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RESEARCH ARTICLE

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Socialized care services for the aged population: System construction and support measures

Abstract Given the aging society, an increase in social demand, information- and communication technology-driven culture, and government policy support emerges to enable the development of the socialized care services system for the aged (SCSSA). The development of the SCSSA would be a significant step toward addressing China's aging population. However, the construction of the SCSSA challenges the theories and methods of traditional elderly care service system construction. Specifically, the implementation path for such elderly care service policies is unclear, the necessary technological support is insufficient, and the mechanism for integrating intelligent information technology remains underexplored. Thus, this paper focuses on the needs of the elderly, grounded in the context of the changing elderly care service policies in China, and proposes a research paradigm that integrates system construction and support measure embedding. We then construct the original SCSSA, which includes "material + spirit + medical treatment + healthcare" and propose a method of optimization and iteration. Finally, we build the research framework of systematic support measures from the perspectives of policy reconstruction, institutional embeddedness, and technical support. Our work provides theoretical support and practical guidance for the construction and dynamic optimization of the SCSSA, thus making a significant contribution that will help China effectively cope with its aging society.

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Keywords socialized, care service for the elderly, system construction, support measure

1 Introduction

In the last 10 years, the population over 60 years old in China has grown from 126 million (10.2% of the population) to 254 million (18.1% of the population) (NHC, 2020). Societal aging results in the increase of economic and social costs year by year, driven by the expanding needs of the elderly, such as high-quality material and spiritual services, continuous medical services, and comprehensive health services. The cost of various elderly care services in China is projected to reach 21.77% of the GDP by 2050. The country's limited resources (especially medical and healthcare resources) cannot satisfy the increasing social needs of the sizeable aging population, which has a high growth rate and high burden. Thus, new solutions must be urgently produced to cope with China's aging society. One source of such solutions may be found in applications based on artificial intelligence and information technology, such as mobile apps, wearable devices, smart homes, and telemedicine, which have gradually penetrated people's lives. The implementation and application of these emerging technologies in elderly services will generate novel ideas for alleviating the resource shortage.

Socialized care services for the aged (SCSA) refers to a service process that centers on (all) the elderly and encourages multiple social service providers (e.g., government, community, and for-profit and non-profit organizations) to participate in care service provision actively, continuously, and jointly. Subsequently, providers support, help, and encourage the elderly to utilize social resources to meet their comprehensive subjective needs (e.g., lifestyle improvement, cultural entertainment, and self-worth realization) and objective needs (e.g., medical needs due to the decline in physical function, and increased health awareness).

However, the SCSA faces several serious practical challenges as follows: 1) The insufficient coordination and interconnection between service providers and the lack of effective linkage of related services. Existing service providers are dominated by government and public institutions, whereas other social service providers (such as families, communities, private medical service entities, and non-profit institutions) are not fully engaged. 2) The diverse needs of the elderly cannot be met, and a prominent mismatch exists between supply and demand. Aged people's service needs have gradually become diversified in levels and types, especially for the urban elderly. Profit-oriented services focus more on pursuing short-term benefits, preventing services to fulfill the diverse needs of the elderly throughout their life cycle. 3) Medical resources for the elderly in China are insufficient, and fully mobilizing market resources and incorporating intelligent information technology to alleviate the shortage of resources are difficult. Most service applications that are based on emerging technologies have a low penetration rate among the elderly. Therefore, integrating intelligent information technology with elderly services is challenging. 4) Support measures for the elderly service system are limited, and policy implementations in China remain inadequate. The existing elderly services have various weaknesses, such as fragmented elderly care policies and support measures, imperfect standards and regulations, incomplete discipline talent construction, and inconsistent payment policies.

In summary, the development of the socialized care services system for the aged (SCSSA) would be a significant step toward addressing China's aging population. Thus, establishing the SCSSA and exploring its effective, stable, and continuous support measures are imperative. To address the above-mentioned practical and theoretical gaps, this paper reviews the relevant research on the supply and demand of elderly services in China. We then construct an SCSSA integrating "material + spirit + medical treatment + healthcare" and propose a method of optimization and iteration. Thereafter, systematic support measures from the perspectives of policy reconstruction, institutional embeddedness, and technical support are established. We conclude by offering our theoretical and practical contributions for the construction of a basic care system for China's elderly people.

2 Background and conceptual foundations

2.1 Service needs of the aged

The service need of the elderly is defined as aged people's requirements and expectations regarding the content and quality of services. A country must fully identify the characteristics of aged people's needs to be able to provide SCSA. Given the recent rapid economic and social development, existing elderly care services are unable to satisfy the individualized and diversified needs of the elderly, thereby leading to an imbalance between the supply and demand of SCSA. The needs of the elderly can be classified into three categories: Material, spiritual, and medical care needs.

Material needs include transportation, living environment, and nutrition needs. The daily transportation needs of the elderly are mainly focused on meeting necessities of life, and the increasing travel needs of the elderly are oriented toward obtaining spiritual enjoyment (Shrestha et al., 2017). In addition, studies on the living environment needs of the elderly indicate that a good natural outdoor environment will positively promote pleasant behaviors, and a good indoor living environment reduces the risk of falls among the elderly (Wang et al., 2016). The nutrition needs of the elderly gradually intensify as they age. The evaluation, management, guidance, and recommended interventions related to aged people's nutrition positively impact their health (Franzke et al., 2018; Liu et al., 2019). However, elderly care institutions lack a balanced dietary system, and food caterers in such institutions have neglected the special dietary needs of the elderly (Zhao et al., 2019).

Spiritual needs include social, entertainment, learning, and self-realization needs. Due et al. (2018) found that social isolation negatively affects the health and well-being of the elderly, whereas the participation in community and the use of social technology can enhance the communication between the elderly and the outside world, thereby increasing their well-being. Extant research has explored the relationship between the level of aged people's social participation and their health-related characteristics (Curvers et al., 2018). Studies have also established that recreational activities improve aged people's quality of life and their mental health. Particularly, the emergence of electronic digital games has become a source of learning for the elderly given their enjoyment in playing such games (Wang, 2016). In addition, activities that meet individuals' need for self-worth and learning can reduce the internal and external psychological pressures experienced by the elderly, which can improve the effectiveness of their medical treatments (Arpino and Solé-Auró, 2019).

