A Study on the Pathways to Achieving High-Quality Rural Elderly Care Services through Digital Technology

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Abstract. Against the backdrop of the convergence of population ageing and digitalisation, the high-quality provision of rural home-based elderly care services is crucial not only for addressing shortcomings in rural elderly care but also for meeting the requirements of equitable basic public services. Digital technology empowers rural home-based elderly care services. Its logic is reflected in the dataization of demand identification, resource allocation platformization, dynamism of supply and demand connection and service ecology.In the practice of digital technology-enabled rural home-based elderly care services, mismatches between supply and demand, insufficient resource support, poor coordination among stakeholders, and inadequate technological adaptation continue to compound, constraining the full realisation of the benefits of digital technology. Therefore, we should improve the closed loop of demand identification and feedback, consolidate resource support and digital foundation, improve the multi-subject coordination mechanism, promote rural adaptation and safety governance, promote services from loose supply to precise response, and move from technology embedding to ecological empowerment.

Keywords: Digital technology; Empowerment; Rural home-based elderly care services; high-quality provision.

1. Introduction

The simultaneous convergence of population ageing and the digital era represents a new national reality facing China as it advances towards the comprehensive construction of a modern socialist country in the new era [1]. In the face of the reality of changes in rural population structure, the weakening of family old-age care functions and the accelerated sinking of digital technology, the miniaturization of family structure continues to weaken the support capacity of family old-age care. On the one hand, the outflow of some young and middle-aged labourers has made it difficult to sustain the traditional model of relying on children for support in old age; on the other hand, the socio-economic security of the rural elderly population is still lagging behind that of urban areas [2]. Rural home-based elderly care services are no longer merely a traditional issue of livelihood security, but a critical area relating to rural revitalisation, the equalisation of basic public services, and the implementation of national strategies to actively address population ageing. The rural elderly group is not only large in scale, but also faces multiple difficulties such as weak economic foundation, insufficient medical security, and weak social support networks. The 'Proposal of the Central Committee of the Communist Party of China on Formulating the 14th Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through the Year 2035' states: 'Strengthen the development of a digital society and digital government, and enhance the digitalisation and intelligentisation of public services and social governance', thereby providing a policy basis for embedding digital technologies into a high-quality supply system for rural home-based elderly care services. The Decision of the Central Committee of the Communist Party of China on Further Deepening Reform and Promoting Chinese-style Modernization adopted by the Third Plenary Session of the 20th Central Committee of the Communist Party of China emphasizes actively responding to population aging and improving the policy mechanism for the development of the elderly care industry and the elderly care industry, showing that the construction of the elderly service

system has been placed in the modernization of national governance and the improvement of the people's livelihood system. Digital means can overcome spatial and temporal constraints, enabling the rural elderly population to access smarter, more convenient and personalised smart elderly care services. The value of digital technology empowering rural elderly care is not only reflected in the improvement of service quality and operation efficiency, but also in promoting the innovation and transformation of the elderly care service system [3]. For rural areas, promoting the high-quality provision of rural home-based elderly care services is not only a matter of safeguarding the elderly population's rights and meeting their needs for a fulfilling later life, but also an effective means of enhancing farmers' sense of fulfilment, happiness and security [4].

The existing research on digital technology empowering elderly care services has formed relatively rich results. The relevant discussions mainly involve the connotation of basic public services in rural areas, the improvement of the supply capacity of digital technology for public services, the practical model of smart elderly care and the obstacles to digital transformation. While these studies have laid the groundwork for understanding the relationship between digital technology and elderly care services, there remains a lack of discussion regarding the intrinsic connections between supply and demand dynamics, operational mechanisms, stakeholder collaboration, and pathways for transformation-particularly from the perspective of ensuring high-quality provision of rural home-based elderly care services. Especially in the context of scattered residence of the elderly in rural areas, hidden expression of demand, limited service resources and insufficient technical adaptation, it is still necessary to explain how digital technology embeds the service chain, reshapes the supply process and improves the quality of service. Achieving a precise supply of elderly care services based on the diverse and multi-layered needs of older adults has become key to the high-quality and balanced development of rural home-based elderly care service systems. Based on this, this article cuts from the perspective of technological empowerment, focuses on the theme of digital technology empowering the high-quality supply of rural home-based elderly care services, analyzes its inherent logic, real dilemma and realization path, and reveals the role mechanism of digital technology from demand identification, platform connection, supply and demand coordination to ecological shaping, in order to improve rural home care The old service system provides theoretical explanation and practical reference.

