent hardware and software to solve the home-based service quality process supervision						
C2-2	You perceive the service process using algorithm model to achieve automatic pushing service guidance to service personnel						
C2-3	You perceive the use of data analysis means to show the service site supervision data in real time to solve the problem of health insurance supervision						
C2-4	You perceive the service process to receive real-time guidance when service personnel encounter difficulties						

Number		5	4	3	2	1	
C2-5	You perceive that service personnel use voice input equipment to collect service data during the service process						
C2-6	You perceive that health insurance institutions can grasp service data in real time through the data screen during the service process						
C3-1	You perceive the service process to fully consider the characteristics of the home service scene (light, acoustic environment, network environment) to choose the appropriate intelligent supervision means						
C3-2	You perceive the process of service to fully consider customer privacy protection and information security						
C3-3	You perceive the service process to timely and accurately identify service scene signs and transimit data						
C3-4	You perceive the service scene design to fully consider the service experience of you and your important relations						
Number	**Collaborated**	5	4	3	2	1	
D1-1	You perceive the service organization to perceive and analyze your needs from a professional perspective						
D1-2	You perceive the service staff to identify your needs in the service process based on professional experience and provide corresponding services in a timely manner						
D1-3	You perceive that the service staff will actively communicate with you during the service process and provide adjusted service content based on feedback						
D1-4	You perceive the level of recognition of the service staff						

Post-test

Annex B: Service Quality Evaluation Research Questionnaire (Staff and management)

Service Quality Evaluation Research Questionnaire (Staff and Management)

In order to accurately grasp our service quality and level, understand the current service quality deficiencies and better improve service quality, this questionnaire is based on the SERQUAL scale. Each question of the questionnaire is some description of service quality, please check the number to indicate how strongly you agree or disagree with each view (5=strongly agree 4=more agree 3=fairly 2=less agree 1=strongly disagree)

	Evaluation indicators	Desired service quality (ES)					Remarks
Number	Affinity	5	4	3	2	1	
A1-1	You expect the organization to embrace a "person-centered" philosophy of care internally and communicate it to you						
A1-2	You expect to be invited to participate in the design of the service journey within the organization						
A1-3	You expect the organization to design service offerings based on client characteristics						
A1-4	You expect family members to be invited to participate in the service and be empowered on a regular basis						
A1-5	The degree to which you expect the service principle within the organization to be consistent with your own						
A2-1	You expect a new insurance service mode within your organization that integrates service and risk control						
A2-2	You expect the organization to provide services in accordance with the norms of long-term care insurance						
A2-3	You expect the organization to offer payment methods based on the client's actual situation						
A2-4	You expect the organization to provide self-pay options based on "individualized" needs						
A2-5	You expect the organization to design a "claims service" commercial insurance service product						
A3-1	You expect to move away from the traditional regulatory concept of service regulation within your organization						
A3-2	You expect to move away from the traditional regulatory approach to service regulation within your organization						
A3-3	You expect the service regulation within your organization to incorporate real-life scenarios						
A3-4	You expect the service supervision within the organization to make use of intelligent equipment						
A3-5	You expect the service supervision within the organization to achieve scenario restoration						
A3-6	You expect the service supervision within the organization can push the service information and feedback in real time						
A3-7	You expect the service supervision concept within the organization to be consistent with your own						
Number	Standardized	5	4	3	2	1	
B1-1	You expect the partners within the organization to have a high degree of professionalism and good service attitude						

Number	Intelligent	5	4	3	2	1	
B1-2	You expect the organization to establish an incentive system that combines positive and negative incentives						
B1-3	You expect the organization to have a training concept based on employee progress						
B1-4	You expect the organization to design a reasonable training plan according to your ability and quality						
B1-5	You expect the organization to establish a reasonable promotion path						
B1-6	You expect the organization to establish a reasonable training and assessment plan						
B2-1	You expect the service process to be executed according to the key guideline and key steps						
B2-2	You expect the service process to have a standardized handling and reporting process for emergency events						
B2-3	You expect to have a unified service evaluation indicator within the service organization						
B3-1	You expect the organization to build a remote service scenario with the goal of "visualization and reversibility" of the home service scenario						
B3-2	You expect the uniformity of service equipment within the organization						
B3-3	You expect the service equipment configured within the organization to be easy to use						
B3-4	You expect the organization to establish a standardized home-based service information base						
B3-5	You expect to have standardized service tools within the organization						
B3-6	You expect the organization to use standardized service processes in the service process						
Number	**Intelligent**	5	4	3	2	1	
C1-1	You expect the organization to build a process monitoring system with the strategic goal of improving service quality and optimizing operational efficiency						
C1-2	You expect the organization to design 5W2H" as the goal of the evaluation results supervision dimension						
C1-3	You expect the organization to actively invest in ensuring the implementation of digital intelligence supervision						
C1-4	You expect the organization to provide training on digital intelligent supervision content						
C2-1	You expect the organization to provide digital intelligent supervision tools to solve the home service process supervision						
C2-2	You expect the organization to provide digital intelligent supervision tools to push the service operation guidance in time						
C2-3	You expect the organization to provide digital intelligent supervision tools to show the service site data in real time						
C2-4	You expect the organization to provide digital intelligent supervision tool with voice recognition as input tool						
C2-5	You expect the organization to provide digital intelligent supervision tool with friendly operation and convenient use						
C3-1	You expect the organization to provide digital intelligent supervision tools to fully consider the characteristics of home scenes						
C3-2	You expect the organization to provide digital intelligent supervision tools with full consideration of customer privacy protection and information security						

Number		5	4	3	2	1	
C3-3	You expect the organization to provide digital intelligent supervision tools to identify the characteristics of service scenarios in a timely and accurate manner						
C3-4	You expect the organization to provide digital intelligent supervision tools to fully consider the service experience of customers and theirs important relationships						
Number	Collaborated	5	4	3	2	1	
D1-1	You expect the organization to design digital intelligent equipment based on the concept of "user experience"						
D1-2	You expect the organization to design the path of intelligent equipment based on "standardized" service processes						
D1-3	You expect the organization to design training programs for intelligent equipment based on the results of "competency" analysis						
D1-4	You expect the organization to regularly iterate the interface design and functional modules of the intelligent equipment based on the experience of employees						
D1-5	You expect the organization to regularly collect feedback from employees on the use of intelligent equipment and optimize the use path						
D1-6	You expect the organization to use effective incentives to motivate employees to use the intelligent care equipment						
D2-1	You expect the organization to understand and agree with the strategic development goals of the organization						
D2-2	You expect the organization to have a smooth communication channel up and down the organization						
D2-3	You expect regular feedback on your satisfaction with the organization						
D3-1	You expect the organization to give full consideration to the degree of customer perception of service personnel						
D3-2	You expect the internal service personnel to provide services based on professional experience and timely identification of customer needs in the service process						
D3-3	You expect the internal service personnel to actively communicate during the service process and adjust the service based on feedback						

Pre-test

Service Quality Evaluation Research Questionnaire

In order to accurately grasp our service quality and level, understand the current service quality deficiencies and better improve service quality, this questionnaire is based on the SERQUAL scale. Each question of the questionnaire is some description of service quality, please check the number to indicate how strongly you agree or disagree with each view (5=strongly agree 4=more agree 3=fairly 2=less agree 1=strongly disagree)

Evaluation indicators		Perceived service quality (PS-1)					Remarks
Number	Affinity	5	4	3	2	1	
A1-1	You perceive that a "person-centered" philosophy of care is embedded within your organization and communicated to you						
A1-2	You perceive that you are invited to participate in the design of the service journey within your organization						
A1-3	You perceive that service offerings are designed within the organization based on client characteristics						
A1-4	You perceive that family members of the client are invited to participate in the service within the organization and that family members are regularly empowered						

Number	Standardized	5	4	3	2	1	
A1-5	You perceive that the service principle within the organization is aligned with your own						
A2-1	You perceive a new insurance service mode within your organization that integrates service and risk control						
A2-2	You perceive that the organization is providing services in accordance with the norms of long-term care insurance standards						
A2-3	You perceive that the organization offers payment methods based on the client's actual situation						
A2-4	You perceive that your organization offers self-pay options based on "individualized" needs						
A2-5	You perceive that the organization is designing "claims service" commercial insurance service products						
A3-1	You perceive that service regulation within your organization is moving away from traditional regulatory concepts						
A3-2	You perceive that service regulation within your organization is moving away from traditional regulatory approaches						
A3-3	You perceive that service regulation within your organization is based on real-life scenarios						
A3-4	You perceive that the service supervision within the organization utilizes intelligent equipment						
A3-5	You perceive the service supervision within the organization can reach the scene restoration						
A3-6	You perceive the service supervision within the organization can push the service information and feedback in real time						
A3-7	You perceive that the service supervision concept within your organization is consistent with your own						
Number	**Standardized**	5	4	3	2	1	
B1-1	You perceive that the partners in your organization are highly professional and have good service attitude						
B1-2	You perceive that the organization has established an incentive system combining positive and negative incentives						
B1-3	You perceive that the training concept of the organization is based on the process of employees						
B1-4	You perceive that the organization has designed a reasonable training program based on your abilities and qualities						
B1-5	You perceive that the organization has established a reasonable promotion path						
B1-6	You perceive that the organization has established a reasonable training and assessment plan						
B2-1	You perceive that the service process is executed according to the key instructions and key steps						
B2-2	You perceive that there is a standardized process for handling and reporting emergency incidents during the service process						
B2-3	You perceive that there is a unified service evaluation indicator in the service organization						
B3-1	You perceive that remote service scenarios are built within the organization with the goal of "visualization and reversibility" of home service scenarios						
B3-2	You perceive the uniformity of service equipment within the organization						
B3-3	You perceive the ease of use of service equipment within the organization						
B3-4	You perceive that a standardized home service information base has been established within the organization						
B3-5	You perceive a standardized service tool within the organization						

