ISSN: 2688-8653

Silent Exclusion: An Analysis of the Healthcare Integration Dilemma for the Elderly in Seeking Medical Treatment under Urban Digital Transformation

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Abstract

Concurrent urban digital transformation and population aging have exacerbated the technological adaptation challenges and the "silver digital divide" faced by the elderly in healthcare settings. To deeply analyse its manifestations and underlying mechanisms, this study, based on a qualitative investigation in healthcare settings, constructs and validates a three-dimensional analysis framework for this dilemma: "Inability to use" refers to challenges at the operational and comprehension levels; "unwillingness to use" reveals psychological rejection and crisis of trust; and “lack of access” exposes systematic access barriers. The research finds that the root cause of this dilemma lies in the "elderly digital disability”, an intrinsic condition. This decline in ability due to aging is further magnified and solidified by the combined effects of the exclusionary design of external technologies and the inadequate compensatory support from amily and society. To resolve this issue, it is necessary to go beyond superficial technological fixes and establish a multi-stakeholder collaborative governance system where the government provides top-level design and foundational guarantees, the market deepens "genuinely" elderly-friendly adaptations, and society and families strengthen empowering support, to promote society's transition from "digital governance" to "digital good governance.".

Keywords

Digital divide; Elderly digital disability; Age-friendly design; Digital healthcare.

1. Introduction

Digital transformation of cities has become the core engine driving social progress and enhancing governance efficiency (Xie, 2024). Digital technologies have become a part of every aspect of daily life, bringing major changes in government services, commercial consumption, and social interaction patterns. This has made society more efficient and daily life more convenient. However, while technology brings huge benefits, its potential negative effects are increasingly prominent. Issues such as the digital divide, data security, and algorithm discrimination are connected, forming new forms of social exclusion.

In China, a dual trend of aging and digitalisation is emerging, presenting new pressures on social and economic development. According to the "2024 Annual National Elderly Development Bulletin", at the end of 2024, there were 310.31 million people aged 60 and above in the country, accounting for 22.0% of the total population. The 56th "Statistical Report on the Development of China's Internet" indicates that as of June 2025, internet users in China stood at 1.123 billion. The proportion of Internet users aged 50 and above was 33.5%. The report states that "lack of skills, cultural limitations, insufficient equipment, and age factors are the main reasons why non-users aged 60 and above do not access the internet". This huge gap has

ISSN: 2688-8653

given rise to the so-called "silver digital divide", leaving billions of elderly people as potential " digitally disadvantaged groups" (Guo, 2025; Kuang and Meng, 2025).

The negative impact of the "silver digital divide" is most sharply and brutally exposed in the healthcare setting. Medical health is the area with the most urgent and strongest dependence among the elderly population; however, the design of current digital medical services has long centred on young and middle-aged users, systematically neglecting the particularities of the elderly in terms of physiological functions, cognitive patterns, and information literacy. When core medical care processes such as appointment scheduling, mobile payment, and report inquiries are fully shifted online, the technologies that were supposed to enhance convenience have instead become numerous "digital barriers" that are difficult to overcome, worsening the medical care challenges of the elderly and directly threatening their most basic health rights. Therefore, addressing the digital integration difficulties of the elderly in the healthcare setting have become urgent public health and social equity issues.

Although previous studies have analyzed the digital divide among the elderly, most existing literature has remained at the macro-level describing the phenomenon broadly and lacking a sufficiently deep examination of how challenges form and appear in specific life situations. To bridge this research gap, this study focuses on the "medical care" scenario, which is a high-risk and high-dependency scenario crucial to the quality of life of the elderly.

This study aims to respond to the following question: In the wave of urban digital transformation, how should we understand and resolve the digital challenges of the elderly in medical care? As Zheng (2021) pointed out: "A completely digitalised life does not necessarily equate to a better life." This study aims to provide theoretical references and practical inspirations through a profound analysis of specific challenges for promoting "age-friendly" technological renovations, optimising public service processes, and building an inclusive digital society, ultimately exploring the path from "digital governance" to "digital good governance".

2. Research Design and Methods

To explore the real experiences and deep challenges elderly people face in digital healthcare, this study adopted a qualitative research design. The study drew on the phenomenological method, aiming to deeply understand and interpret the personal feelings of participants in specific situations and to construct a theoretical explanatory framework from a bottom-up perspective. Therefore, the researchers conducted a field investigation in three large general hospitals in Chengdu, China, over several months. They used purposive sampling to select 14 elderly people aged 60 and above who had used digital healthcare within the past six months and could express themselves clearly as the subjects for in-depth interviews.