2. The Underlying Logic of Digital Technology Empowering the High-Quality Provision of Rural Home-Based Elderly Care Services

2.1. Technology Embedding: From Experience Supply to Data-driven Demand Identification

Whether high-quality provision of rural home-based elderly care services can be achieved hinges on the ability to accurately identify the genuine care needs of the rural elderly population. The core goal of public service accuracy is to improve the efficiency of service supply through demand identification and resource adaptation [5]. The use of digital technology to empower high-quality elderly care services constitutes a dynamic, closed-loop process centred on demand, consistently treating the precise identification and effective response to personalised care needs as both the starting point and the endpoint of the entire operational process. Compared with urban communities, the elderly in rural areas live more dispersed, with large differences in physical condition, family support, economic conditions and service preferences, and some care needs are still hidden in the details of daily life. If we continue to rely on manual surveys, empirical judgements and passive reporting, service provision will only be able to respond after problems have arisen, which is likely to lead to issues such as delayed identification of needs, inadequate service responses and inefficient resource allocation.

Digitalization empowers the high-quality development of rural home-based elderly care services, following the basic logic of taking digital technology embedding as the starting point, organizational structure innovation as the way forward, and serving ecological shaping as the purpose. By using technology to identify the diverse needs of the elderly, data to link service processes, algorithms to

allocate care resources, and platforms to integrate service providers, scattered demand information can be continuously captured and systematically processed. Leveraging the Internet of Things (IoT), smart wearable devices, voice interaction systems and elderly care service platforms, the health status, mobility, home environment, care records and service feedback of the elderly can be dynamically aggregated, whilst data on health status and environmental changes can be promptly transmitted to the system platform [6].Digital technology enables the continuous collection of process data and feedback, allowing for the precise construction of dynamic demand models for the elderly population. As a result, rural home-based elderly care services are no longer just the simple placement of offline care resources, but form a continuous chain between demand identification, service matching and feedback correction. Service provision has thus shifted from a 'one-size-fits-all' approach to tiered and categorised, on-demand responses and dynamic adjustments; from reactive remedies to proactive identification; and from experience-based governance to data-driven governance. Wuhan's elderly care service platform has laid a municipal digital base for the identification of rural home-based elderly care needs. As of July 2023, Wuhan had collaborated with 13 departments, including those responsible for government data, political and legal affairs, public security, and health, to aggregate 2.3 billion data records. The city has established 16 municipal and district-level elderly care service platforms, signed contracts with over 5,800 service providers, and responded to more than 9 million requests for ‘three assistance and one care' services. Wuhan Elderly Care APP will build a library of the elderly, elderly care facilities, service providers, policies and courses online to form an electronic map of elderly care. Consequently, the identification of needs has shifted from a one-way reporting system by the elderly to a digital matching mechanism supported by data aggregation, online resource integration and policy enquiries [7].

2.2. Platform Integration: From Dispersed Resources to Collaborative Supply by Multiple Stakeholders

The long-standing constraints on the supply of rural home-based elderly care services stem not merely from an absolute shortage of resources, but more fundamentally from the lack of a sustained and stable mechanism for coordination among stakeholders such as the government, the market, social organisations, village communities and families. Many elderly care resources are scattered in different departments, different levels and different fields. Information cannot flow fully, responsibilities are difficult to be effectively connected, and services are prone to problems such as duplicate construction, connection breakpoints and slow response. The advantage of digital technology lies in its ability to optimise resource allocation and enhance decision-making accuracy through data analysis and the application of intelligent systems, thereby effectively facilitating the precise matching of various resources and services across different sectors [8]. The profound significance of digital technology empowering rural home-based elderly care services lies in the use of platforms to penetrate the boundaries of the subject, information and resource boundaries, so that the originally fragmented service force can be reconstructed around the actual needs of the rural elderly. Leveraging robust data aggregation, processing and analysis capabilities, smart elderly care platforms possess distinct advantages in terms of resource integration, stakeholder coordination, cost control and service coverage, thereby helping to expand the scope of elderly care services. The data platform not only undertakes task assignment and service supervision at the community level, but also uses the collaborative service management platform, call center and IoT supervision platform to accurately connect the data of the family, community and government supervision, and promote the allocation of resource colleges and universities and the coordination of multiple subjects [9] .

From an institutional perspective, digital collaboration is not merely a technical upgrade; logically, it also drives a transformation in the operational rules of elderly care services. Digital technology can unify data specifications, penetrate the platform interface and improve the sharing mechanism, and build a unique "digital rule system" [10]. The government utilises digital platforms to coordinate policies, allocate resources and oversee services; enterprises provide smart products, professional services and operational support; social organisations and village-level entities undertake home visits,