Number		5	4	3	2	1	
B3-6	You perceive that standardized service processes are used in the service process within your organization						
Number	**Intelligent**	5	4	3	2	1	
C1-1	You perceive that the organization has built a process monitoring system with the strategic goal of improving service quality and optimizing operational efficiency						
C1-2	You perceive that the organization has designed 5W2H" as the goal of the evaluation results supervision dimension						
C1-3	You perceive that the organization is actively involved in ensuring the implementation of digital intelligence supervision						
C1-4	You perceive that your organization should provide training on digital intelligent supervision content						
C2-1	You expect the organization to provide digital intelligent supervision tools to solve the process of home service supervision						
C2-2	You expect the organization to provide digital intelligent supervision tools to push the service operation guidance in time						
C2-3	You expect the organization to provide digital intelligent supervision tools to show the service site data in real time						
C2-4	You expect the organization to provide digital intelligent supervision tool with voice recognition as input tool						
C2-5	You expect the organization to provide digital intelligent supervision tool with friendly operation and convenient use						
C3-1	You expect the organization to provide digital intelligent supervision tools to fully consider the characteristics of home scenes						
C3-2	You expect the organization to provide digital intelligent supervision tools with full consideration of customer privacy protection and information security						
C3-3	You expect the organization to provide digital intelligent supervision tools to identify the characteristics of service scenarios in a timely and accurate manner						
C3-4	You expect the organization to provide digital intelligent supervision tools to fully consider the service experience of customers and theirs important relationships						
Number	**Collaborated**	5	4	3	2	1	
D1-1	You perceive that the organization is designing digital intelligent equipment based on the concept of "user experience"						
D1-2	You perceive that the organization designs the path of intelligent equipment based on "standardized" service processes						
D1-3	You perceive that the organization designs training programs for intelligent equipment based on the results of "competency" analysis						
D1-4	You perceive that the organization regularly iterates the interface design and functional modules of the intelligent equipment based on the employees' experience						
D1-5	You perceive that the organization regularly collects feedback from employees on the use of intelligent equipment and optimizes the usage path						
D1-6	You expect the organization to use effective incentives to motivate employees to use the intelligent care equipment						
D2-1	You expect the organization to understand and agree with the strategic development goals of the organization						

D2-2	You expect the organization to have a smooth communication channel up and down the organization						
D2-3	You expect regular feedback on your satisfaction with the organization						
D3-1	You perceive that the organization takes into account the degree of customer perception of service personnel						
D3-2	You perceive that the service personnel within the organization provide timely services based on their professional experience in identifying customer needs						
D3-3	You perceive that the service personnel within the organization actively communicate during the service process and adjust the service based on feedback						

Post-test

Annex C: Additional Tables

Additional table 1 Interviewee and basic information

No	Name	Age	Employment duration	Position	Unit name
1	Mr. Shen	48	20	Bureau Chief	Civil Affairs Bureau
2	Mr. Jiang	45	21	Director of Bureau	Civil Affairs Bureau
3	Mr. Liu	43	20	Deputy District Director	Civil Affairs Bureau
4	Mr. Jia	45	18	Director of Bureau	Civil Affairs Bureau
5	Mr. Chen	38	15	Deputy Director	Civil Affairs Bureau
6	Mr. Yong	43	15	Deputy Director	Health Care Commission
7	Mr. Tian	45	20	Director of Bureau	Medical Insurance Bureau
8	Mr. Zhu	43	18	Deputy Director	Medical Insurance Bureau
9	Mr. Zhu	38	12	Center Director	Medical Insurance Bureau
10	Mr. Li	50	24	President	Association of Medical Institutions
11	Mr. Zhang	40	12	Director	Medical insurance
12	Mr. Wang	40	18	CEO	Eldercare group
13	Mr. Jiang	38	17	VP	Eldercare Group
14	Mr. Gao	37	15	Senior Manager	Eldercare Group
15	Mr. Liu	35	12	Senior Director	Eldercare Group
16	Mr. Lei	27	5	Manager	Eldercare Group
17	Mr. Shen	45	20	Operations Supervisor	Eldercare Group
18	Mr. Jin	23	2	Operations Specialist	Eldercare Group
19	Mr. Wu	50	20	Specialist	Ministry of Civil Affairs
20	Mr. Yin	55	25	Specialist	Association of Senior Care Services Industry

Additional table 2 Compilation of Interviews with Respondents

Interviewee number and interview content	Brief description of the questions
(TGMZ) There is currently a regulatory gap and a need for regulation.	Later promotion of landing needs to consider the actual situation and the cost of equipment.
(TGYB) 1. The current regulatory approach is more traditional and inefficient. 2. The product pain point needs to be captured accurately, this product development is the process of setting benchmarks and building industry standards. It is worth exploring. 3. The focus of regulatory attention is on authenticity, compliance (whether there is beyond the scope of medical insurance), effectiveness (service experience, quality evaluation)	How to achieve the maximum restoration of the service site?
(TBSB) 1. Demand concerns tend to be consistent with medical insurance, mainly focusing on the process control of home-based care services (quality and quantity assurance)	1. How is user privacy protection handled? (Shanghai seniors and their families are sensitive to privacy)

2. Health insurance will reach trillion market in the next 3~4 years, among which the proportion of care and disability insurance will increase significantly, this product development is in line with the national policy planning and there is a potential market.

(TCJS)

The focus on service quality is "service initiative", "demand response", "service etiquette" and "service capability "

(TCYG)

1. Current staff concerns about potential service safety hazards: elderly people with dementia suspecting theft in their homes, elderly people being aggressive, male clients harassing caregivers

2. ID design requirements

(1) Wristwatch type - must be waterproof, not too big and can be timed.

(2) Arm hanging type - mesh pouch with buttons that do not interfere with operation

2. Some of the disabled elderly cannot voice normally? How to capture the voice information?

3. How to restore the scene after voice capture?

How is the application of product technology linked to service quality indicators?

How is user privacy protection handled? (30% of employees believe the recordings violate privacy)

Additional table 3 Questionnaire scoring standard 1

Options	Strongly agree	Agree	General	Disagree	Strongly disagree
Scoring	5	4	3	2	1

Additional table 4 Basic Questionnaire Information Statistics

		Frequency	Percentages	Effective Percentage	Cumulative Percentage
Gender	Male	986	40.6	40.6	40.6
	Female	1443	59.4	59.4	100
Age Distribution	≤59	184	7.6	7.6	7.6
	60-69	425	17.5	17.5	25.1
	70-79	641	26.4	26.4	51.5
	80-89	910	37.5	37.5	89
	≥90	269	11	11	100
Education Level	Bachelor's degree and above	250	10.3	10.3	10.3
	High School	879	36.2	36.2	46.5
	Primary school and below	434	17.9	17.9	64.4
	Junior/Senior High School	607	25	25	89.4
	College	259	10.6	10.6	100
Monthly Income	Under 2999	252	10.4	10.4	10.4
	3000-5999	1722	70.9	70.9	81.3
	5999-8999	408	16.8	16.8	98.1
	Above 9000	47	1.9	1.9	100
Residential Areas	BS Zone	1	0	0	0
	CN Zone	1059	43.6	43.6	43.6

HP Zone	2	0.1	0.1	43.7
JA Zone	412	17	17	60.7
MH Zone	157	6.5	6.5	67.1
PD Zone	320	13.2	13.2	80.4
Zone XH	478	19.6	19.6	100

Additional table 5 Basic Information Statistics of the Practitioner Survey - Personnel Structure

		Frequency	Percentages
Sex	Male	32	5.4
	Female	558	94.6
	Under 30 years old	49	8.3
Age	31-40 years	37	6.3
	41-50 years	366	62
	51-60 years	138	23.4

Additional table 6 Basic Information Statistics of the Practitioner Survey - Educational Level

		Frequency	Percentages
Level of education	Bachelor's degree and above	27	4.6
	Post-secondary	65	11
	High school	136	23.1
	Lower secondary and below	362	61.4
Positions	Agency managers	16	2.7
	Agency Administrative staff	7	1.2
	Frontline staff	542	91.9
	Others	25	4.2

Additional table 7 Basic Information of Practitioner Survey – Working experience

		Frequency	Percentages
Worked in my current position for	Less than half a year	28	4.7
	Six months to one year	122	20.7
	One to three years	399	67.6
	More than three years	41	6.9

Additional table 8 Basic Information of Practitioner Survey - Job performance expectations

		Frequency	Percentages
Which of the following do you currently value most in the job you hold	Reasonable income	341	57.81
	Smooth work and smooth processes	286	48.41
	Jobs with prospects	376	63.76
	Sharing the same values as the company and being a community of interest	501	84.92
	Other	68	11.48

Additional table 9 Results - Knowledge of intelligent equipment among home-based health care giver

		Frequency	Percentage
Knowledge of intelligent equipment	Know a lot	762	31.19
	Know some	94	38.53
	Have heard of	695	28.44
	Others	45	1.83

Additional table 10 Service process supervision "5W2H" content and SHC identification content

Service process restoration	Content details	Current restore path	SHC
When	Service start and end time	Service punching + confirmation report	Equipment punching
Where	Service Locations	Service punching; matching based on system address and actual check-in place	Location check-in
Who	Service Providers	Service punching + confirmation report + return visit	Face Recognition
Whom	Service Users	Service punching + confirmation report	Identity verification (keyword crawling)
What	Service Determination	Service punching + confirmation report + quality control spot check + return visit	Keyword Crawl
How	Service attitude, communication	Confirmation report + quality control spot check + customer service return visit	Keyword Crawl
How Much	Service quality evaluation	Confirmation report + customer service callback	Keyword Crawl

Annex D: Additional Figures
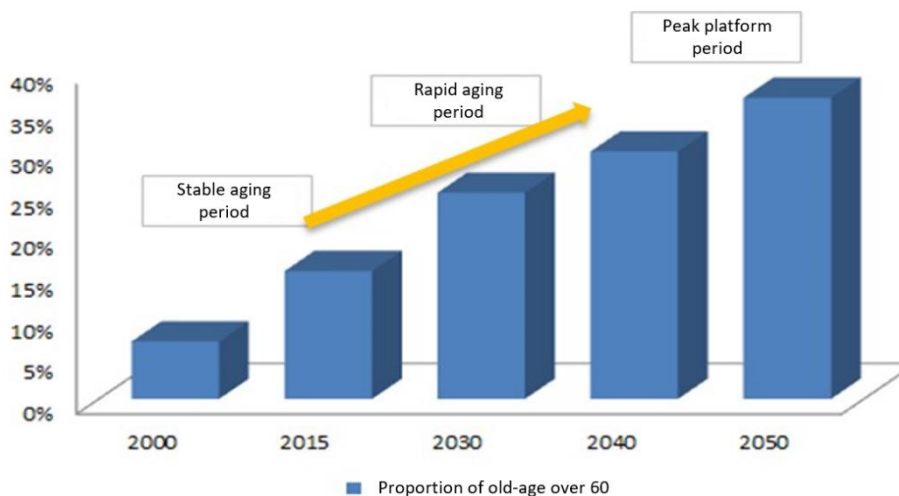
Additional figure 1 Prediction of the proportion of elderly people over 60 years old in the total

population in China

Source: WIND, Dongxing Securities Research
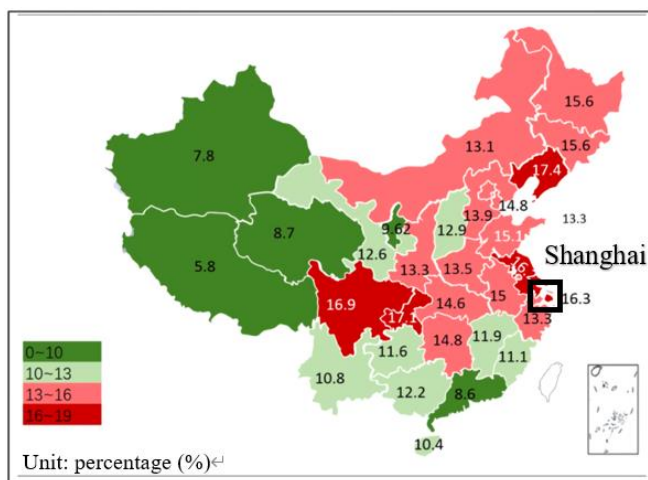
Additional figure 2 Distribution of the proportion of the elderly population over 65 years of age by pro

vince and city in China, map (Excluding Hong Kong, Macao and Taiwan).