Data was collected mainly through semi-structured, in-depth interviews and participatory observation. All interviews were recorded after obtaining informed consent from the participants, and the materials were strictly anonymised. After transcribing all the interview recordings and field notes into text, the analysis was conducted using thematic analysis. The analysis process involved several steps: repeated reading, generating initial codes, searching and reviewing themes, and ultimately defining and naming themes. This study refined and constructed the three-dimensional challenge model of "not knowing how to use, not daring to use, and unable to use" presented in the text, as well as its underlying micro-meso-macro generation mechanism.

3. A Three-Dimensional Analysis Framework

As digital transformation speeds up, the "digital divide" has become increasingly prominent, especially showing a structural and fixed trend among the elderly population. Research

ISSN: 2688-8653

indicates that limited access to digital technologies is associated with poorer self-reported physical and mental health conditions. At the same time, natural decline in cognitive abilities with age may further make it harder to learn new technologies. Therefore, helping older adults with digital integration has become an urgent public health priority (Cheung et al., 2023).

Currently, researchers often break down the digital divide into three progressive levels (Chen and Zhou, 2022). The first level, also known as the "access gap", refers to the unequal situation in obtaining information technologies; the second level, also known as the "use gap", refers to the differences in digital technology usage abilities due to individual skills or environmental factors; the third level, also known as the "knowledge gap" or "effect gap", points to the social economic inequality resulting from the use of digital technologies. These three levels of the digital divide are interrelated and progressive. The "access gap" is the foundation, the "use gap" is the process, and the "knowledge gap" is the result. In other words, while digital technologies are expanding the differences in information access opportunities, they may also become an "amplifier" of the existing social inequality structure and pass that inequality down through generations (Wang, 2024).

3.1. The "Inability to Use" Challenge: Lacking Technical Skills

In healthcare settings, the "skill barriers" and "mental barriers" faced by older adults are particularly prominent (van Dijk and Hacker, 2003). Currently, hospital tasks like booking appointments, paying, and checking reports are all digital, but the elderly generally lack the basic skills needed to operate these complex medical information systems (Neves et al., 2018). Simultaneously, the widespread adoption of smart outpatient services, difficult self-registration procedures, and specialised terminology displayed by machines are now common. Also, many offline service windows have been reduced or removed. This has forced the elderly to passively adapt to digital processes, exacerbating their inability to receive timely medical treatment.

Specifically, these barriers appear in three connected ways. First, on a physical level, older adults often struggle to do basic things such as clicking, sliding, or biometric recognition due to physiological decline, such as blurred vision and decreased finger dexterity. These minor operational mistakes, when displayed on complex interfaces, can be magnified and can easily lead to failure or interruption of key steps (Wang et al., 2025). Second, on a cognitive level, because of slower cognitive processing speed or limited working memory capacity, if the system operation steps are numerous, page transitions are frequent, and the terminology is overly specialised, the elderly cannot clearly grasp the current task status or the meaning of the next instruction.

Third, in terms of willingness to use, repeated experiences of failed operations significantly make the elderly more likely to avoid digital technologies. This drives them to stick to familiar but inefficient traditional methods or completely entrust digital operations to others, actively giving up the opportunity for self-learning and adaptation. During the COVID-19 pandemic, the mandatory promotion of remote medical services (Ramsetty and Adams, 2020) made this "not knowing how to use" problem worse. Many elderly people are unable to master tools such as video consultations or online appointments, making it difficult for them to obtain timely medical services. This directly confirms the real threat of digital skill deficiency to the right to health (Yao et al., 2021).

3.2. The "Unwilling to Use" Challenge: Fear and Lack of Trust

In healthcare settings dealing with personal health and well-being, the common fear of technology among the elderly is significantly amplified. This fear shows up not just as general anxiety, but as specific mental blocks that stop them from easily using digital medical services. For instance, their unfamiliarity with new technologies, deep concerns about potential errors

ISSN: 2688-8653

while using them, or feel that the design is too complex, difficult to understand, and operate (Wu et al., 2015).

The "unwillingness to use" digital medical services among the elderly stems from two interrelated psychological aspects. First, it is rooted in deep technological fear and a lack of self-efficacy. When faced with increasingly complex intelligent devices, the elderly tend to worry a lot about making mistakes and naturally avoid complicated technology. They often assume that they cannot master new skills; this "self-denying" mentality of "not being able to learn" leads them to actively avoid the digital medical treatment process. Second, it shows up as a serious lack of trust. As research indicates, the fear of "making mistakes and experiencing negative consequences" among the elderly is particularly prominent in high-risk decision-making scenarios in healthcare (Nimrod 2021). This active avoidance and passive worry caused by technological phobia seriously undermines the trust foundation of the elderly in digital tools (Khasawneh, 2018), making them more inclined to rely on traditional, predictable, manual services.