daily care, emotional support and service referrals; whilst family members can also participate in daily care through remote interaction. It can be seen that the technology-enabled elderly service system is a structural reshaping of the traditional model, aiming to build a multi-subject collaborative elderly service information platform [11].By integrating resources from various government departments, all levels of government and commercial entities, strengthening horizontal and vertical collaboration, avoiding duplication of effort and promoting the optimal allocation of resources, a closed-loop management system has been established covering service dispatching, process documentation, outcome evaluation and risk warning. This has driven the shift in the service delivery model from decentralised operation towards collaborative provision. In 2020, Huang pi District will promote the government's purchase of Internet + home-based elderly care services on the basis of the six street pilots in 2019, including five types of needy or elderly people in the key guarantee, and subsidize 100 yuan per person per month, including 30 yuan online and 70 yuan offline. Elderly residents in villages who do not meet the criteria for the five categories may also submit requests to the platform via the hotline and purchase services at their own expense. Consequently, village-level organisations, the hotline platform, service providers and elderly households are integrated into a single service chain, providing a formalised channel for addressing dispersed demand [12].

2.3. Supply-Demand Coordination: Shifting from Static Allocation to Dynamic, Targeted Provision

The coordination of supply and demand in rural smart elderly care is a process driven by changes on the demand side, responded to by the supply side, and realised through a coordination mechanism that matches supply and demand. Improving the fit of supply and demand of elderly care services is essentially to meet the common needs of the elderly, pay attention to the differences in the individual needs of the elderly, reshape the interaction between the supply side and demand side of elderly care services, and promote the shift of elderly care services from unified supply to differentiated response. The care needs of rural older people are not static or uniform; rather, they undergo constant adjustment as a result of ageing, changes in physical function, the weakening of family caregiving capacity, and shifts in living circumstances.The needs of basic life care, meal assistance, cleaning, medical rehabilitation, etc. are more prominent, while the needs of spiritual comfort, social participation and emergency relief are often more hidden and situational. If one continues to rely on one-off surveys and static resource allocation as the basis for service provision, service content is likely to become disconnected from actual needs, potentially creating a practical dilemma where services exist but fail to meet the requirements. By continuously collecting demand information, service records and evaluation data, the digital platform can capture changes in the needs of the elderly in a timely manner and transform these changes into important bases for resource allocation, service dispatch and project optimization.

Promoting the effective circulation and efficient utilisation of elderly care data, and fully unlocking the value of data as a resource, has become a key measure for transforming the provision of rural home-based elderly care services from mere 'availability' to 'excellence'. In this process, whether the supply side of elderly care services can effectively respond to the needs of the elderly group depends on whether multiple subjects can participate together, whether information can be fed back in a timely manner, and whether rules can be formulated jointly. Consequently, digital technology is driving rural home-based elderly care services from a static resource allocation model towards a cyclical process where demand expression, service response, process supervision and outcome feedback are seamlessly integrated. Only by forming a continuous interaction mechanism between supply and demand can rural home-based elderly care services truly become reachable, accurate and sustainable. The APP-based service dispatch and QR code location mechanism in Huang pi District, Wuhan, demonstrates how digital technology is dynamically reshaping the relationship between supply and demand in elderly care. After the elderly are selected by the hotline or the community or village staff, the platform will verify the information, evaluate the needs and dispatch workers through the mobile phone APP; the service personnel will scan the code to locate and take photos to sign in. After that,

the elderly will sign to confirm and scan the code to sign out. The platform conducts a follow-up within 48 hours and handles any complaints, with funds settled monthly based on actual costs, forming a closed-loop system of demand confirmation, service delivery, quality evaluation and payment [13] .

2.4. Ecosystem Shaping: High-Quality Development from Technology Application to Local Adaptation

The introduction of digital technology into the rural home-based elderly care sector must not stop at expanding equipment, launching platforms and deploying smart devices. Relevant topics are moving from the one-way linear framework of "technology application-service supply" to the multi-dimensional dynamic system of "technology adaptation-subject collaboration-value anchoring"[14]. If digital technology is understood merely as an external tool, the provision of elderly care services is likely to remain at a superficial level of modernisation, failing to genuinely address the lived circumstances of the rural elderly. Its deep value lies in embedding digital technology into the rural social structure, thereby shaping an elderly service ecology that adapts to the logic of rural life. Unlike the relatively standardised service provision in urban communities, rural home-based elderly care has long relied on family ethics, neighbourly mutual aid, village networks and local resources. The service relationship has a strong human foundation and is also deeply influenced by the social order of acquaintances. Precisely for this reason, if digital technology merely transplants urban experiences or focuses solely on process re-engineering and platform management without fully taking into account the living habits, trust dynamics and digital literacy of rural older people, it may lead to issues such as services being disconnected from reality, low usage rates and a mismatch between supply and demand. Therefore, digital technology cannot be promoted in isolation from local logic, but should achieve multi-dimensional deep integration between cultural identity, relationship connection, technical adaptation, organizational integration and institutional guarantee.