Source: National Bureau of Statistics 2020 National Census Summary Data
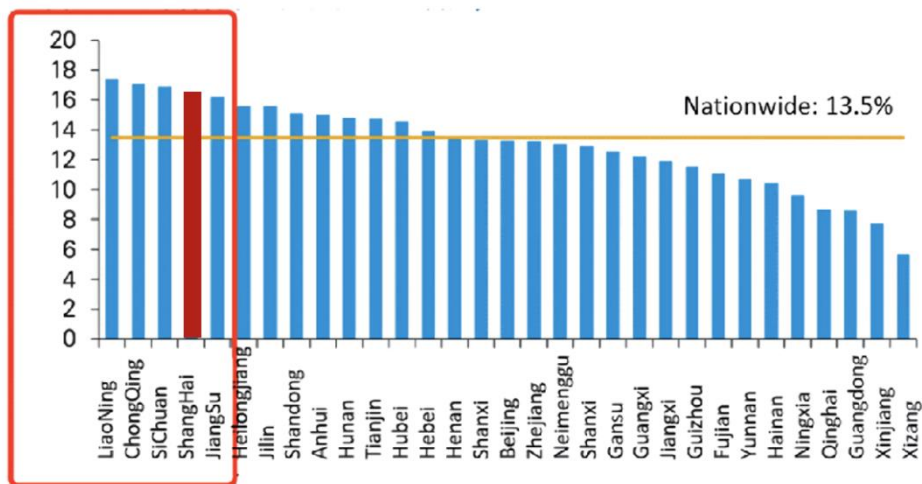
Additional figure 3 Distribution of the proportion of the elderly population over 65 years of age by province and city in China in 2020, ranks (Excluding Hong Kong, Macao and Taiwan).

Source: National Bureau of Statistics
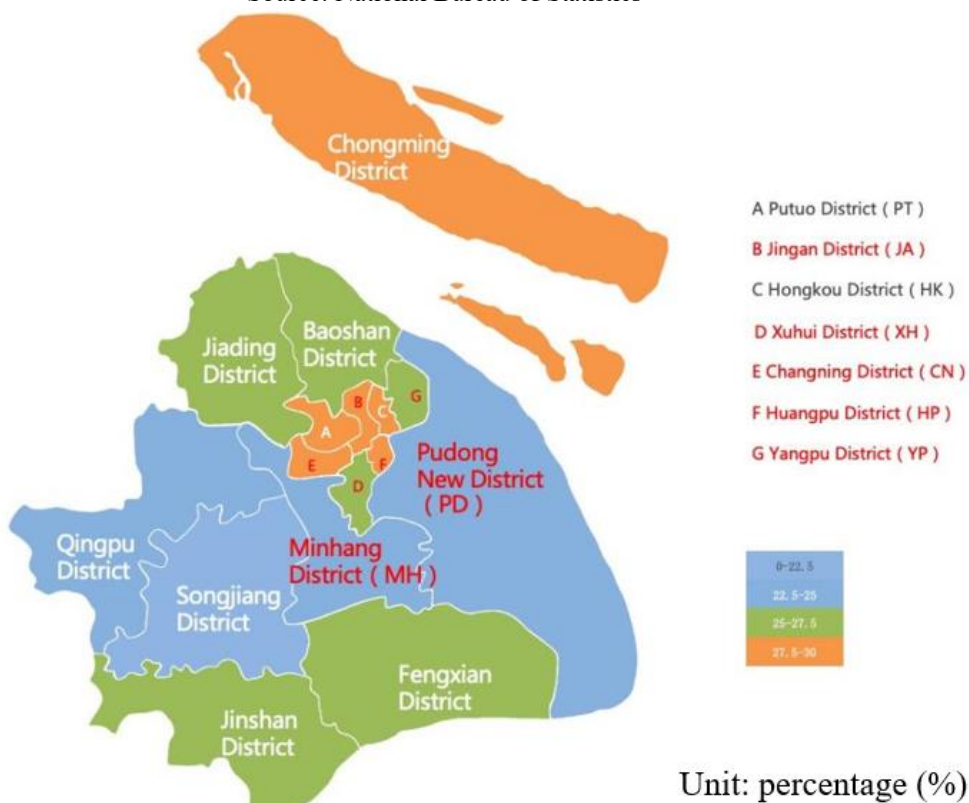
Additional figure 4 Distribution of the proportion of the elderly population over 65 years of age in Shanghai Source: Statistical information on monitoring the elderly population and the aging business in Shanghai in 2020
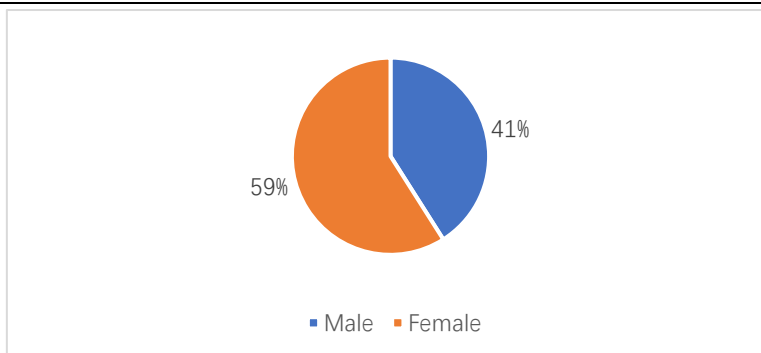
Additional figure 5 Questionnaire Survey Results - Gender Distribution
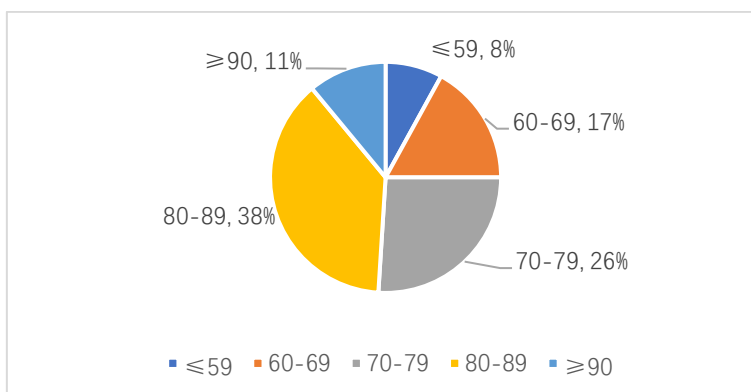
Additional figure 6 Questionnaire Survey Results - Age Distribution
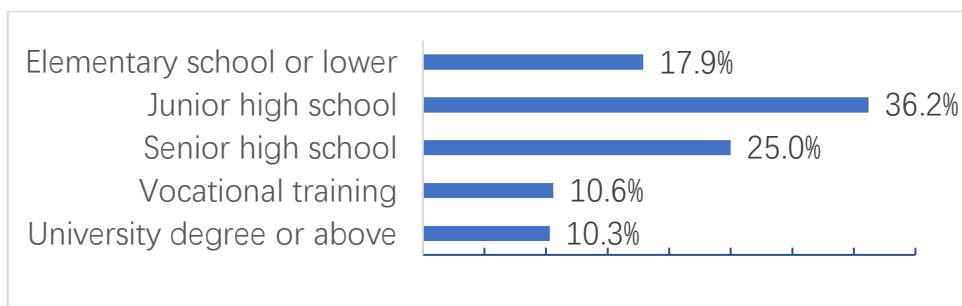
Additional figure 7 Questionnaire Results – Level of education
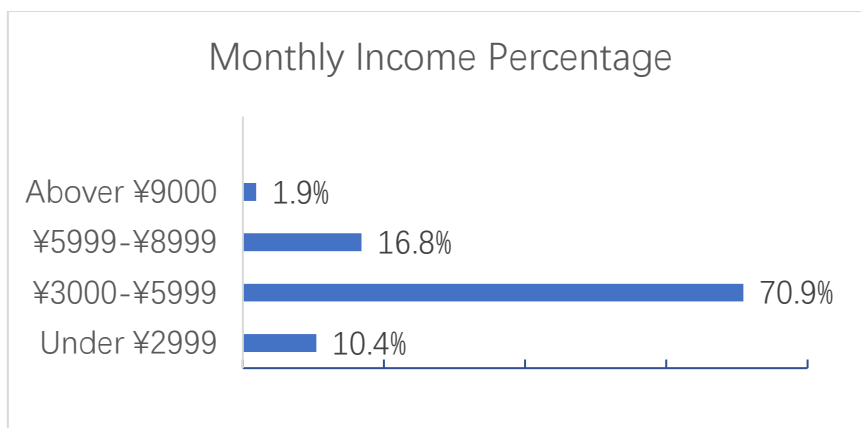
Additional figure 8 Questionnaire Results - Monthly Income
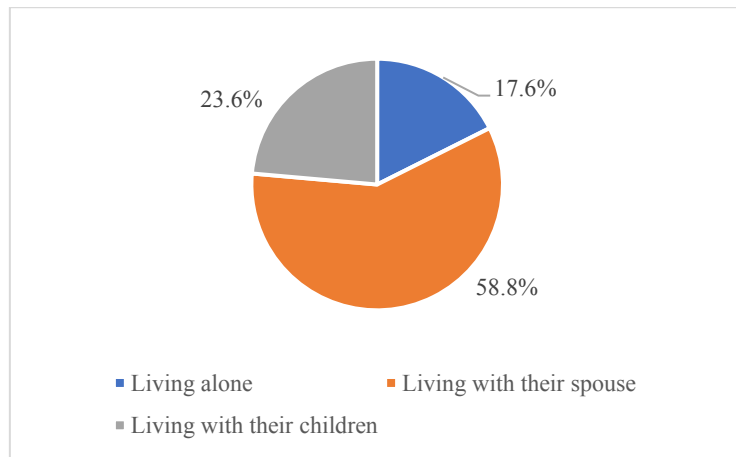
Additional figure 9 Results of questionnaire survey -- living mode of respondents
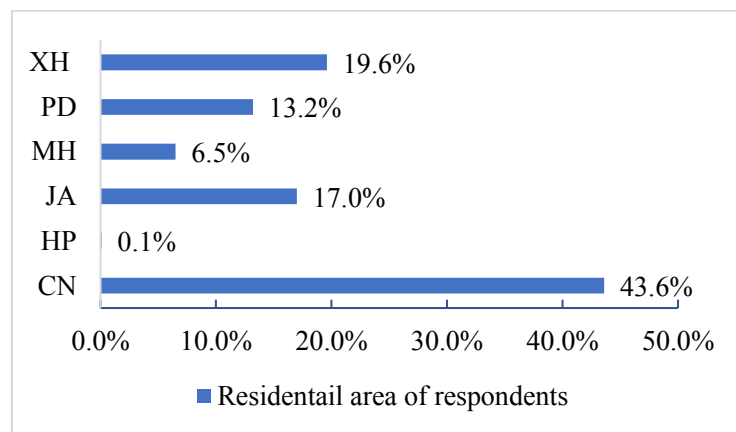
Additional figure 10 Results of questionnaire survey -- Residential area of respondents
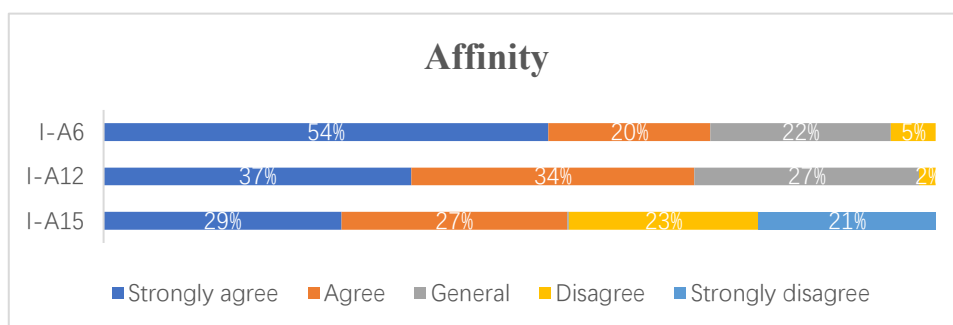
Additional figure 11 Research result for the affinity indicators: I-A6, I-A12, and I-A15
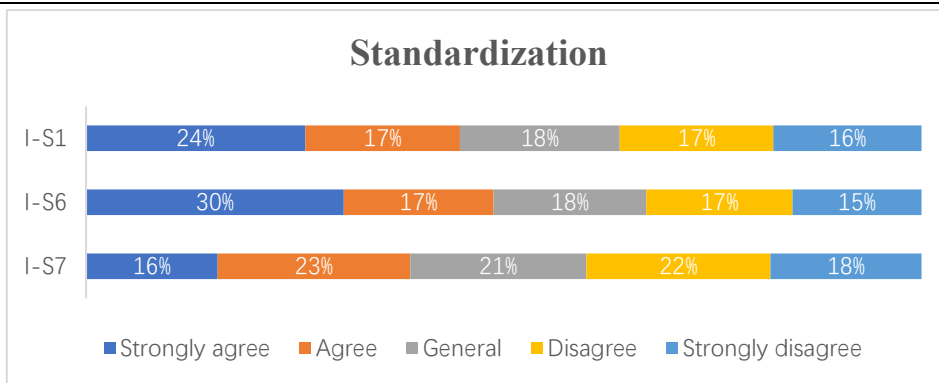
Additional figure 12 Research result for the standardization indicators: I-S1, I-S6, and I-S7
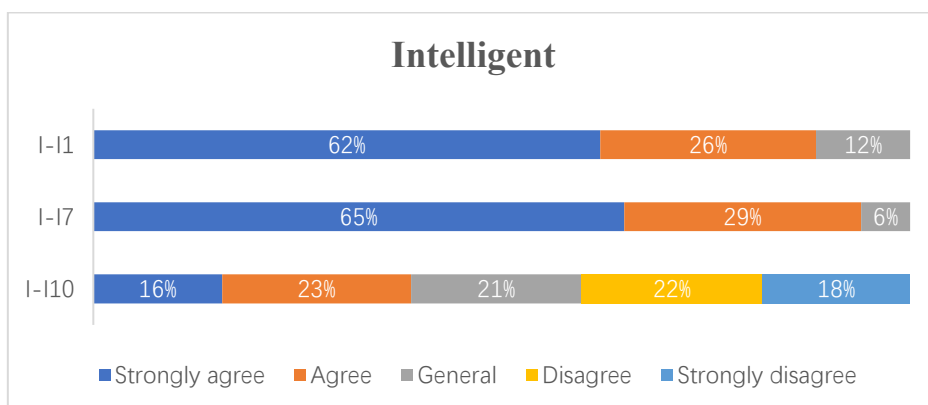
Additional figure 13 Research result on the intelligence indicators: I-I1, I-I7, and I-I10
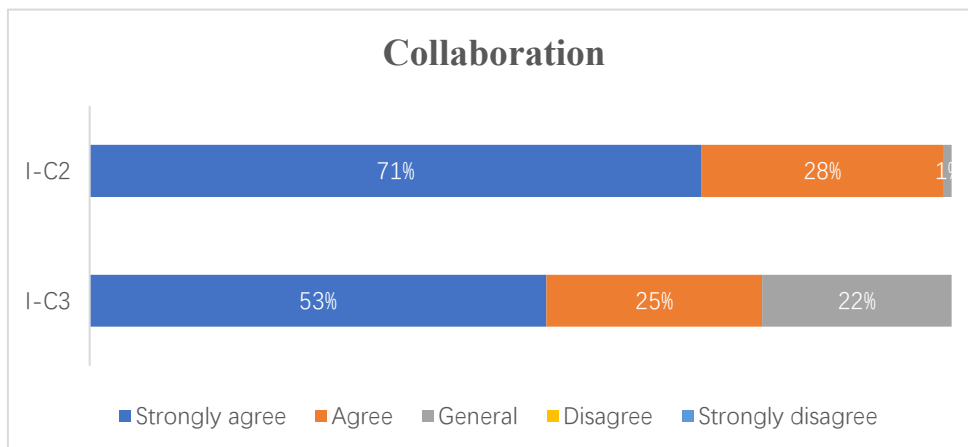
Additional figure 14 Research result of the collaboration indicator: I-C2, and I-C3
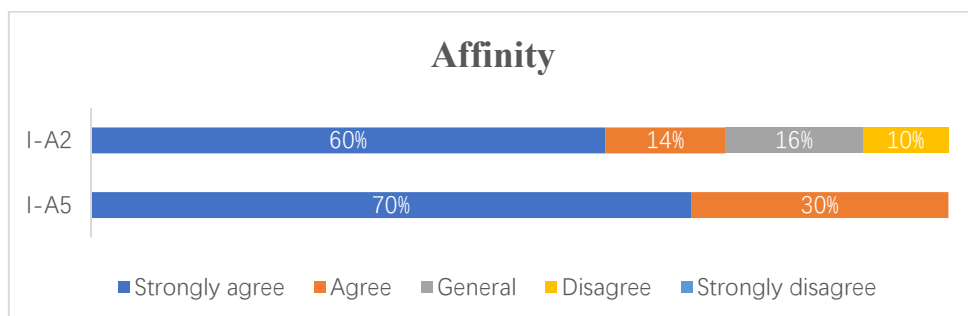
Additional figure 15 Research result of the affinity indicators for practitioners: I-A2, and I-A5
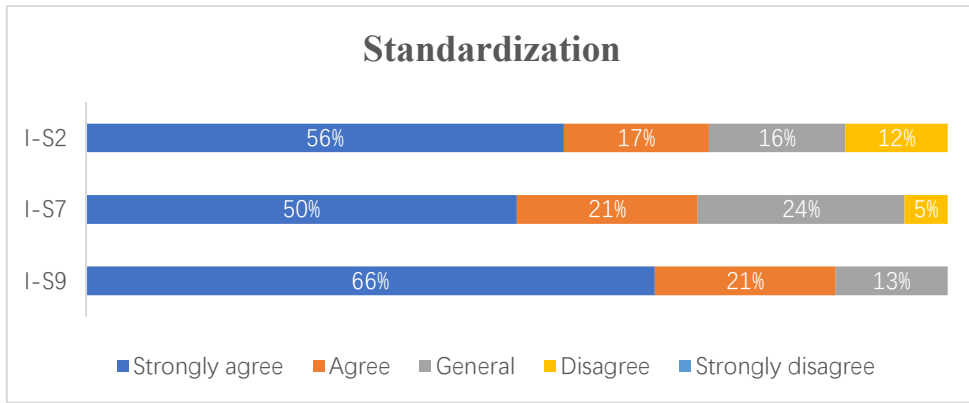
Additional figure 16 Research result on the standardization indicators for practitioners:

I-S2, I-S7, and I-S9
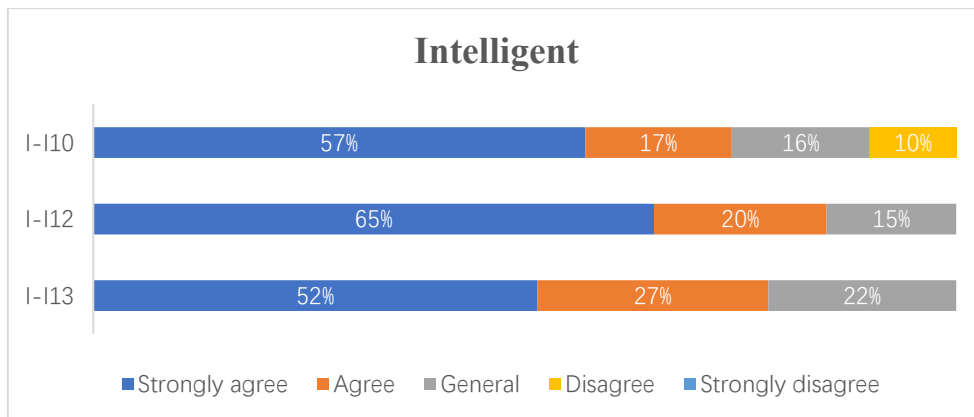
Additional figure 17 Research result on the intelligence indicators for practitioners:

I-I10. I-I12, and I-I13
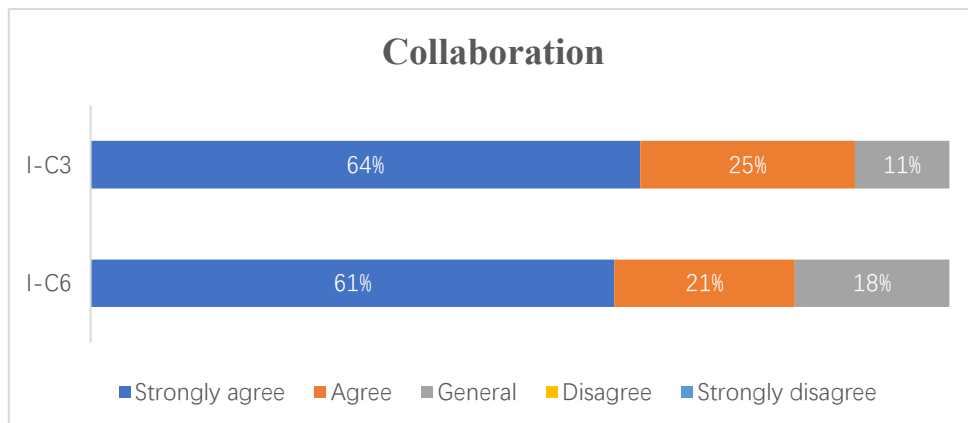
Additional figure 18 Research result of the collaboration indicators for practitioners:

I-C3, and I-C6
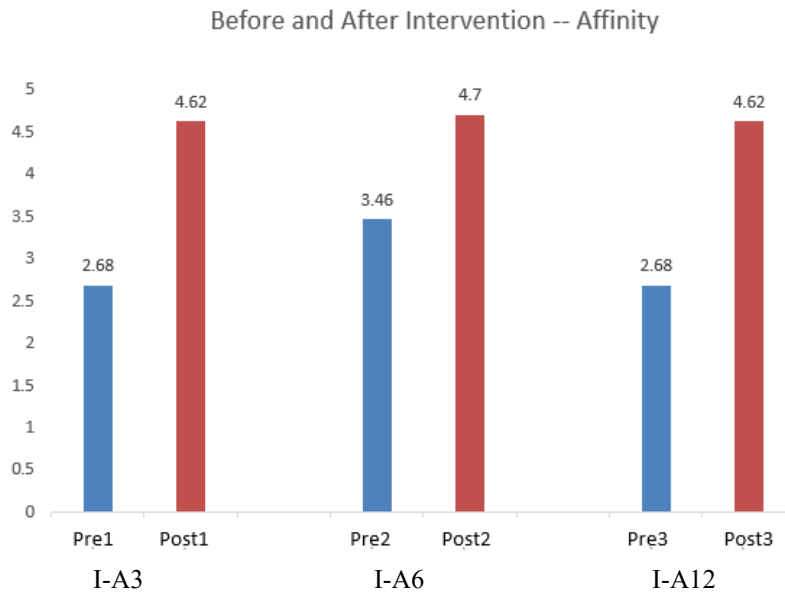
Additional figure 19 Before and after intervention comparison of the affinity indicators: I-A3, I-A6, and I-A12
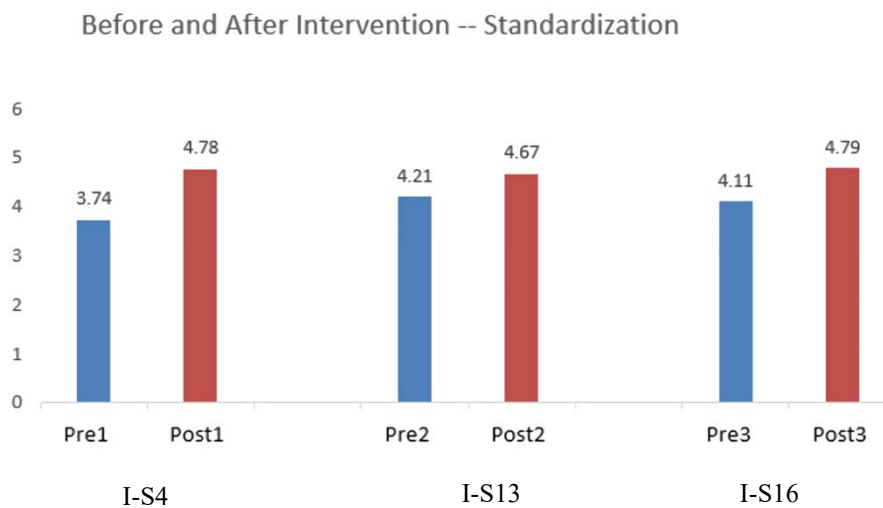
Additional figure 20 Before and after intervention comparison of the standardization indicators: I-S4, I-S13, and I-S16
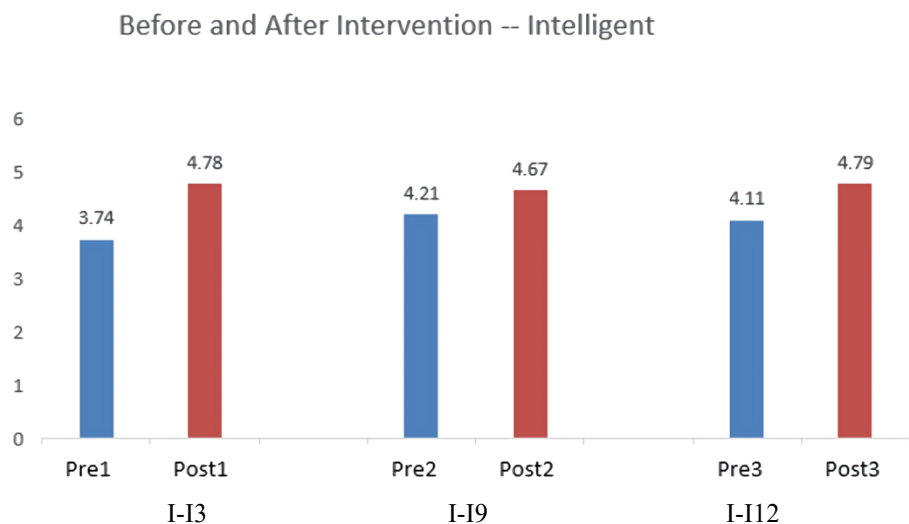
Additional figure 21 Before and after intervention comparison of the intelligence indicators: I-I3, I- I9, and I-I12
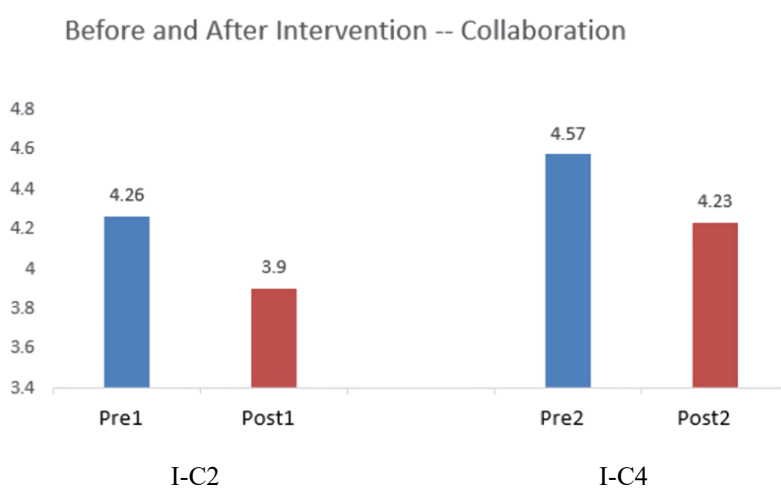
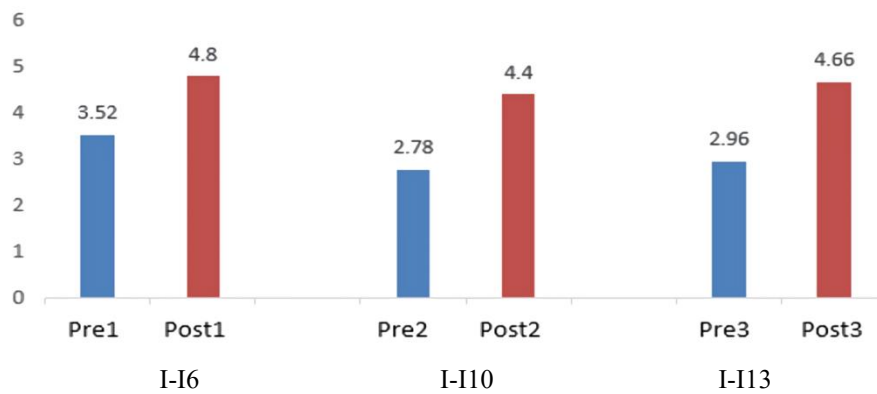Additional figure 22 Before and after intervention comparison of collaboration indicators: I-C2, and I-C4
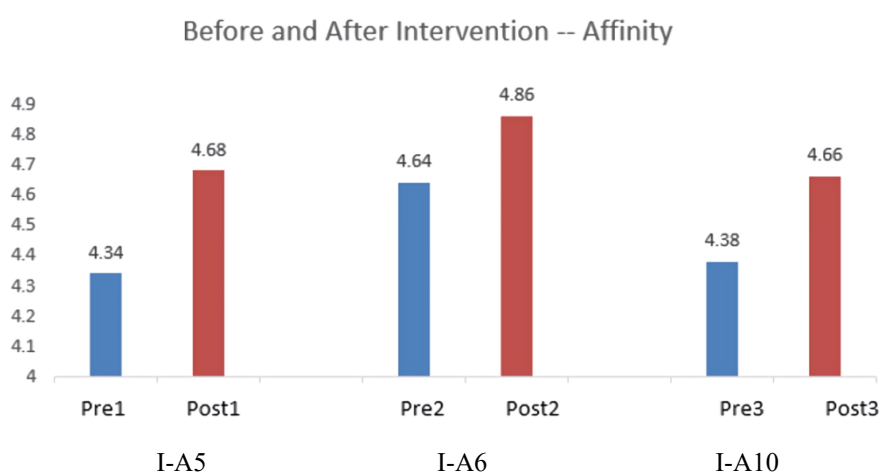
Additional figure 23 Before and after intervention comparison of the affinity indicators

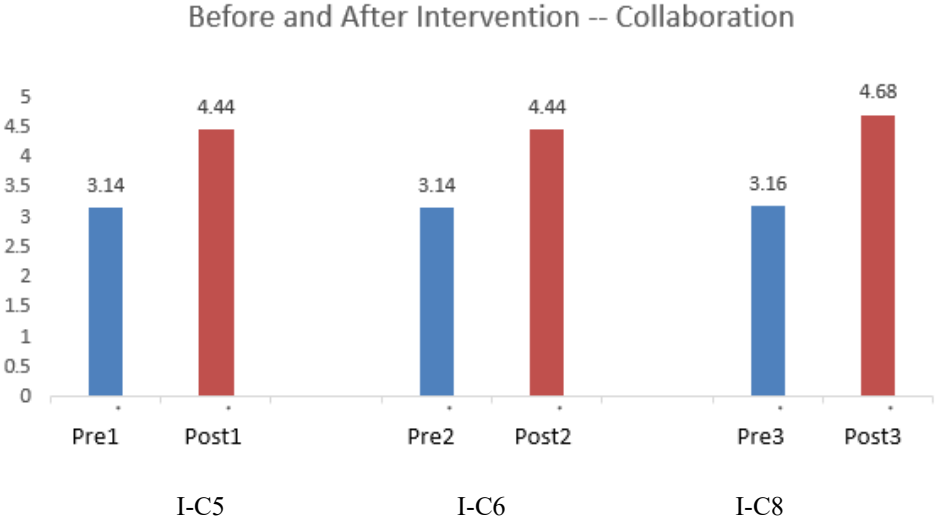for practitioners: I-A5, I- A6, and I-A10