In fact, the "unwillingness to use" phenomenon not only exposes the current insufficient technological accessibility for the elderly in the medical scenario but also profoundly reflects the systematic neglect of the cognitive characteristics, learning needs, and psychological safety of the elderly group in the digital transformation.

3.3. The "Lack of Access to use" Challenge: Systemic Barriers and Poor Design

In addition to subjective skills and willingness barriers, the elderly also face a series of objective systemic limitations in the process of seeking medical treatment. These problems together create the "lack of access" challenge.

First, at the individual level, some scholars believe that many elderly people encounter the "elderly digital disability" challenge, which is a decline in cognitive and physiological functions caused by ageing. When technology is designed in a way that excludes them and social support is lacking, elderly people continuously experience digital technology usage obstacles in a "capacity deprivation state" (Khasawneh, 2018). The specific manifestations are influenced by multiple factors, including an individual's income, educational background, health status, digital skills foundation, and the degree of support from the physical and social environment they are in (Konig et al., 2018; Voelter et al., 2021).

Second, at the system level, the existing structural obstacles are even more severe. On the one hand, the design problems of technology itself are particularly a major issue. Many medical service platforms still have issues such as complex interfaces, unintuitive interactions, small fonts, and cumbersome verification processes. They generally lack elderly-friendly designs and are too difficult for many older adults to learn and use. While hospitals promote online services to improve efficiency, they significantly reduce traditional manual windows and on-site service channels, leaving elderly people without digital technology with "digital access barriers".

On the other hand, the problems for rural elderly people are made worse by the digital gap between urban and rural areas, and the digital divide between generations. In rural areas, there is generally a lack of digital infrastructure and resources. Also, the outflow of young population means that technology is not widespread. With fewer young people around, there is less support between generations, which weakens the motivation of older adults to join the digital world (Zeng and Lin, 2025). Moreover， the lack of systematic learning and support resources， such as digital skills training and family assistance, leaves the elderly isolated in their use of technology applications.

From the limitations of individual physiological functions to the structural exclusion of technology, the environment, services, and support systems, a formidable barrier has been constructed for the elderly group in the digital medical treatment scenario, profoundly affecting their equal access to medical services and experience.

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3.4. The Negative Effects of These Challenges

The three challenges of "not being able to use", "not daring to use", and "unable to use" do not exist independently. These are intertwined and mutually reinforcing, eventually forming a vicious cycle that leads to multiple negative effects and deeply harms the well-being of the elderly population.

On the one hand, due to their inability to operate digital platforms proficiently, the elderly have difficulty accessing high-quality medical resources on an equal footing, resulting in substantive inequality in medical access opportunities (Zhang and Wang, 2025). This may not only delay the optimal treatment timing but also significantly increase their sense of helplessness and psychological stress by taking away their independence in the medical process.

However, these challenges have deepened the social isolation of the elderly. Academic research and empirical reality have long shown that the effective use of digital tools can improve the quality of life. However, as registration, payment, and even basic social connections increasingly become digital, elderly people who face technical obstacles are more likely to be disconnected from society and fall into deeper loneliness (Zhang and Wang, 2025). Ultimately, this series of micro-level predicaments solidifies and deepens structural social inequality on a macro level. The already uneven distribution of digital infrastructure and medical resources between urban and rural areas is further amplified by the "silver digital divide". The digital divide continuously deprives the elderly of their chances to adapt and grow in society, ultimately affecting their overall quality of life and making health equity more intractable.

4. Deep-seated Reasons for the Digital Dilemma

4.1. Micro level: "Digital Capability Poverty" in Older Adults

At the micro level, the root cause of the digital integration difficulties faced by the elderly lies in their "digital capability poverty". The interview data from three hospitals in Chengdu clearly reveal multiple aspects of digital capability poverty.

First, age-related physical and mental decline constitutes the most fundamental obstacle. The decline in visual, auditory, and tactile sensitivity due to physical aging directly limits operational capabilities, further amplifying operational difficulties, such as difficulty in seeing small font information on screens due to "severe presbyopia", hearing voice prompts clearly, or precisely touching small icons (L10). This is consistent with the "operational disability" discovered by Wang Xing et al. (2025) and the common expressions of concern about their own functional decline by the elderly in interviews by Cheung et al. (2023).