The high-quality provision of rural home-based elderly care services requires not only more precise service content but also processes that are affordable, comprehensible and sustainable. Through the joint construction of rules, the improvement of standards, privacy protection, evaluation feedback and intelligent supervision, technical rationality can form a necessary balance with humanistic care. Attitudes towards ageing represent an individual’s multidimensional cognition, evaluation and emotional inclinations regarding their own and their peers' ageing process [15]. The positive aging attitude is reflected in the positive expectation of the autonomy of health and the sustainability of social participation in old age. Only by completing the transition from instrumental empowerment to ecological empowerment within the context of local communities [16] can the rural home-based elderly care service system gain the endogenous momentum for continuous optimisation. The pilot of party building + rural mutual assistance for old-age care in Caidian District, Wuhan shows that rural home-based old-age care services cannot be operated without local social relations. Six villages, including Dushan and Huali, have leveraged rural mutual care centres for the elderly to mobilise active Party members, retired officials and mass organisations, whilst training relatives, friends and neighbours to serve as neighbourhood mutual care workers. It can be seen that digital scheduling can reduce the risk of service suspension by embedding grass-roots organizations and neighborhood mutual assistance networks [17].

3. Practical Challenges in Using Digital Technology to Empower High-Quality Home-Based Elderly Care Services in Rural Areas

3.1. Mismatch between supply and demand: Inadequate identification of needs and lack of targeted provision

Following the integration of digital technology into rural home-based elderly care services, one would expect that data collection, platform-based task allocation and service feedback to steer

provision towards a more precise alignment. However, after entering the practical field, the supply and demand matching deviation did not naturally dissipate with the platform construction, but became an important link that restricts service efficiency. The care needs of rural older people are not a static list; they evolve in response to changes in age structure, health status, family support, income and living conditions, and are characterised by diversity, complexity and hidden nature. Many elderly people also need help with meals and cleaning, medical rehabilitation, living care, emergency assistance and spiritual comfort. However, due to limitations in their ability to express themselves, their consumption attitudes and their proficiency with digital devices, their genuine needs often remain confined within the family or are silenced in daily life, making it difficult for them to be promptly captured by the platform system.

At the same time, the data collected by the existing digital platform is more concentrated on basic information, service records and simple evaluation. The extent to which the data value of smart home-based elderly care in communities across different regions is realised varies considerably. The degree of data value release of smart elderly care in local communities varies, and there are still problems such as "unused" and "unused" of elderly care data, which seriously restricts the efficiency improvement of elderly care services. Although the supply side can utilise platforms to provide tiered and categorised services, it remains prone to perpetuating administrative, project-based and standardised working practices in terms of service content, frequency and resource allocation. As a result, there is supply but it may not be adapted, and there is a platform but it may not respond. It is evident, therefore, that the empowerment of digital technology does not automatically equate to the generation of precise service provision. Only by integrate demand identification, service matching and feedback correction into a continuous closed loop, can rural home-based elderly care services get rid of the rough configuration and truly turn to on-demand response.

3.2. Insufficient Resource Support: Urban-Rural Disparities Compounded by Weak Digital Infrastructure

The high-quality supply of rural home-based elderly care services cannot be achieved by digital technology alone. It also requires facilities, funds, talents and data and other basic conditions. For a long time, influenced by disparities in urban-rural resource allocation, rural home-based elderly care services have suffered from accumulated deficiencies in fiscal investment, facility planning, system development and talent cultivation, and a clear gap remains between rural and urban areas. In recent years, elderly service stations, happy homes, meal assistance and information platforms have been built in some areas. The number of service carriers has increased, but the daily operation has not matured synchronously. Issues such as insufficient funding for maintenance, a shortage of service staff and weak professional capabilities remain prominent.The supply of nursing care, rehabilitation guidance and psychological support is unstable, and the digital scenario is difficult to operate sustainably. Turning to digital infrastructure, the levels of internet coverage, device compatibility and platform connectivity in rural areas are uneven. Elderly people in remote areas often lack stable smart devices, and there is a shortage of grassroots service staff familiar with platform operations.

The lag in the construction of digital infrastructure in rural areas is one of the key bottlenecks that restricts the high-quality development of rural elderly with digital technology. The roll-out of technological products is similarly constrained by cost; smart wearable devices, health monitoring equipment and emergency call systems all require ongoing investment, from purchase and installation to maintenance and updates. These devices are generally subject to structural market contradictions, such as high supply costs coupled with low willingness to pay, and a focus on technological supply at the expense of the needs of the elderly. Rural families have limited ability to pay, and insufficient space for grass-roots finances, it is easy to form a dilemma that can be built but not used well, and can be installed but not managed in detail. It is therefore evident that digital technology can only break free from the limitations of pilot projects and platform demonstrations, and truly transform into sustainable home-based elderly care services, if it is underpinned by a solid resource base. In 2023, there will be 96 rural elderly mutual aid care centers in Jiangxia District, Wuhan, 85 qualified and 11

unqualified; 187 mutual aid care service points, 174 qualified and 13 unqualified. Qualified centres and service points received operational subsidies of 1.7 million yuan and 3.48 million yuan respectively; however, some locations still failed to pass verification, indicating that rural home-based elderly care services are constrained by operational quality, staffing levels and the capacity for sustained maintenance, and that digital platforms also require stable offline infrastructure support [18] .