I-S2   I-S4   I-S8
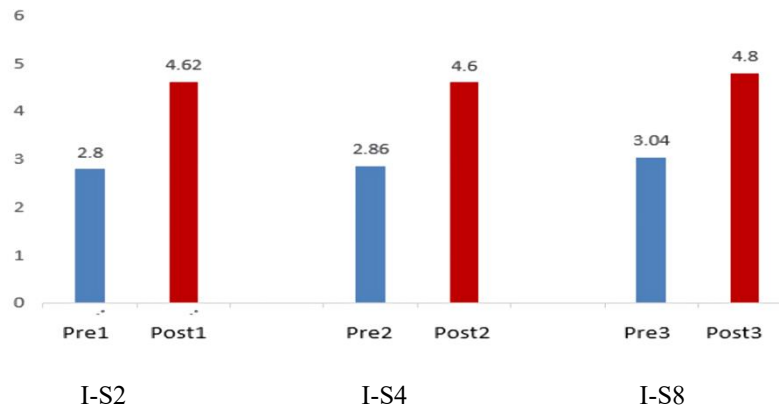
Additional figure 24 Before and after intervention comparison of standardization indicators

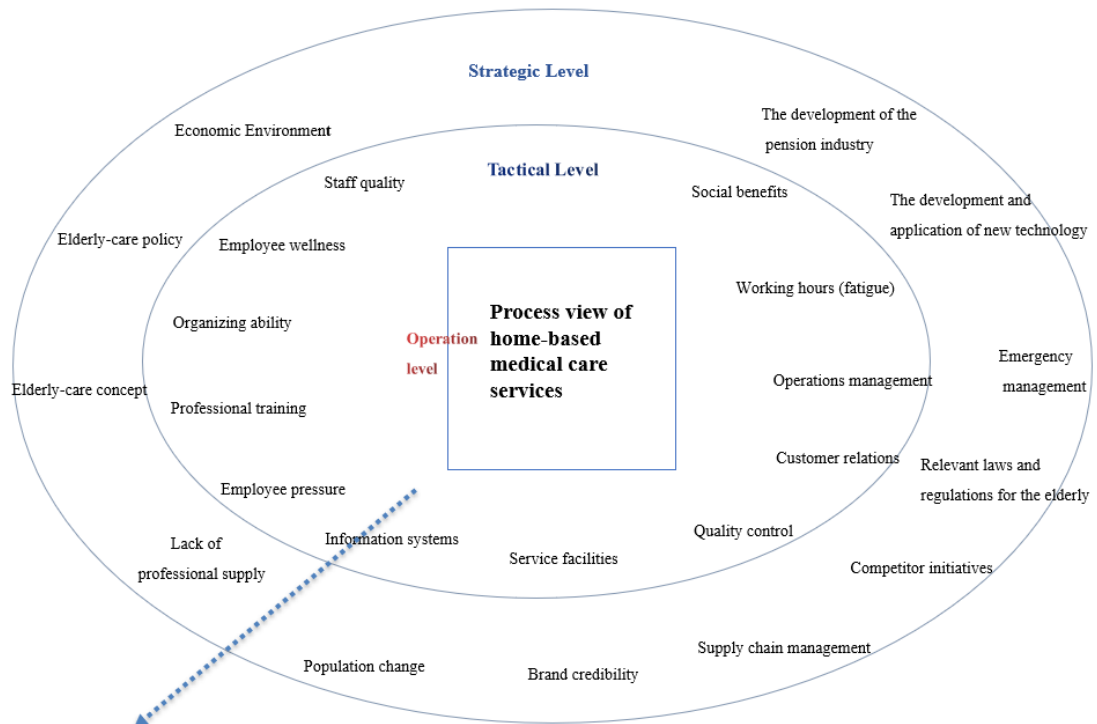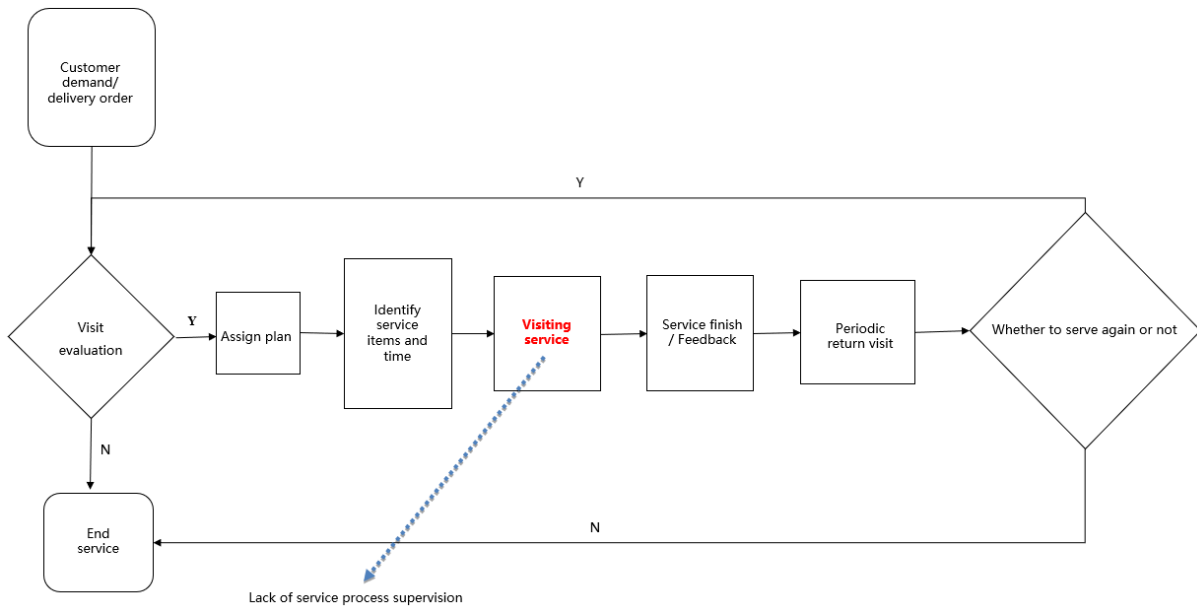for practitioners: I-S2, I-S4, and I-S8

Additional figure 25 Before and after intervention comparison of intelligence indicators

for practitioners: I-I6, I-I10, and I-I13

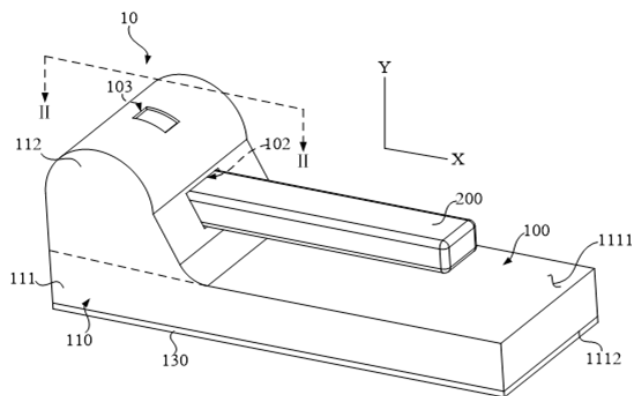Additional figure 26 Before and after intervention comparison of collaboration indicators

for practitioners: I-C5, I-C6, and I-C8

Strategic Level

Economic Environment

The development of the pension industry

Tactical Level

Staff quality

Social benefits

The development and application of new technology

Elderly-care policy

Employee wellness

Organizing ability

Working hours (fatigue)

Operation level

Process view of home-based medical care services

Emergency management

Elderly-care concept

Professional training

Operations management

Customer relations

Relevant laws and regulations for the elderly

Employee pressure

Quality control

Information systems

Service facilities

Competitor initiatives

Lack of professional supply

Supply chain management

Population change

Brand credibility

Process view of home-based medical care services

Customer demand/ delivery order

Y

Visit evaluation

Y → Assign plan → Identify service items and time → **Visiting service** → Service finish / Feedback → Periodic return visit → Whether to serve again or not

N

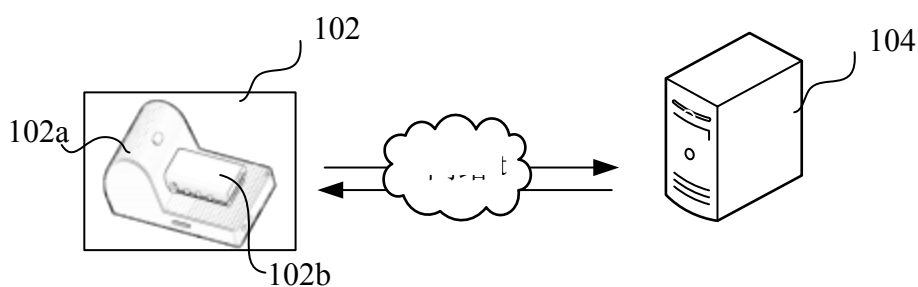End service

N

Lack of service process supervision

Additional figure 27 System view of home-based health care service delivery process