Medical care needs include basic medical needs, emergency treatment, nursing needs, and self-management needs. Medical support for the elderly comprises pension and medical insurance, and this support positively affects the use of health-related services in older people (Reeves et al., 2017). Previous research has explored the impact of the medical insurance system on the medical needs of the elderly and on their utilization of medical services. One basic medical need is timely healthcare interventions provided by family doctors, which can largely prevent disability in the elderly (Wan, 2017). In addition, compared with other populations, older people have more

frequent and deeper needs for emergency treatment (McCusker et al., 2003). Daily health self-management is strongly associated with controlled chronic diseases among the elderly. Health education and information technology assistance can significantly improve older people's capabilities for health self-management (Danielsson et al., 2017). Furthermore, self-care and collaborative care services can help older people who live alone to adopt health self-management (Caldeira et al., 2017). Various approaches exist to such care due to individual differences in the levels of disability, economic status, relatives, and other conditions (Liu and Lv, 2019).

A review of the previous literature revealed that the service needs of the elderly are mainly concentrated in material, spiritual, and medical care needs. However, elderly people who have comprehensive needs of "material + spirit + medical treatment + healthcare" do not represent all the current elderly groups in China (e.g., the aged population in the village with limited income may still have problems with material living and are unaware of spiritual needs). With the development of society, the elderly group with comprehensive needs will gradually expand. Therefore, this paper aims at the present and future elderly with comprehensive needs of "material + spirit + medical treatment + healthcare". However, the extant literature on satisfying the service needs of the elderly is mainly focused on how to meet older people's basic service needs and how to improve their basic quality of life. Studies on the subjective needs of the elderly, such as lifestyle improvement and self-worth realization, remain scant. Thus, SCSA must be further studied.

2.2 Construction of a care service system for the aged

The care service system for the elderly integrates family, community, institution, and government resources to provide comprehensive services that cover living support, medical care, and spiritual care for aged people. In consideration of national conditions and cultural differences, many countries have gradually formed unique care service systems for the elderly that adapt to economic and social development. For example, the care service system for the aged in Sweden focuses on home care services, including housing support, care assistance, institutional care, and other services, and employs tax reduction policies to reduce care costs (Longo and Notarnicola, 2018). The care service system for the aged in Germany is a tripartite model, which uses home care as the mainstay and institutional care and on-site services as supplements, which depends on the support of fund-accumulated private pension insurance (Theobald and Luppi, 2018). In addition, the care service system for the aged in the US is planned and guided by regional elderly institutions, with local institutions then providing care services, such as long-term care, information consultation and assistance, disease prevention, and health promotion for aged people (NCPSSM, 2018).

China has enacted various policies for elderly care service at the national and local levels. It has also conducted policy research and practical exploration in many respects, including the home care service system (Shi, 2015; Mao, 2019), nursing home service system (Qing, 2017; Diao et al., 2019), community service system (Zhou and Lu, 2018), and social pension service system (Zheng, 2019). Specifically, studies on care service systems for the elderly have clarified the role of elderly care institutions and have provided the government suggestions concerning social investment, the internal construction of elderly care institutions, and reform of the retirement support system. The rights and interests of older people who are disabled in the provision of food, nursing, rehabilitation, and assistive equipment should be secured to improve their quality of life (Xu and Liu, 2017). However, existing policies still have certain shortcomings, such as the limited coverage of social pension insurance and the fragmentation of management departments (Hu and Peng, 2018; Guo, 2019). Moreover, a misalignment exists between policy supply and practical demand, which results in the weak effectiveness in policy implementation and the dissatisfaction of the elderly regarding the effect of policy implementation (Peng and Hu, 2011; Yang and Zhang, 2013; Xie, 2015).

Other developed countries where the growth of the aging population began earlier have formed a pension pattern in which community home care is the mainstay and institutional care is supplemental (Zhong and Zhang, 2016). At present, China remains in its infancy in this area, and an impeccable service system for the elderly has not been formed. In addition, the extant research shows that the elderly care service system, which is limited to providing medical and healthcare services, is no longer satisfying the multi-level and diversified service needs of the elderly. Therefore, a comprehensive and continuous care service system must be constructed, which not only includes elderly care services but also provides material support for daily living, spiritual and cultural services, medical services, and healthcare services for the elderly. Thus, the status quo of the development of the elderly care industry in China must be prioritized, and the advanced practical experience of foreign nations must be absorbed. After identifying the principles that must be followed and dimensions that should be considered in the construction of such a system, we put forward an original version of the SCSSA that can satisfy the comprehensive needs of the elderly. Moreover, we explore how to iterate and optimize the proposed system.

2.3 Support measures of care service system for the aged

A series of support measures are necessary to construct and implement a care service system for the elderly.

Work that evaluates and optimizes such support measures has become the main research stream in the construction of care service systems for the aged. The extant research mainly focuses on three fields: Policy reconstruction, information technology support, and social support measures.

(1) Policy reconstruction

Reconstructing public policies concerning the elderly is the key part of providing institutional guarantees for aged people (Wu, 2011). Reconstructing such policies will contribute significantly to solving China's problems concerning the insufficient satisfaction of older people's needs and the inadequate implementation of elderly care policies (Zhen and Liu, 2016). The extant literature has mainly focused on the reconstruction of the pension policy system, including the reconstruction of policies in the social pension service system, the home care service system, and the institutional care service system. Relevant research is shown in Table 1.

Few of the extant research on the policy reconstruction of the care service system for the aged has adopted a holistic perspective. Studies have mainly focused on analyzing possible changes of existing policies and the deficiency of pension policies to put forward policy restructuring recommendations from a qualitative and macro perspective. However, a single qualitative research method has limitations, and little is known about the overall path of policy reconstruction. Therefore, there is a need for further studies on how to determine the optimal path for policy reconstruction by combining qualitative and quantitative methods, an approach that can effectively improve the pertinence and accuracy of the reconstruction policy. This study explores the path of policy reconstruction in the SCSSA and analyzes the internal interaction mechanism between the existing policy issues and the need satisfaction of aged people, thus providing policy support for the effective operation and implementation of the SCSSA.

(2) Information technology support for the care service system for the aged

The application of information and communication technology drives the efficient operation of the SCSSA. This subsection reviews the relevant research on information integration and sharing, information privacy and security, and other information-related topics (see Table 2).