3.3. Poor Coordination Among Stakeholders: Fragmented Governance Networks and Inadequate Coordination of Responsibilities

Rural home-based elderly care services possess a complex nature that spans departments, stakeholders and scenarios. For digital technology to really play a role, the key is not only to build a platform, but also to organize the government and the market, social organizations, villages, families and the elderly. However, in practical operation, the governance of rural home-based elderly care services remains highly fragmented. However, there are still two major problems in the implementation of the relevant policy of "one old and one young" service: firstly, there is a lack of effective means for inter-departmental coordination;secondly, the coordination tools are relatively traditional and lack sufficient digital sophistication [19]. The information systems between government departments operate separately and the boundaries of responsibilities sometimes overlap. Civil affairs, health, medical insurance, township and village-level organisations have yet to establish stable coordination mechanisms regarding data sharing, service referrals and accountability tracking; consequently, the information accumulated on platforms struggles to be translated into concrete collaborative service actions.

The participation of market entities is also not sufficient. The operation and follow-up maintenance of research and development services suitable for aging products require continuous costs. Based on profit expectations and management convenience, some enterprises are more willing to enter urban markets with strong purchasing power and short service radii, whilst remaining relatively cautious about investing in rural settings. Social organizations and volunteers are close to the village and familiar with the elderly, and the service method is more flexible, but the degree of specialization, resource stability and continuous participation ability are still insufficient. Family members, particularly adult children working away from home, can participate in care provision remotely; however, constraints of time, distance and technical capability mean that such support often remains limited to a supplementary role. From this point of view, if there is a lack of clear rules, stable incentives and responsibility sharing among pluralistic subjects, the digital platform is easy to stay at the information convergence end, and it is difficult to grow into a collaborative governance hub, which will eventually cause problems such as slow resource flow and feedback mechanism failure in the service chain to persist. In August 2023, the Mutual Care Centre in Dushan Village, Caidian District, Wuhan, was already serving more than 20 elderly residents; however, the long-term care of elderly people living in scattered locations is difficult for a single entity to shoulder alone. The local government purchases services to introduce third-party institutions, and cultivates two teams of party members, volunteers and mutual elderly care workers. Collaborative governance for home-based elderly care must simultaneously address the inadequacies in service coverage, professional provision and grassroots mobilisation capacity [20].

3.4. Inadequate technological adaptation: the coexistence of the digital divide, service disconnection and security risks

The challenge of using digital technology to empower rural home-based elderly care services lies not in whether equipment can be deployed to these areas, but in whether technological applications can be embedded within the local social order, becoming everyday tools that older people are willing to use and able to understand. The education level of the rural elderly group is relatively limited, and the evaluation of smartphone online appointment services and the mastery of health monitoring equipment are not sufficient; consequently, the digital divide and technological divide remain

pronounced. The digital divide has become the primary obstacle to the implementation of rural smart old-age care. Given the vast geographical expanse, dispersed settlements and scattered resources in rural regions, the hardware infrastructure required for smart elderly care products-such as high-speed network coverage and sensor deployment-lags significantly behind that in urban areas. What's more important is that some elderly people are influenced by the traditional concept of filial piety. They are used to relying on family members' neighborhood mutual assistance and acquaintances to handle old-age care affairs. They are often hesitant about purchasing services through online platforms or the introduction of smart devices, and may even perceive such arrangements as unnecessary external interference. If digital technology is only transplanted from urban elderly care experience, but does not respond in detail to the living habits, trust, mode and use ability of the rural elderly, the service will easily be suspended on the platform, and there will be problems such as low utilization rate and misalignment of supply and demand.

Furthermore, digital elderly care services rely heavily on personal information, health data and behavioural trajectory data. In rural areas, the encryption authorization, use and supervision system of network security protection data is still weak, and the ability of the elderly to identify information leakage to induce consumption and online fraud is also insufficient. The application of artificial intelligence technology may expose the elderly's financial information, health data and personal biometric information to significant security risks, potentially triggering ethical controversies and privacy infringements. Once data collection, storage and sharing are not standardized, digital technology is not only difficult to enhance service trust, but also may amplify the risks of misjudgment of privacy leakage algorithms and regulatory failure. It is thus evident that inadequate technological adaptation is not merely a single operational obstacle, but rather a comprehensive predicament arising from the interplay of digital literacy, cultural identity and institutional safeguards.