The main unit 100 includes a housing 110 and a locking equipment 120, the housing 110 has a housing cavity 101 and a mounting slot 102, the housing 110 can be provided with an SOS button and a microphone array, the housing cavity 101 is used to place the locking equipment 120, which are a processor, a power supply and a control line. The slot wall of the mounting slot 102 is provided with a through hole 103 connected to the housing cavity 101. In an embodiment, schematically, the housing 110 includes a body 111 and a projection 112, the body 111 includes a first surface 1111 and a second surface 1112 set opposite each other, the projection 112 is convexly provided on the first surface 1111, and the projection 112 is connected to the body 111 and forms said housing cavity 101, and the mounting slot 102 is opened on the projection 112, when the display 130 can be attached to the second surface 1112.
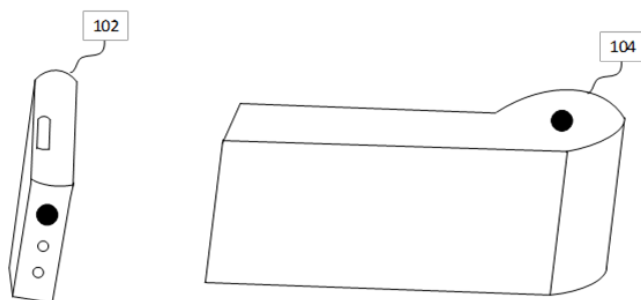
Additional figure 28 IoT hardware composition of SHC intelligent system
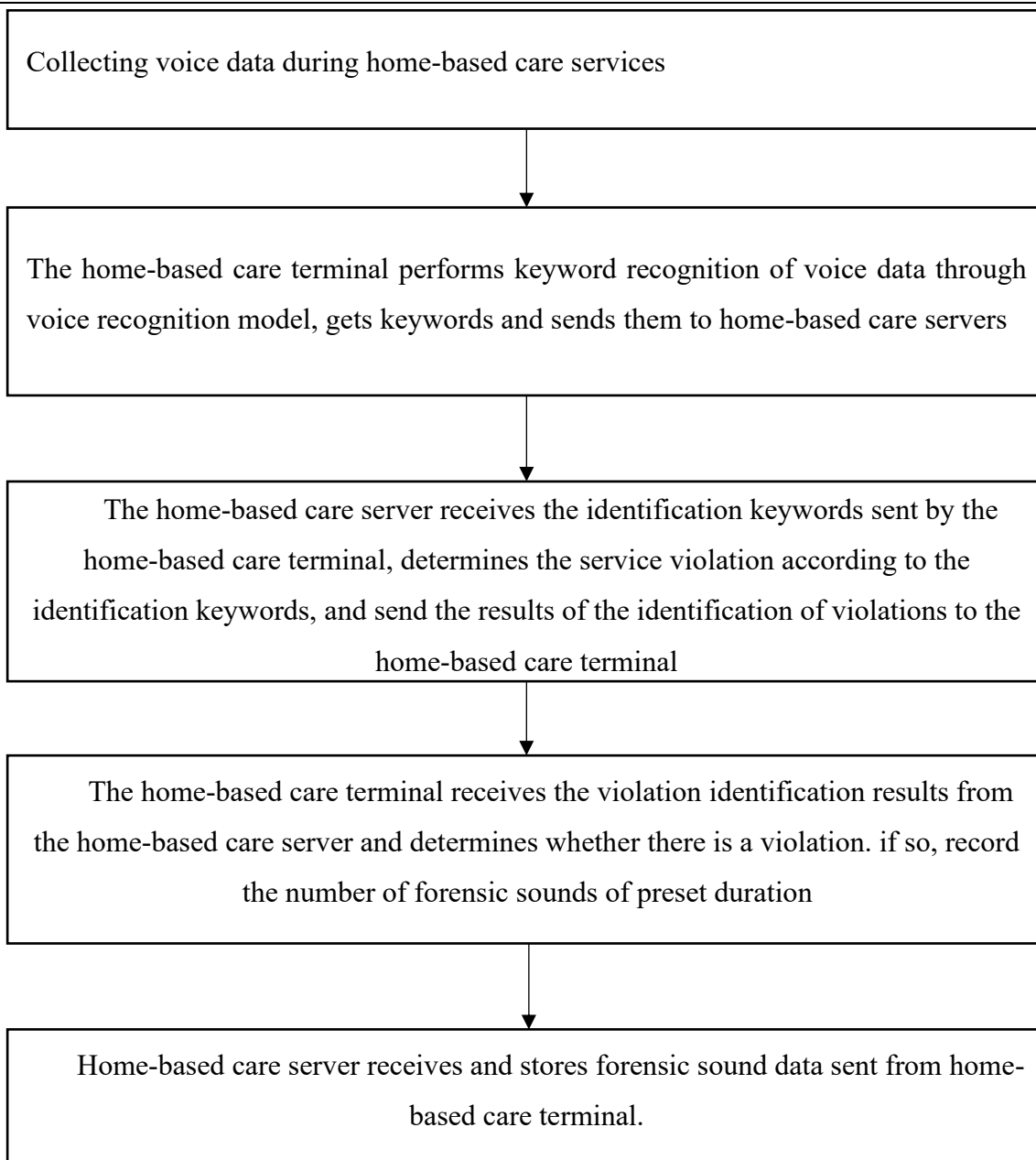

Additional figure 29 SHC intelligent system IoT hardware collect signal and upload server
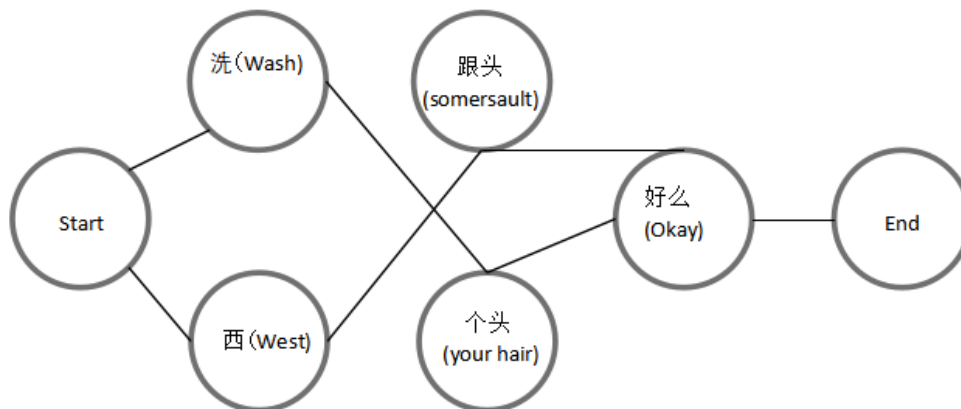
Additional figure 30 Service supervision cases of SHC in Shanghai

Collecting voice data during home-based care services

The home-based care terminal performs keyword recognition of voice data through voice recognition model, gets keywords and sends them to home-based care servers

The home-based care server receives the identification keywords sent by the home-based care terminal, determines the service violation according to the identification keywords, and send the results of the identification of violations to the home-based care terminal

The home-based care terminal receives the violation identification results from the home-based care server and determines whether there is a violation. if so, record the number of forensic sounds of preset duration

Home-based care server receives and stores forensic sound data sent from home-based care terminal.

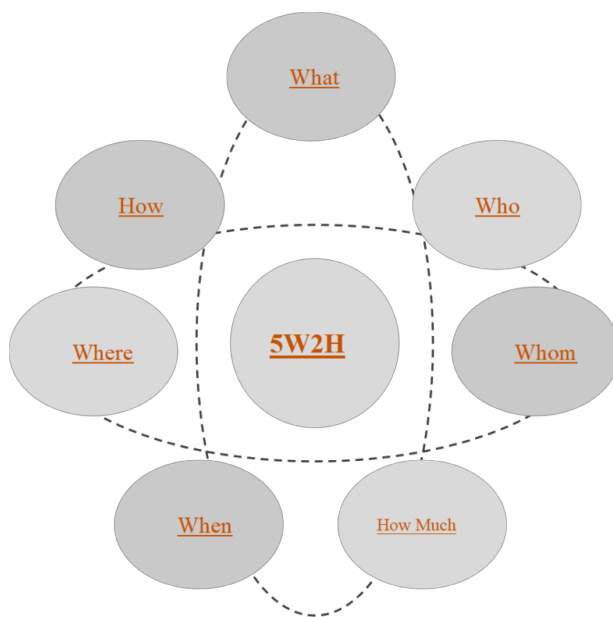Additional figure 31 SHC intelligent system identification logic

Additional figure 32 Speech recognition processing logic

Receive identification keywords sent from home-based care terminal

Identify violations of home-based care services based on identification keywords and get the violation result

Send violation identification results to home-based care terminals
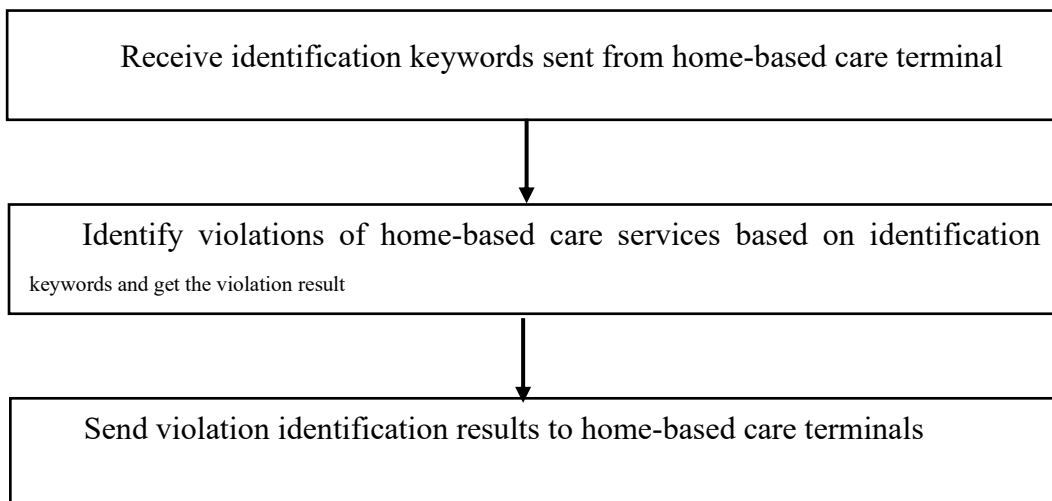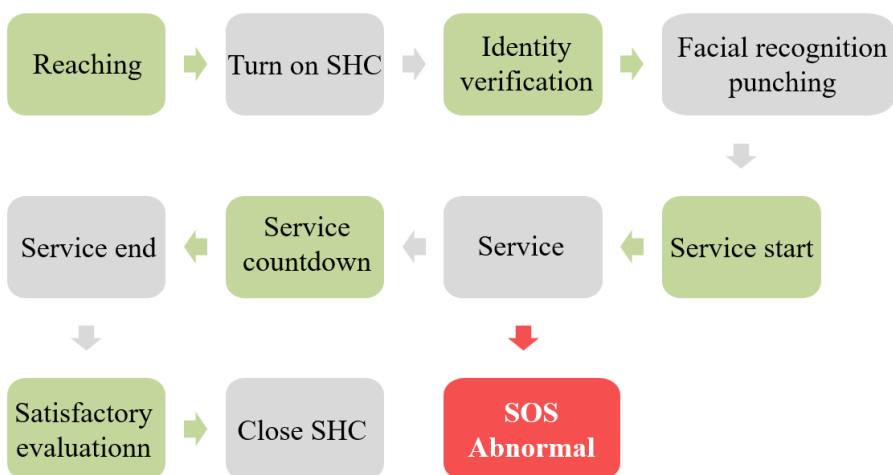
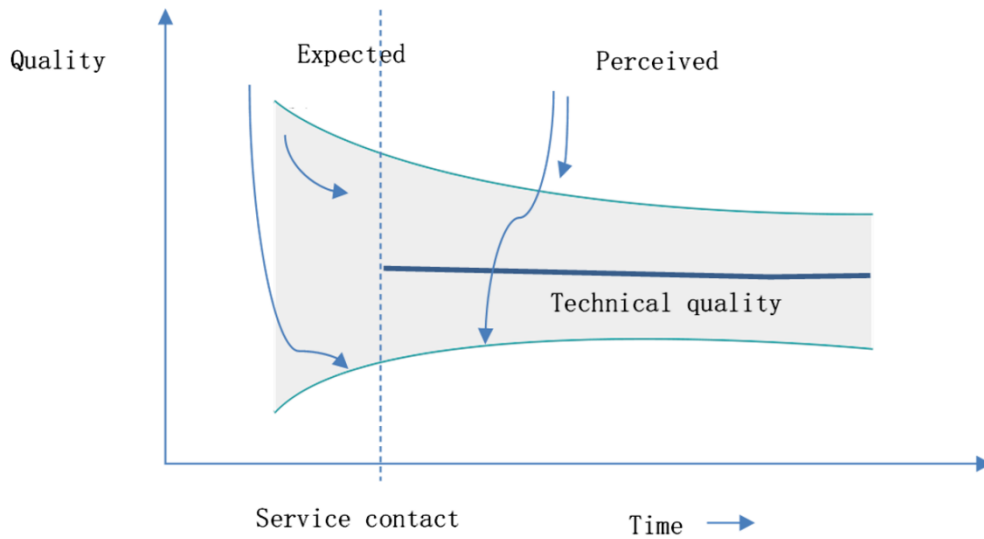Additional figure 33 Home-based health care services violations forensics