A review of the relevant research demonstrated the following. First, in terms of information integration and sharing, although previous research has identified the promotive effect of information technology application on elderly care services, little is known about how to systematically satisfy aged people's needs for information integration and sharing services. Second, in terms of information security and privacy, although previous research has indicated many privacy security issues in the application of information technology, few studies have clearly explained how to ensure the security and privacy of personal information in care service systems for the aged. Therefore, we further explore the issues of the information technology application in information integration and sharing, information privacy, and security. Thereafter, we analyze the relevant support

Table 1 Research on the reconstruction of the elderly care service policy

Topics	Propositions	References
Reconstructing policies concerning the social pension service system	Reconstruction of the home-based community care policy should focus on the needs of the elderly, highlight the core of the policy, and identify the responsible institutions. Such work should start with the transformation of government functions and the professionalization of community service provision, further improving the supply structure. Then, a community platform should be built, and the participation of the home should be strengthened.	Qian (2015); Wang (2018)
	Based on the analysis of the situation of Shanghai's "13th Five-Year Plan" care system for the elderly, this study provides ideas and suggestions for developing community care to improve the standardization and systematicness of Shanghai's community care policies.	Zheng (2016)
	This paper provides recommendations to improve policies for providing better community and social services for the elderly.	Gu (2000)
Reconstructing policies concerning the home care service system	From the perspective of the changes and function development of traditional family-based care for the aged, this study suggests that reconstructing the public policy of family endowment in China should focus on policy principles and concepts, target objects, content frameworks, and operating mechanisms.	Li et al. (2019)
	This study proposes the framework of the "five-in-one" elderly care service policy system of loss-of-only-child families from the perspective of supply–demand coordination.	Zhou and Sun (2018)
	The aged population and the changes in housing patterns in China intensify the pressure on family support. Thus, current family policy system must be constructed on the basis of respecting traditions and grasping trends.	Peng and Hu (2016)
	Exploring reasons why home care functions are weakening and why traditional filial piety is declining, this paper proposes a comprehensive view of the aging population and discusses reconstructing the ethics of filial piety in response to the aging society.	Peng and Guo (2016)
Reconstructing policies concerning the institutional care service system	On the basis of the basic framework and methods of social policy analysis, this paper focuses on the analysis of the elderly service policy in Shanghai by reviewing the evolution of Shanghai's institutional pension policies.	Yao (2016)
	This study identifies the discordance of the institutional endowment policy system, either inside or outside the system, by empirically analyzing 68 policy samples that were obtained from international and national websites.	Long (2017)

Table 2 Research on information technology support for the care service system for the aged

Topics	Propositions	References
Information integration and sharing	The "Internet+ elderly care" service mode is conducive to optimizing the allocation of resources, promoting a balance between the supply and demand of elderly care services, and increasing the level of elderly care services.	Hodge et al. (2017); Zhang (2019); Cao (2019)
	Using cloud computing technology and the integrated informatization platform can efficiently integrate resources and improve the social support service system. Home care services for the elderly should be real time, efficient, accurate, and low-cost.	Konstantinidis et al. (2016); Tai and Wang (2018)
Information privacy and security	Some risks are involved in the privacy protection of existing intelligent home care. For instance, the personal information of the elderly can be easily leaked through information service platforms and intelligent devices.	Hao (2018); Yang (2019)
	User privacy and information security in wearable devices are important issues that must be addressed urgently.	Wu and Ma (2018); Wu et al. (2020)
Other topics of information	Development of equipment and software: Advanced methods can be used to design intelligent equipment or software for the elderly by considering the characteristics of the elderly.	Lyons et al. (2017); Tai and Tao (2017)
	Elderly care service provision: Information technology, including technology related to the Internet-of-Things, intelligent sensing, infrared scanning, and GPS, can be used to provide various convenient and practical care services for the elderly.	Godfrey (2017)

measures to provide countermeasures and suggestions for stakeholders.

(3) Social support measures in the care service system for the aged

In China, the research into social support measures in the care service system for the aged mainly focuses on five topics: Service standards and regulations, discipline and talent construction, service pricing, payment policies, and socializing organization collaboration. Relevant research is shown in Table 3.

Previous research has indicated that, overall, the standard system for the elderly care industry is not yet mature in China, which is reflected in the low quality of services, irrational structures, and inconsistent connections among different systems. Few studies have explained how to reduce the mutual exclusion of different systems to promote the development of the SCSSA. Although previous studies have proposed a care service system for the aged that requires the coordination of social organizations, cooperative partnerships have not been established among multiple participants in the system. Moreover, little is known about how support measures should best supplement each other to achieve the optimization and integration of elderly service resources in government,

Table 3 Research on social support measures in the care service system for the aged

Topics	Propositions	References
Service standards and regulations	Standardization of institutional elderly care services: Current institutional care services for the elderly have a low service capability that can barely satisfy the needs of the elderly.	Yang et al. (2017)
	Standardization of community home care services: Although the professional standards of care institutions and care providers have been gradually clarified, problems exist in implementation, supervision, and management.	Li and Ding (2014); Tang (2018a)
	Standardization of integrated medical and healthcare services: In the two major service systems for elderly care (medical service and healthcare service), problems exist in the connection of quality standards, service content, and fees.	Ma and Wang (2017)
Discipline and talent construction	Construction of service talent: China should strengthen service training, improve the talent system, formulate incentive policies of talent training, and improve the social status of practitioners.	Lea et al. (2015)
	Construction of medical talent: China should strengthen the construction of geriatric clinics and polyclinics for the elderly, construct a multidisciplinary diagnosis and treatment team for geriatric medical care, improve the professional qualification certification system for geriatric care, and train senior talents.	Kang (2013)
Service pricing	Private capital institutions implement differentiated pricing as their pricing strategy for elder care services according to the market size, competitive effects, self-positioning, and government pricing.	Forder and Allan (2014)
	Government agencies implemented government-guided prices as a pricing strategy for elder care services.	Tang (2018b)
	Home care services implemented asymmetric service pricing when they provide differentiated services.	Zheng et al. (2019)
Payment policies	China's retirement pension system has some problems, such as the fragmentation of the content structural system and the imbalance between the responsibilities and powers of the hierarchical system. The cost of elderly care services is paid by multiple entities in Japan.	Ding (2014); Morikawa (2014)
Socializing organization collaboration	This study centers on community and emphasizes multi-subject cooperation of communities, governments, and social organizations.	Ban (2017)
	Embedding volunteer departments into the structure of the country, market, and society promotes collaboration among multiple entities to provide professional and diverse care services for the elderly.	Verhoest and Mattei (2010); Yan and Peng (2018)
	The supply of elderly care services is led by the government and involves the participation of the market, social organizations, families, and other entities that interact, connect, and support each other to realize the transformation of the "holistic governance" of the aging society.	Johansson (2014)

society, and communities. Therefore, we analyze the status quo of elderly care services in service standards and regulations, discipline and talent construction, service pricing, payment policies, and social organization collaboration. We then further explore support measures of SCSSA in the standards, talents, and organizations. Ultimately, we try to form a dynamic closed loop of social support measures around the SCSSA and strive to promote the effective implementation and operation of the system.