4. Pathways to Realising High-Quality Provision of Rural Home-Based Elderly Care Services through Digital Technology

4.1. Improve the closed loop of demand identification and feedback, and promote supply and demand matching from coarse to precise

To address the issues of inadequate demand identification and insufficient precision in service provision, rural home-based elderly care services must prioritise demand-side governance at an early stage, rather than passively addressing issues after services have commenced. There are obvious differences in rural elderly groups in terms of age structure, health status, family support and ability to pay, and the demand will also be constantly adjusted with changes in physical function life scenes and care resources. Relying solely on one-off surveys and static records is no longer sufficient to address such fluctuations. The more feasible path is based on the digital platform, combining the intelligent terminal of household survey to collect family members' feedback village-level service records and service evaluation data to form a dynamic demand identification mechanism.

The coordination of supply and demand in rural smart elderly care is, at its core, a process driven by changes on the demand side that prompt a response from the supply side, utilising collaborative mechanisms to achieve a match between supply and demand. Accordingly, the allocation of service resources should change from coarse delivery to precise arrangement, and establish a hierarchical list of needs around the subdivision of service types such as care for the disabled, meals, cleaning, medical rehabilitation, emergency rescue and spiritual comfort.The platform must also prioritise post-service feedback and adjustments, incorporating the user experiences of older people and their families into resource allocation and programme updates. Digital technology realizes the openness of data to managers, collaborators and service recipients by converting service processes into observable, trackable and monitored data. Only by integrating demand collection, service dispatch, process tracking, outcome evaluation and iterative optimisation can digital technology truly alleviate supply-demand mismatches and drive rural home-based elderly care services from a reactive model towards proactive sensing and precise provision.

4.2. Strengthening Resource Support and Digital Infrastructure to Transform Service Capacity from Weak to Sustainable

Given the disparities in urban-rural resources and the weak digital infrastructure, addressing resource gaps must become the fundamental approach to empowering rural home-based elderly care services through digital technology, as well as a prerequisite for the stable and sustained implementation of subsequent collaborative governance. In the long run, rural home-based elderly care services are weaker than urban areas in terms of financial investment, system design, facility planning system construction and talent cultivation. Consequently, even if digital platforms, smart devices and online services are introduced into rural areas, they are prone to falling into a state where they are built but not used, used but not stabilised, and managed but not sustained. Therefore, we should take the county as the coordinating unit, integrate civil affairs, health, medical insurance, human, social, agriculture and rural areas and other old-related resources, build a unified public service data platform and information resource sharing mechanism, and promote cross-departmental, cross-level and cross-business data sharing and resource utilization.

Broadband network coverage in rural areas should be further expanded, and signal quality improved, to ensure that older people in rural areas can access the internet smoothly and reliably when using digital care services. The layout of infrastructure needs to be close to the traffic conditions of the village distribution and the density of the elderly population, and the network should be covered with the remote monitoring of intelligent terminal call equipment and the overall arrangement of village-level service stations, so as to avoid digital facilities being concentrated only in the central village and a few demonstration sites. In remote areas, mobile service grid visits can be combined with smart call systems to ensure that digital signals from the platform translate into concrete door-to-door services. At the same time, it is necessary to increase the training investment of village-level assistants and digital elderly workers for local elderly service personnel, improve their equipment use data entry risk identification and household service ability, and form follow-up maintenance support. Only by consolidating the foundations of funding, infrastructure, human resources and data can digital provision move beyond mere project-based demonstrations and transform into a stable, sustainable capacity for rural home-based elderly care services.

4.3. Improving the Mechanism for Multi-Stakeholder Collaboration to Transform the Governance Network from Fragmented to Integrated

In response to the lack of coordination among stakeholders and the fragmentation of the governance network, platform-based governance should serve as the key to restructuring relationships within rural home-based elderly care services. Rural home-based elderly care services involve government market social organizations, villages, communities, families and the elderly and other subjects. The needs of the elderly are diversified and hierarchical, and it is difficult for any single subject to complete the effective supply independently. Empowering rural elderly care through digital technology requires the joint participation of the government, the market and social capital. The government should build a cooperation platform to promote the coordinated development of enterprises, social organizations and capital. A better integration of an active government and an efficient market is key to the high-quality development of the elderly care sector. Therefore, the government should assume the responsibility of formulating standards and supervising and evaluating the top-level design resources, draw the boundaries of responsibility between the three levels of counties and villages, and promote the formation of stable cooperation between civil affairs, health and medical insurance townships and village-level organizations.