Additional figure 34 Service process restore "5W2H content"
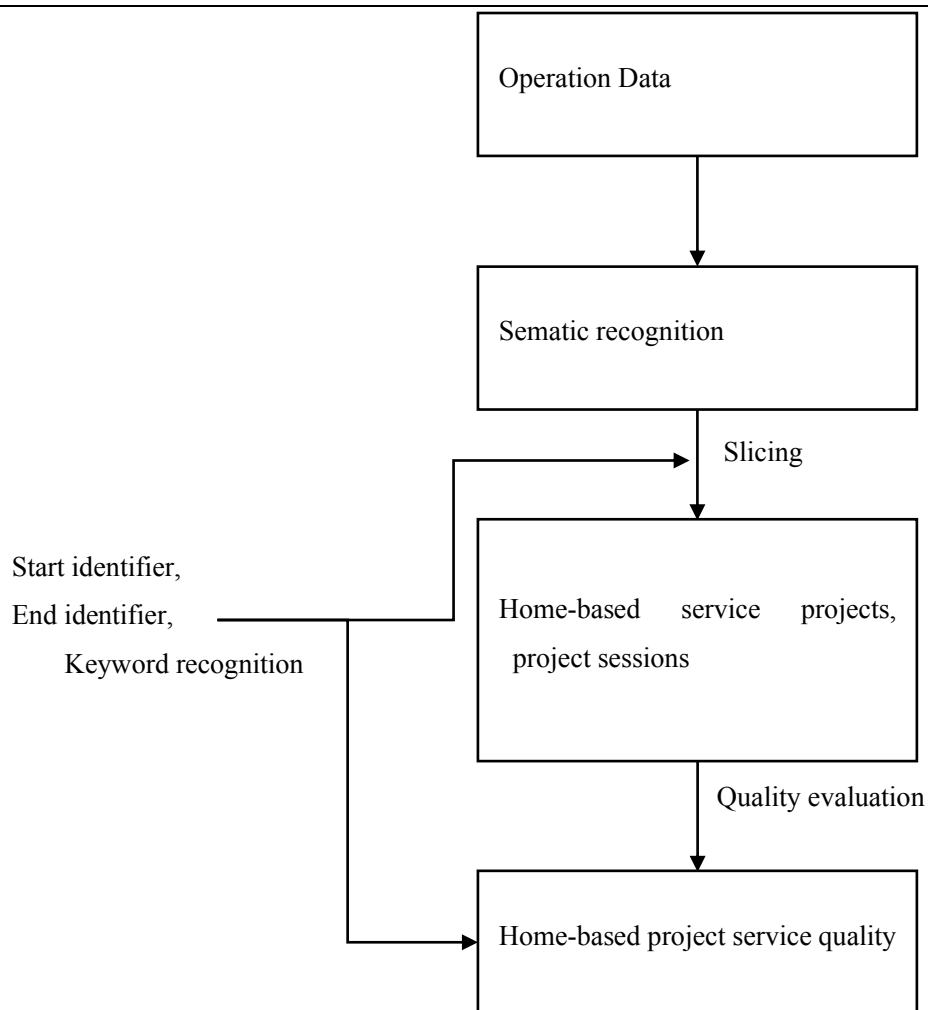
Additional figure 35 SHC service process regulatory identification process

Additional figure 36 Service process monitoring system and business combination operation flow
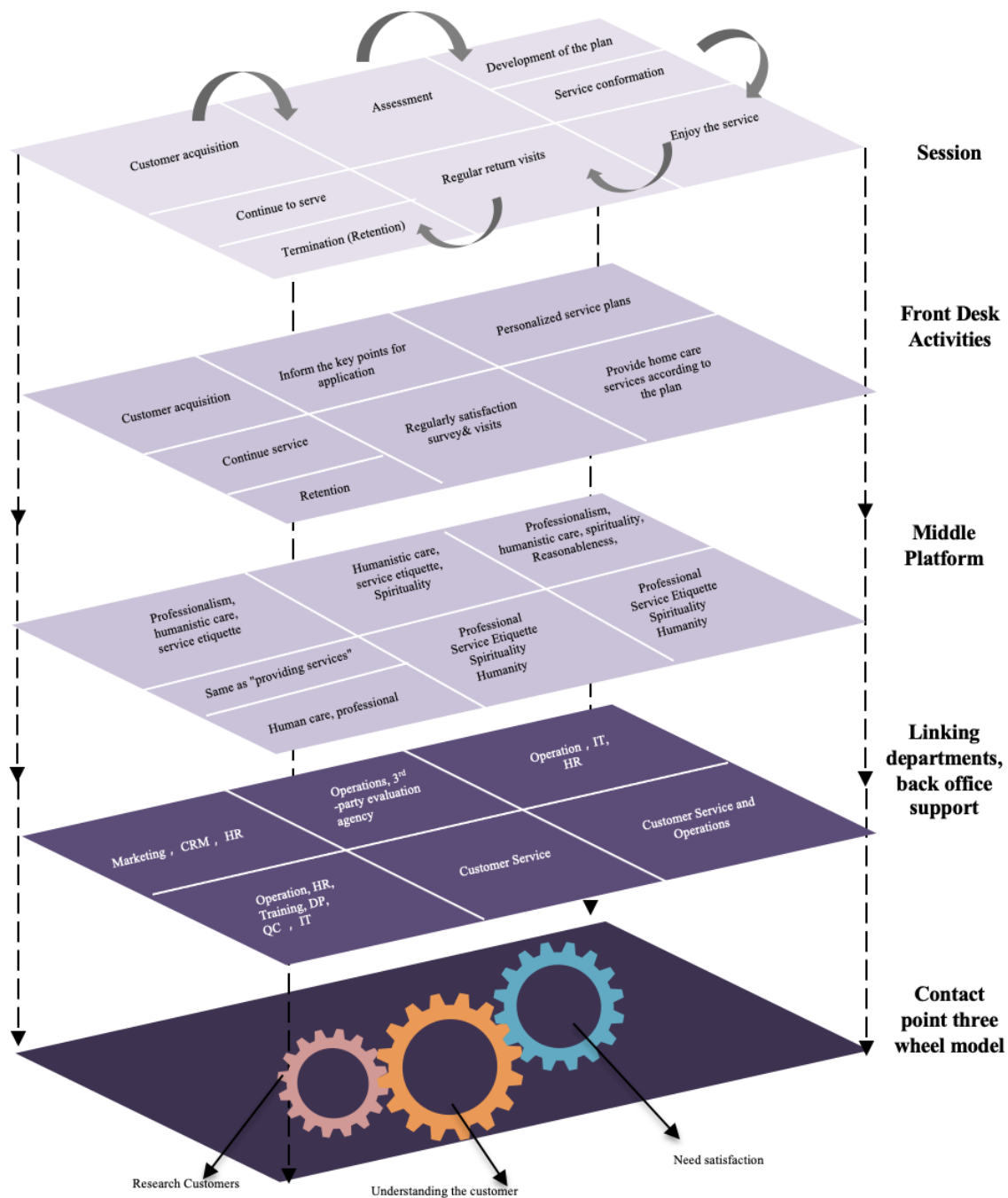
Additional figure 37 Relationship between desired quality, perceived quality and technical quality of services evolving over time
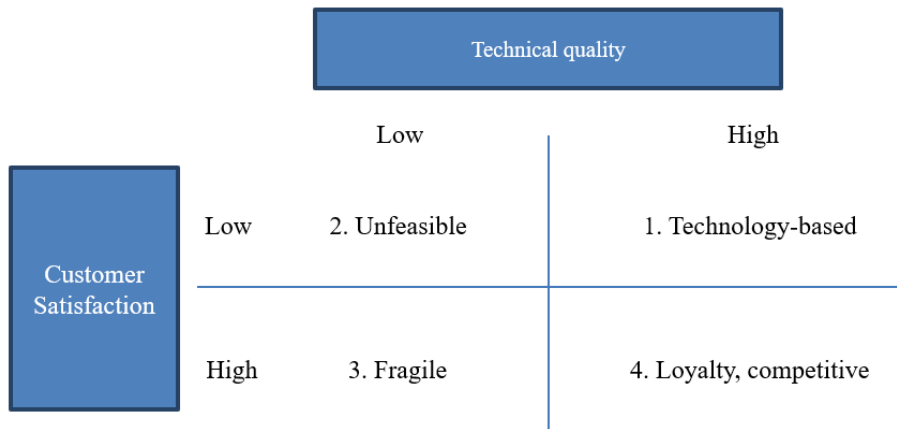
Additional figure 38 Customer satisfaction and technology quality

Additional figure 39 Enterprise "front, middle and back" offices collaborations to promote the process of supervision

Annex E: List of Abbreviations

Abbreviations	Explain
AAL	Ambient Assisted Living
AI	Artificial Intelligence
AHP	Analytic Hierarchy Process
ASR	Automatic Speech Recognition
BPM	Business Process Management
CLASS	China Longitudinal Aging Social Survey
CN	Chang Ning
CNN-HMM	Convolutional Neural Networks-Hidden Markov Model
CRM	Customer Relationship Management
CSI	Customer Satisfaction Index
DP	Development and Planning
FMEA	Failure Mode and Effects Analysis
FGAC	Fine Grained Access Control
ERG	Existence Relatedness Growth
HR	Human Resources
HP	Huang Pu
ID	Identity document
IoT	Internet of Things
IT	Information Tchaikovsky
JA	Jing An
LTC	Long Term Care
MEMES	Micro-Electro-Mechanical System
MH	Min Hang
NPS	Net Promoter Score
PEST	Politics Economy Society Technology
PKI	Public Key Infrastructure
PD	Pu Dong
QC	Quality Control
RMB	Renminbi
SHC	Smart Home Care
SPO	Structure-Process-Outcome
SSL	Secure Sockets Layer
TBSB	To Business ShangBao
TCJS	To Customer JiaShu
TCYG	To Customer YuanGong
TGMZ	To Government MinZheng
TGYB	To Government YiBao
US	United States
UK	United Kingdom
VR	Virtual Reality
XH	Xu Hui