3 SCSSA development

The proposed SCSSA is the prerequisite for implementing the elderly service policy, delivering service content for the aged, and supplying support measures for elderly services in China. Starting from the principle and construction dimensions that must be followed in the construction of an SCSSA, we explore the construction of the SCSSA and then discuss iterating and optimizing such a system. We intend to form an SCSSA that fits China's policy planning, which can satisfy the needs of the elderly.

(1) Construction of the SCSSA

The principles and dimensions of constructing the SCSSA. First, guiding principles are identified, including the principle of existence (the principle of constructing similar systems based on the literature, the experience of practitioners, etc.), the principle of comprehensiveness (the system should meet the comprehensive needs of the elderly), and the principle of key point (the system should have a key focus, such as the socialization and intelligence). Second, the analysis of multiple dimensions should inform the construction of the SCSSA. Such analysis should not only focus on the multiple dimensions of system operation support (e.g., service technology, service content, and service providers), but also involve in-depth analysis of the content of every single dimension (e.g., technical support and maintenance are needed to analyze the dimension of system operation).

On the basis of a systematic review, the research related to SCSSA is analyzed, and the relevant principles and dimensions of system construction are abstracted. The specific process is as follows. 1) Pilot searching: We identify the relevant keywords (e.g., socialization, elderly care service, elderly care system, and the aging population) and search such keywords in platforms, such as PubMed, to find the research status of the SCSSA. 2) Systematic searching: Based on the identified keywords, we search the relevant literature in databases, forming a database to manage relevant research papers. 3) Identifying the principle of research: On the basis of the Population, Intervention, Comparison, Outcome, Study (PICOS) framework (design), we establish research standards to evaluate and extract data related to research relevance, service objects, and service classification. On the basis of the healthy aging framework proposed by the World Health Organization (WHO), we map an evidence database. 4) Gathering findings: We use tables to gather the description of relevant evidence and adopt a quantitative meta-analysis approach to analyze research results. Through artificial processing, the relevant principles and dimensions of constructing the SCSSA are abstracted.

Proposing the original SCSSA on the basis of the identified principles and dimensions. On the basis of the principle of comprehensiveness, we focus on four aspects, namely, material, spiritual, medical, and healthcare for the elderly. On the basis of the principle of existence and the principle of key point, we investigate the key issues involving the four aspects. Finally, we put forward the original SCSSA that involves the four aspects. Specifically, creating this SCSSA entails: 1) Building of the "community + home" material service system for the elderly in response to the shortage of supply in living service resources and the misalignment between supply and demand. 2) Building of the "trinity" spiritual service system for the elderly containing entertainment, education, and social contact, which can satisfy the diversified spiritual needs of the elderly. 3) Relying on the cloud data center of the Internet of Healthcare Systems (IHS), the SCSSA has multiple participants and has the support of resource linkage. 4) In terms of the healthcare service system, we introduce the modes of "group management" and "Internet+ nursing" to satisfy the need for continuous health management and long-term care. The proposed SCSSA is shown in Fig. 1.

(2) Iteration and optimization of the SCSSA

The original SCSSA must be iterated and optimized to adapt to national conditions and meet the comprehensive needs of the elderly, ultimately constructing a stable, continuous, and adaptable SCSSA. By using the process analysis method and following the research paradigm of action design, we explore the process of iterating and optimizing the SCSSA as follows.

In the time dimension of iteration and optimization (horizontal dimension), on the basis of the time consumed by every method, we divide the process into several categories, including the literature review process (same as the above process in the original SCSSA proposal), the questionnaire survey process (conducting scenario-based surveys to investigate the need of participants and the principles and dimensions of system construction), the in-depth interview process (taking in-depth interviews with representative objects selected from participants), the case study process (investigating and learning from extant successful cases), the pilot experiment process (conducting pilot programs in each sub-system and optimizing experimental programs), and the pilot implementation process (employing the system and optimizing and iterating this system in practice).

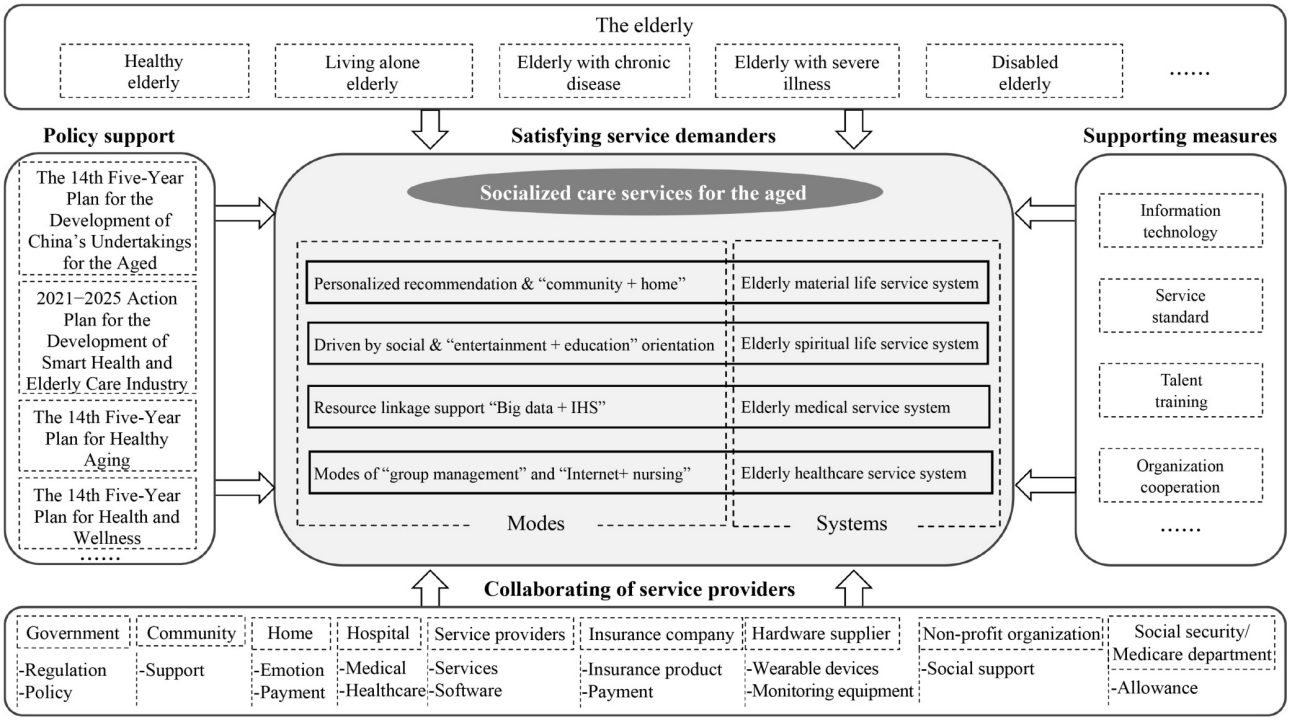

Fig. 1 Original SCSSA.