Corporate participation must not be limited to the deployment of equipment; rather, it should focus on the usage capabilities and payment capacity of rural elderly people, providing age-friendly products, smart platform maintenance and professional service support, so that technological products are tailored to local contexts. Local forces such as social organization volunteer village cadres, the young elderly and filial staff can be embedded in the links of household visits, comforting life care and risk referral to make up for the lack of formal services. Existing research indicates that

technology-enabled elderly care systems do not merely involve the installation of tools, but rather a structural reshaping of traditional models. The aim is to build information platforms for multi-stakeholder collaboration, and through horizontal and vertical cooperation, reduce duplication of efforts and promote the optimal allocation of resources. Accordingly, we should improve the incentive mechanism of collaborative rules and the responsibility-sharing mechanism, integrate the abnormal early warning and result evaluation of the service dispatch process into the unified platform, and promote the sharing of information common responsibilities and service governance. In this way, digital platforms will not remain mere tools for aggregating information, but will be transformed into hubs for the collaborative governance of rural home-based elderly care services.

4.4. Promoting Local Adaptation and Safety Governance: Shifting Technology Application from Isolation to Integration

In response to the coexistence of the digital divide, service detachment and security risks, the use of digital technology to empower rural home-based elderly care services should integrate local adaptation and risk governance throughout the entire process. Rural home-based elderly care is deeply embedded in family ethics, neighborhood mutual assistance, acquaintance relationship and village network. If technology is advanced in isolation from local logic, it will struggle to gain the trust of the elderly or become embedded in daily life; effective integration can only be achieved through multidimensional, in-depth convergence. Technical design should adhere to the principles of simplicity, easy to understand, low cost and maintainability. Platform interfaces, voice prompts, one-touch calling, offline proxy services and home visits should be optimised around high-frequency needs, ensuring that older people are not forced to adapt to the system. For the elderly with weak digital ability and elderly people living alone, an auxiliary use mechanism with the joint participation of village-level service personnel and digital elderly workers can be established.

Digital literacy and trust in services must be enhanced. Digital elderly care services involve health data, identity information, action trajectory and service records. Security governance must not be limited to remedial measures, but should intervene proactively through institutional rules, technical standards and ethical constraints. Digital technology empowers rural home-based elderly care services. It is necessary to optimize the system and strengthen multiple guarantees. Smart elderly care in rural areas must also rely on a combination of formal and informal rules to ensure service coordination. Therefore, it is necessary to improve the security review and risk warning mechanism of the data collection authorization graded classification protection platform to prevent privacy leakage from inducing consumption and algorithm misjudgment. Only by striking a balance between technology adapted to the elderly, cultural suitability, and security and trust can digital technology be embedded into rural living contexts, thereby driving the high-quality provision of rural home-based elderly care services.

5. Conclusion

The key to enabling high-quality provision of rural home-based elderly care services through digital technology does not lie in mechanically superimposing platforms, terminals and data onto the existing rural home-based elderly care service delivery system, but rather in reshaping a more resilient delivery mechanism centred on needs identification, resource allocation, stakeholder coordination and risk governance. The research in this article shows that digital technology empowerment can extend the reach of elderly care services, improve the efficiency of supply and demand matching, promote multi-subject collaboration, and provide a basis for service process supervision and performance evaluation. However, when applied to the rural home-based care sector, the effectiveness of digital technology remains constrained by factors such as inadequate expression of needs, disparities in urban-rural resources, fragmented governance networks, the digital divide and security risks; moreover, the advantages of digital technology are easily undermined by weak foundational conditions and insufficient institutional integration. Therefore, in the future, we should

put the demand-side governance at the forefront, make up for the shortage of funds, facilities, talents and data in the county, rely on platform governance to rationalize the relationship between the government, the market, social organizations, villages, communities, families and the elderly, and integrate rural adaptation, technology for the elderly and data security throughout the whole service process.Only when digital technologies are truly embedded in rural living contexts can home-based elderly care services move away from a crude, one-size-fits-all approach towards a model that responds precisely to individual needs, and achieve high-quality development through sustained operation. This shift not only responds to the pressure of rural aging, but also supports the balance of public services.

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Reference

[1] Wei Yan, Li Jing, Wang Ziteng. The Impact Mechanism and Optimization Path of Digital Village Construction on Rural Smart Senior Care Service[J]. Northwest Population Journal,2025,46(5):14-27.

[2] Liu Chengfang, Chen Siwei. Empowering Rural Elderly Care with AI:Theoretical Framework, Pathways and Challenges[J]. Journal of South China Agricultural University (Social Science Edition),2026,25(1):23-33.

[3] Liu Xiaoyan, Peng Hanting. Digital Technology-Enabled High-Quality Development of Rural Elderly Care: Practical Foundations, Constraints, and Policy Pathways[J]. Macroeconomics,2025(11):62-73.