To scientifically optimize and determine each generation of the SCSSA, we use the process method to realize whole-process quality management for each process; this method includes pre-analysis and design, in-process control and feedback, and post-evaluation and optimization. In the stage of pre-analysis and design, on the basis of the method characteristics of the process (e.g., the questionnaire survey process, and the in-depth interview process), we extract the process elements required in the principle and dimension of system identification. We then identify the input and output, conversion activities, and their sequence and interaction in the optimized service system and finally formulate the implementation plan. In the in-process and post-process stages, on the basis of the process elements, we conduct planning, implementation, performance evaluation, and improvement activities. Moreover, we continuously improve the program for optimizing the service system.

In the participant dimension of iteration and optimization (vertical dimension), we follow the research paradigm of action design to explore the path analysis of SCSSA iteration to realize the cyclic improvement of the care service system for the aged among academic researchers, service providers, and service objects. At the academic research level, academic researchers can analyze the operating effects of the care service system and continuously enrich the theoretical basis for this system. At the service provider level, relying on the operating effects and evaluation results of the care service system, participants can continuously enrich and improve the service content to enhance the social support capacity of the care service system. At the service object level, with the help of elderly individuals, the research team can improve the care service system in response to older people's contemporary needs to provide more professional, personalized, and comprehensive services.

The horizontal (time) and vertical (participants) dimensions of iteration and optimization are superimposed with each other. Different time iteration processes have different participants in the vertical dimension. In doing so, we determine the optimized version (the *N*th SCSSA) that is generated during the time iteration process. We then continue to iterate according to the time process until the optimal system is reached. The process of SCSSA iteration and optimization in the horizontal and vertical dimensions is shown in Fig. 2.

4 Support measures for the SCSSA

To facilitate optimizing and iterating the SCSSA, it is salient to effectively embed support measures, such as policy reconstruction, information technology, service standards, talent training, and organizational collaboration into the SCSSA. In this study, we explore the content and implementation path of support measures from three aspects: Policy reconstruction, information technology support and standards, and talent and organizational support measures.

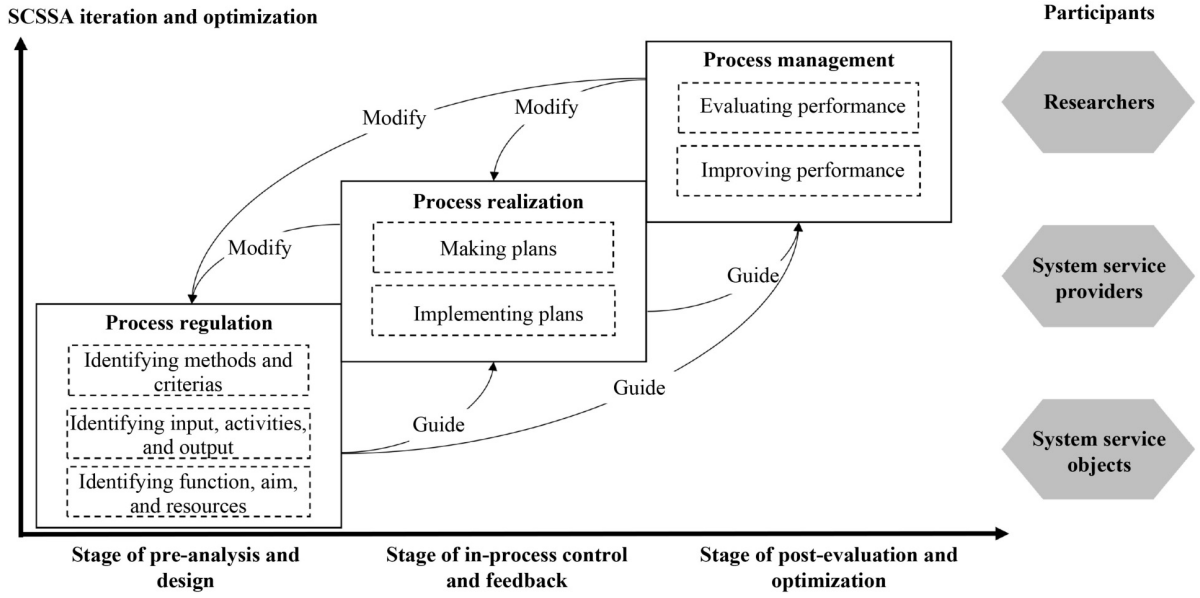

Fig. 2 Process of SCSSA iteration and optimization.

(1) Policy reconstruction

Policies play a critical role in directing elderly care service development, coordinating social resources to serve the elderly, and ensuring the smooth operation of the service system for the elderly. Understanding and analyzing the changes in the country's elderly care service policy will help researchers and policymakers accurately grasp the direction of elderly care service development in China and lay the foundation for the reconstruction of the elderly care service policy.

Research on policy change can be understood from three perspectives, including policy combing, policy analysis, and system exploration. More specifically, in the policy combing, we comb the cultural background, implementation background, and evolution of the elderly care service policy in China on the basis of the policy network theory. In the policy analysis, we explore the implementation path and operation mode of the elderly care service policy in China and analyze the effectiveness and social influence of implementing such policies. In terms of system exploration, given the current status of the operation of the elderly care service system in China, we identify the difficulties in implementing policies and the key focus of future development. We then provide countermeasures and recommendations.

Specifically, we use the bibliometric analysis to comb the existing elderly care service policies in China. By conducting a time sequence analysis of the policy-related paper's keywords used, the number of articles issued, and the citation relationship between papers, we summarize the change regulation and the transmission path of elderly care service policies in China. Then, using multi-source data, such as policy documents, historical data, statistical data, and interview records, we apply open interviews, semi-structured interviews, and other qualitative research methods to conduct interviews with different stakeholders (policy makers, executive agencies, policy implementation objects, etc.). In doing so, we analyze the implementation path, the operation mode, and the effectiveness and social influence of implementing elderly care service policies in China. Finally, we use the fuzzy comprehensive evaluation method to quantify the evaluation index. We also develop a comprehensive evaluation index system and a fuzzy relation matrix to find the difficulty in policy implementation and the future focus of policy development.

Policy reconstruction research is highly beneficial in effectively improving the pertinence of support policies for the elderly care service system, optimizing the allocation of policy resources, and maximizing the social utility of policy. There exist two stages in studying the policy reconstruction. In the first stage, on the basis of the research findings regarding policy changes, we identify the impact of deficiencies in existing policy on the degree to which older people's daily living and health needs are satisfied. We then reveal the underlying internal interaction mechanism, which provides support for exploring the optimization path of policy reconstruction. Specifically, the deficiency of existing policy includes policy fragmentation, policy overlap, and insufficient top-level policy design. Focusing on the needs of the elderly, such as personalized needs, diversified needs, and cultural needs, we analyze the role of these needs in causing deficiencies of policy from two perspectives: Static needs evaluation and dynamic needs evaluation. Then, we further analyze the impact of these existing deficiencies of policy on the degree to which the daily living and health needs of the elderly are met. In the second stage, grounded in the impact of policy deficiencies on satisfying the needs of

the elderly in the previous stage, we identify the optimal policy reconstruction path (policy reorganization and compensation) to ensure the effective, stable, and effective operation of the care service system for the elderly. The second stage aims to realize the balanced satisfaction of older people's needs in all aspects. In terms of policy reorganization, we tend to improve existing policies by enhancing the vertical accuracy and horizontal complementarity of policies. In terms of policy compensation, after analyzing the static and dynamic needs of the elderly concerning daily life and health, we assess the timeliness of policies to supplement existing policies. The specific research framework is shown in Fig. 3.

(2) Information technology support

We analyze and formulate information technology support measures for the SCSSA to find an effective path to realize the informatization and intelligence of SCSSA. This analysis can provide support for the deep integration between information technology and the SCSSA.

In this subsection, we explore the role of intelligent information technology in supporting the SCSSA by constructing the support mechanism of information technology for the SCSSA. Specifically, we analyze the application of information technology in meeting the needs of the elderly and explore the role of information technology in supporting the SCSSA from two perspectives, including data integration and sharing and information security and privacy. In terms of methods, on the basis of grounded theory, we present the supporting framework of information and communication technology for the SCSSA using in-depth interviews. The process is as follows.

① Combing policies and papers. We systematically summarize and comb the policies and papers on the integration and sharing of information resources and user information security and privacy. Then, we analyze deficiencies in existing regulatory measures and deficiencies of technical means.

② Conducting interviews in governments and enterprises. Interviews conducted in government departments clarify the policy support for the application of information and communication technology in the SCSSA and the regulatory role of government agencies over relevant service entities. Interviews conducted with the application providers (big data platforms) and the service developers of intelligent elderly equipment summarize the core support measures.

③ Reviewing theories. We search the conceptual categories and their interrelationships in existing research and then summarize the core categories. On the basis of the operating procedures of grounded theory, we provide the design ideas and plans for proposing the framework of information technology support for the SCSSA.

Figure 4 shows the research framework of information technology support for the SCSSA.

(3) Standards, talent, and organizational supports

To reduce the mutual exclusion between different systems and enhance the feasibility and sustainability of the SCSSA, researchers should pay attention to service standards, payment modes, talent training, and organizational support in the implementation process. Thus, analyzing the formulation of various support policies and the situation of support measure implementation in the extant elderly care service system is of great significance to effectively embed adequate support in the SCSSA.

From the institutional embedding perspective, we provide support for the effective embeddedness of the SCSSA at the levels of resource, organization, demand, and relationship characteristics. The specific content includes: 1) Conducting investigations of existing elderly care services, such as intelligent elderly care and medical care integration from the perspectives of service content standard-setting, pricing and medical insurance payment, discipline and talent construction, and organization coordination. 2) Exploring support measures for elderly care services from the perspective of institutional

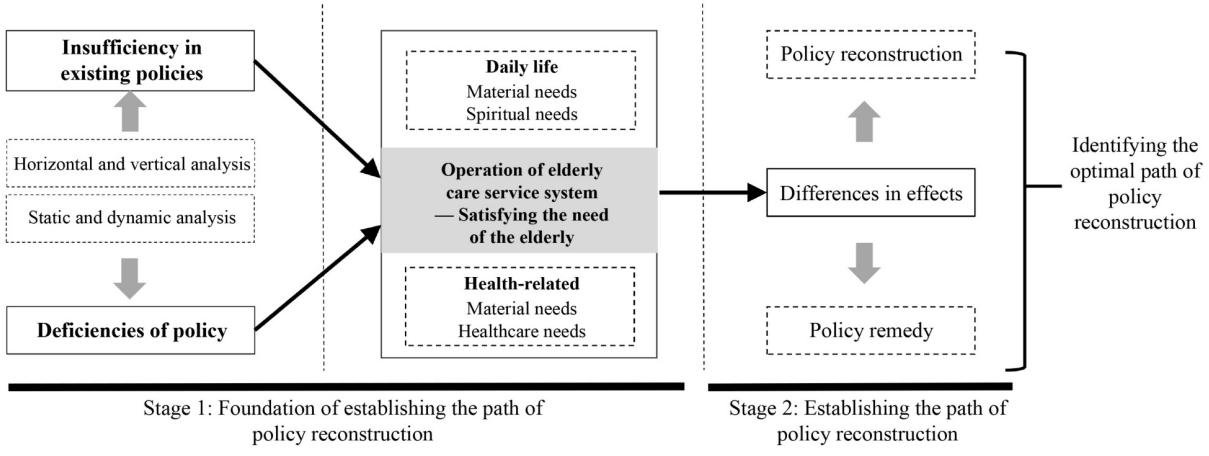

Fig. 3 Research framework of policy reconstruction.