[4] Wang Zhixin. Digital Empowerment for the High-Quality Development of Rural Elderly Care Services: Theoretical Logic, Practical Barriers, and Realization Approach[J]. Local Governance Research,2026(1):52-66+80.

[5] Huang Jing, Han Songyan and Zhou Rui. How Digital Intelligent Technology Drives the Personalization of Public Services[J]. Social Science Research, 2025(3):87-97+228.

[6] Li Qiao Xiao Jie. The Contradictions and Realization Paths of Synergistic Supply and Demand in Rural Smart Elderly Care Services[J]. Population and Society,2026,42(3):87-98.

[7] Reply to Recommendation No. JY20230013 of the Second Session of the 15th Wuhan Municipal People’s Congress [EB/OL]. (2023-07-28) [2026-06-15]. https: // mzj.wuhan.gov.cn/zwgk_918/fdzdgk/qtzdgknr /jytabl /mzj_sjyta1/202309/t20230915_2265271.shtml? utm_source.

[8] Chen Xin, Lu Yihua. Value Mechanisms, Realistic Bottlenecks and MechanismInnovations of Digital Intelligence Enabling High-QualityDevelopment of Urban Elderly Services[J]. Nanjing Journal of Social Sciences,2025(2):65-74.

[9] Li Changyuan. Digital Platforms Empower Agile Governance of Smart Elderly Care: Operating Mechanisms, Practical Constraints, and Advancement Pathways[J]. Jiang-huai Tribune,2026(3):46-54.

[10] Gao Peng. Power Reconfiguration and Systemic Coordination: How Digital Technology Reshapes the Governance Structure of Integrated Medical and Elderly Care Services[J/OL]. Journal of Xi'an Jiaotong University (Social Sciences) ,1-16[2026-06-15]. https: // link.cnki.net/urlid/61.1329. C. 20260615.1033.002.

[11] Zhang Jianghai, Zhou Qizheng. Practical Exploration and Optimization Pathways for Technology-Enabled Precision Supply of Rural Elderly Care Services[J]. Journal of Fujian Provincial Committee Party School of CPC (Fujian Academy of Governance),2024(5):99-107.

[12] Office of the People’s Government of Huangpi District, Wuhan Municipality. Notice of the Office of the District People’s Government on Issuing the Huangpi District Plan for Government-Purchased Internet

Plus Home-Based Elderly Care Services (Trial)[EB/OL]. 2020-04-30[2026-06-16]. https: // www.huangpi.gov.cn/fbjd_33/xxgkml/gysyjs/shbz_mh/shfl/202110/P020230515671771825732.pdf

[13] Office of the People's Government of Huangpi District, Wuhan Municipality. Notice of the Office of the District People's Government on Issuing the Huangpi District Plan for Government-Purchased Internet Plus Home-Based Elderly Care Services (Trial)[EB/OL]. 2020-04-30[2026-06-16]. https: // www.huangpi.gov.cn/fbjd_33/xxgkml/gysyjs/shbz_mh/shfl/202110/P020230515671771825732.pdf

[14] Zhu Hao. rtificial Intelligence-Enabled Precision in Community Home-Based Elderly Care Services: Internal Logic, Practical Dilemmas, and Optimization Pathways: A Case Study of District C in Shanghai[J/OL]. E-Government,1-12[2026-06-15]. https: // link.cnki.net/ urlid/ 11.5181.TP. 20260129.1309.004.

[15] Voss Peggy, Kornadt Anna E, Hess Thomas M,et al. A World of Difference? Domain-Specific Views on Aging in China, the US, and Germany[J]. Psychology and Aging,2018,33(4):595-606.

[16] Shen Kaijun, Peng Xizhe, Wang Xuehui.The Impact of Ownership of Smart Health and Elderly Care Devices on Older Adults' Attitudes toward Aging[J]. Population Journal,2026,48(3):97-114.

[17] They Form Teams to Provide Door-to-Door Services, Enabling Older Adults to Enjoy Elderly Care Without Leaving Home[N]. Changjiang Daily,2023-08-05(20).

[18] Funding Plan for Operating Subsidies for Rural Older Adults' Mutual-Aid Care Centers (Service Points) in Jiangxia District in 2023[EB/OL]. (2024-03-28) [2026-06-15]. https: // www. jiangxia.gov.cn/zzzq/zzzq_ylfw/202403/t20240328_2380479.shtml.

[19] Cai Yumei, Chen Gong. Digital Technology-Driven Coordinated Development of Services for Older Adults and Children: Actual Constraints, Typical Models, and Practical Pathways[J]. Jianghan Tribune, 2026(4):38-48.

[20] They Form Teams to Provide Door-to-Door Services, Enabling Older Adults to Enjoy Elderly Care Without Leaving Home[N]. Changjiang Daily,2023-08-05(20).