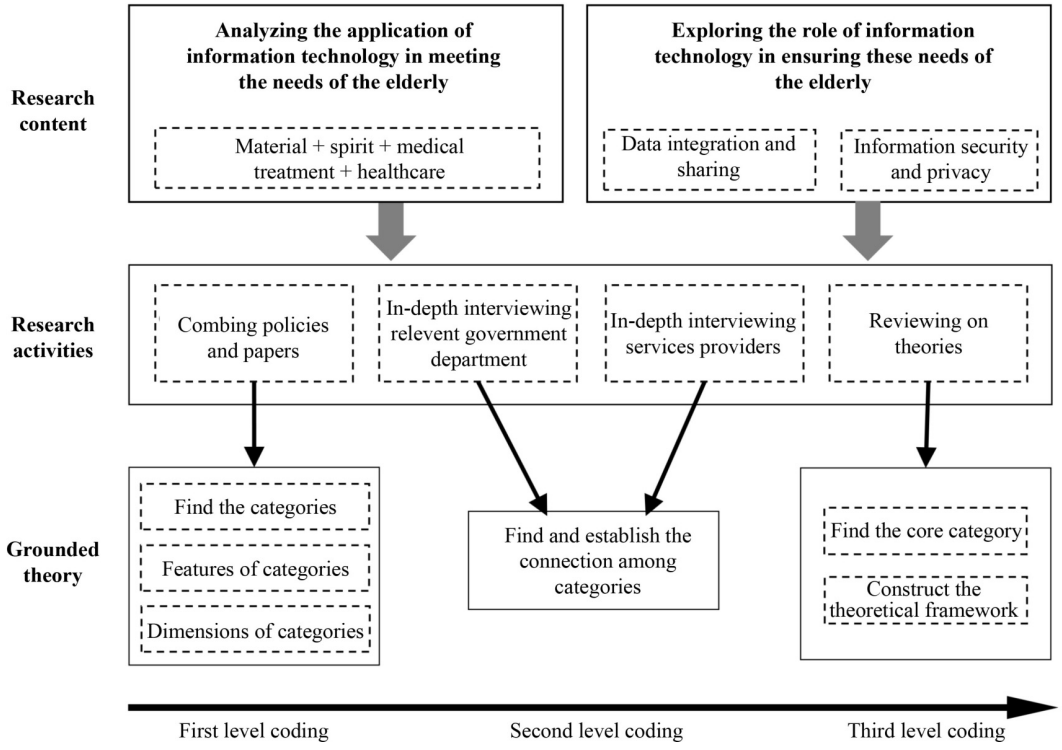

Fig. 4 Research framework of information technology support.

embeddedness. Focusing on the SCSSA, we form a dynamic closed loop of institutional embeddedness that contains support measures, embedded mechanisms, and embedded results to sustain the effort in promoting the effective implementation and operation of the SCSSA. The specific process is as follows.

Literature review. We use the bibliometric analysis method to comb the literature related to the support measures of the existing elderly care service system (including service standards, payment modes, talent training, and organizational support). Then, we clarify the application of the institutional embeddedness theory in formulating safeguard policies and support measures. Finally, we form a multi-dimensional literature summary.

Qualitative research. We use the research methods of case studies, observation methods, open interviews, and semi-structured interviews to clarify the implementation modes and embedded mechanisms of relevant support measures. Grounded in multi-dimensional data, we form a credible chain of evidence and compare it with previous studies to improve the reliability and validity of the research conclusions.

Cases comparison and analysis. We vertically compare the changes in the elderly care service system before and after the implementation of support measures to find the relevant characteristics of the embedding mechanism and the result of embedding. Then, we horizontally compare similarities and differences in different cases from the specific content and embedding background of support measures to find factors that affect the smooth implementation of support measures. In the post-event interview phase, we conduct interviews with different participants to explore the changes experienced by participants after the implementation of support measures and the impact of such measures.

The research framework is shown in Fig. 5.

5 Discussion and directions for future research

Focusing on the needs of the elderly and grounded in the current situation of the elderly care services supplied in China, we explore the system construction and support measures of the SCSSA. Our goal is to provide a theoretical basis and practical guidance for a comprehensive response to the aging of the population in the future. This study thus provides a theoretical foundation and methodological contributions for constructing the SCSSA and researching its support measures. First, grounded in the current needs of elderly care services in China, we identify the principles and dimensions of establishing a SCSSA. Thereafter, we propose the original SCSSA and the method of continuous iteration and optimization. These efforts provide a theoretical basis and methodological support for the construction of the SCSSA. Second, in terms of policy reconstruction, we explore various methods for support measures, including elderly care service

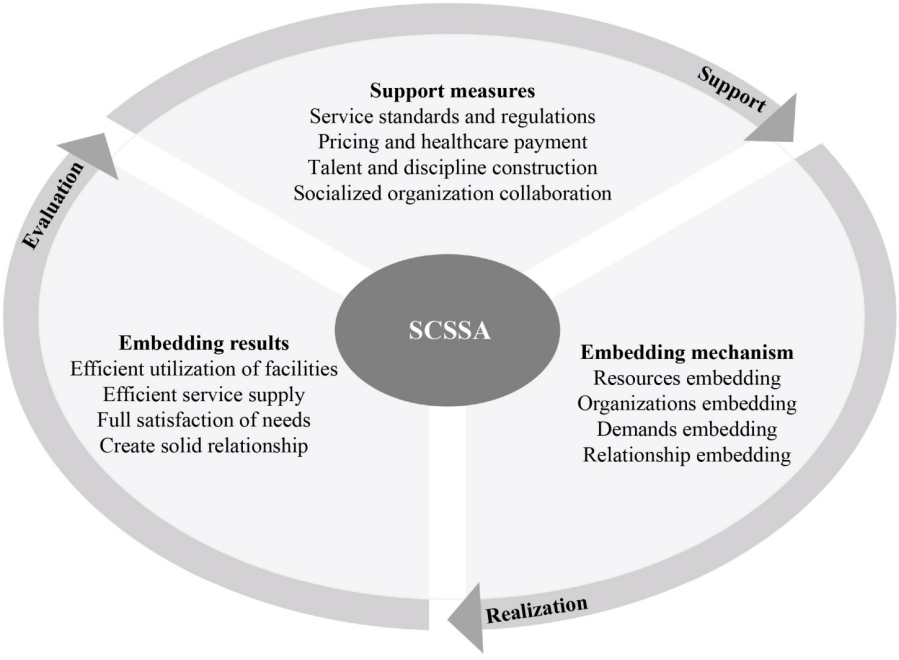

Fig. 5 Research framework for the closed loop of the institutional embeddedness dynamic.

policy, information technology, service standards, talent training, and organizational collaboration, to effectively embed such support in the elderly care service system. Our work thus contributes to the methodological guidance to ensure the continuous and effective operation of an elderly care service system.

The SCSSA established in this study should have the following characteristics: Collaborative service supply of multiple participants; multi-level demand orientation; optimized allocation of service resources; intelligent full-cycle service; and systematic service support. Such characteristics pose many challenges in reality and in theory for the construction of the SCSSA and the exploration of its support measures. Grounded in the connotative framework of this study and the above-mentioned challenges, the future research directions related to SCSSA are mainly reflected in the following.

Construction and optimization of the system. The construction of SCSSA requires the in-depth analysis of the implementation path and operation mode of elderly care service policy based on existing policies. In addition, optimization of the SCSSA should follow the development principles of comprehensiveness, focus, and sustainability to iteratively optimize the original SCSSA so it will adapt to changes in needs, policies, environment, and practical experience. All these requirements challenge the theories and methods of traditional elderly care service system construction. This points to the following several opportunities for future research. First, explore the identification plan for identifying research elements of the SCSSA on the basis of the three optimization principles: Comprehensiveness, focus, and development. Second, explore ways to harmonize and integrate the three optimization principles. Third, identify changes in requirements, policies, environment, and practical experience in the process of iteration and optimization in real-time and execute dynamic study of system iteration. Fourth, research on the impact of new problems and new phenomena during the pilot iteration and optimization processes.

Improvement and embeddedness of support measures. The SCSSA requires the support of measures related to policy, information technology, standards, talent, and organizational collaboration. These requirements lead to many challenges related to building sound theories, proposing effective technical methods, understanding the interaction mechanism between policy and demand satisfaction, improving the information technology system and data compatibility, protecting information privacy and security, and establishing good talent training, service pricing, medical insurance, and socialized organizational collaboration. These challenges point to opportunities for future research. First, following the three research frameworks for policy reconstruction, information technology support and standards, and talent and organizational support measures proposed in this paper, a need persists to further research the improvement of support measures in empirical, theoretical, and simulated aspects. Second, research on the coordination and integration among the three support measures. Finally, research on how the three support measures should be embedded in the SCSSA.

Distribution and employment of social resources. Socialized elderly care services necessitate the support of continuous and massive social resources. Although the

extant literature has tried to find solutions to cope with the shortage of resources in terms of the geographical distribution and efficient use of resources, resource integration, and approaches to resources apportionment, elderly care services still cannot meet the huge resource demand caused by the aging population. An urgent need exists for theories and methods to help identify the characteristics of the resource needs of the elderly. Moreover, an empirical optimization plan that socializes the existing resources for the elderly must be constructed.

Application and integration of information and communication technology. Socialized elderly care services should integrate services with information and communication technologies. Although existing studies have suggested that emerging information and communication technologies positively impact the quality of people's lives and the quality of healthcare services, no effective way exists to improve the material life of the elderly while not only ensuring the accuracy and personalization of intelligent recommendation algorithms but also meeting elderly users' needs in terms of ease of use, convenience, safety, and real-time performance. With respect to improving the spiritual life of the elderly, there exists a lack of theoretical exploration of how technical applications, such as social networking, online entertainment, and online course platforms, might be innovated to help the elderly decelerate their mental aging and realize self-value. To enhance the acceptance of such technical applications by the elderly, these technical applications should focus on the characteristics of the elderly in their platforms' design process and adopt some designs suitable for the elderly, such as enlarging default fonts, support for voice input, and ease of use. In terms of meeting the medical needs of the elderly, the IHS and hierarchical diagnosis and treatment plans lack big data support. Compounding this issue, the marketization mechanism of the medical service system remains underexplored. The socialized allocation of medical resources for the elderly is insufficient. In addition, there exists a lack of understanding of graded diagnosis and treatment rules in the IHS, and little is known about public–private competitive partnerships. In terms of supporting the health management of the elderly, an urgent need persists for theories and technologies that will alleviate pervasive problems, including high management costs, low continuous utilization, insufficient incentive mechanisms, and deficiency of platforms for older people who are disabled.

6 Conclusions

This study aims to implement and improve elderly care service policies in China. We present an original SCSSA that can meet the comprehensive and continuous needs of the elderly, examine the iteration and optimization methods for this system, and explore how support measures such as information technology, service standards, talent training and organization collaboration may be effectively embedded in the SCSSA. We introduce a research paradigm that integrates system construction and support measures embedding. We propose a "1+1+3" socialized care service research paradigm that contains an original SCSSA, an iteration and optimization process of system construction, and a research framework of three embedded support measures. More specifically, by exploring the current implementation path and effects of the elderly care service policy, we identify and define the principles and dimensions required for the construction of the SCSSA and propose the original SCSSA that contains "material + spirit + medical treatment + healthcare". For the SCSSA, we introduce a continuous optimization and iteration process that is based on horizontal (time) and vertical (participants) dimensional interactions. In addition, we explore support measures, including service policies, standards, technical support, and talent and organizational support for the SCSSA. Furthermore, we study the optimization path of policy reconstruction, establish the service content, quality, payment, medical insurance, and other standards of socialization care service, and dissect the integration and support methods between information and communication technology and socialization in elderly care services. We improve the strategy of integrating talent and organization support to form a dynamic closed-loop socialization care service support system.

The theories and methods proposed in this study will contribute to the construction and operation of the SCSSA in the following ways: 1) To promote multiple participants to provide services for the elderly, we resolve pervasive problems, including the insufficient participation of multiple entities in elderly services, the insufficient definition of service content, quality specifications, and linkage relations, and the lack of effective connection among services. 2) To provide suggestions for demand-oriented socialization elderly care services, we enhance the ability of service providers to identify the needs of the elderly, improve the poor ability of the elderly to discriminate among information about life services, change the single spiritual life content mode, improve the continuity of medical services and alleviate the insufficiency of healthcare. 3) To provide support for optimizing the allocation of resources for socialized elderly care services, we address problems, including the imbalance of supply and demand in medical resources, the market imbalance of multiple participants' service supply in the medical service system, and the high cost and difficulty in implementation of healthcare services, for the elderly. 4) Our work promotes the in-depth integration of emerging technologies, such as the Internet of Things, artificial intelligence, big data, and "Internet+" with services for the

elderly, which is helpful for realizing the full-cycle intelligent informatization of socialized elderly care services. 5) To provide policy guidance for systematizing service guarantees of the socialized elderly care service, we optimize support measures with respect to service standards, technical support, talent training, and organizational collaboration. Ultimately, these efforts are necessary for resolving problems, such as the inadequate implementation of policies, the confusion in relevant service industries, the difficulty in ensuring information security, the lack of professional personnel, and difficulty in coordinating institutional organizations.

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