Second, cognitive aging phenomena, such as decreased working memory capacity, slower information processing speed, and difficulty in attention allocation, make the elderly bear a huge cognitive load when facing complex, rapidly changing hospital APP registration processes, intelligent terminal payment systems, or multi-level menu guidance interfaces (L05, L06, L13). This makes it hard for them to process information well, leading to mistakes or failures.

Third, the generation gap in knowledge and technological fear forms a psychological barrier to trust loss. Many elderly people grew up in the pre-digital era and lack the basic knowledge and learning experience in information technology, resulting in a natural unfamiliarity and distrust of intelligent devices (L11). For example, participant L07 stated, "Except for making phone calls, I dare not operate other functions." In this high-risk and high-pressure context of medical treatment, this technological anxiety is significantly magnified, easily leading to a sense of fear and frustration, and subsequently choosing to avoid digital medical access routes, forming a vicious cycle of "inability–failure to use–loss of confidence–complete abandonment".

At the same time, internalised "self-directed age discrimination" weakens learning motivation. As Choi et al. (2020) pointed out, when the elderly believe the negative stereotype in society

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that "the elderly can't learn" they will have a strong self-denying mentality. This "I'm too old to learn" thought makes them actively give up the opportunity to learn and adapt. The "substitution" chosen by children for efficiency and safety purposes, although solving the immediate problem, also deprives the elderly of the opportunity to practice and learn independently. (L06, L13, L14)

Table 1. Micro level: Digital capability deprivation among the elderly population

Level	Sub-argument Keywords	Interview Keywords	Source Labels
Elderly	Physiological function decline	Vision impairment (cannot see small text)	L10 (severe presbyopia)
	Cognitive overload	Forget after learning, unable to operate independently	L05 (learned but cannot use independently), L06 (forgets after teaching), L13 (forgets after learning)
	Lack of technology trust	Dare not use, worried about security	L07 (dare not click randomly), L11 (dare not use mobile payment)
		Children instruct and operate on their behalf	L06, L13, L14 (children worry about accidental touches causing issues)
Hospital	Physical decline	Font too small, chaotic visual hierarchy	Hospital H (homepage font small), Hospital Z (inconsistent font sizes)
	Cognitive overload	Inconsistent interfaces, high learning cost	Self-service devices (different-brand interfaces, e.g., report printing)
	Lack of technological trust	Complex authentication, safety concerns	Health-insurance binding (multiple jumps plus facial recognition)
	Digital-ability heterogeneity	Mode-switch failure, non-persistent senior-friendly features	Hospital H (senior mode disappears after jump), Hospital R (elder mode invalid after jump)

4.2. Mid-Level: Failures in System and Product Design

If the "digital capability poverty" at the micro level is the internal cause, then the failure of institutional design and products and services at the mid- level is the key external factor that makes the problem worse. Current policies, regulations, industry standards, and service processes for promoting the digital transformation of healthcare are mostly designed on the assumption that users have a certain level of digital literacy. However, they lack mandatory standards for adapting to the needs of the elderly and effective supervision mechanisms.

First, at the product interaction level, adaptation to the elderly is merely formal and lacks consistency. The online systems of the hospitals participating in the survey generally have incomplete adaptations for older adults. For example, the "elderly mode" on the outpatient service homepages of H Hospital and R Hospital still revert to the normal mode after multiple page transitions. Z Hospital lacks the "elderly mode" and has confusing icons and inconsistent font sizes. The offline self-service devices have "different brand interface displays different" issues, increasing the learning cost for the elderly.

Second, at the operation logic level, the systems are generally not forgiving of mistakes, which makes them fragile. On the one hand, the process of online hospital appointment registration can be summarised as "hospital area - outpatient type - department or expert - time period - appointment confirmation", and some operations require repeated page jumps to check the availability of appointments. This design is unfavourable for user convenience. However, when the elderly encounter "error prompts from the self-service machine system" or other sudden failures, there is a lack of clear guidance or a fast manual intervention channel, which makes a

ISSN: 2688-8653

minor operational mistake lead to the failure of the entire task, greatly undermining the confidence of the elderly in using it, forcing them to return to traditional service channels.

Furthermore, the lack of inclusiveness in offline services exacerbated the situation. First, surveys show that hospitals generally have more self-service machines than manned windows, but the number of people queuing at the in-person service windows is still considerable. Self-service machines do not accept cash, forcing elderly people who are accustomed to cash payments to turn to more time-consuming manual windows. Some participants also said, "I'm afraid to use mobile payment" (L11). Second, the digitalisation of public services overly focuses on "online substitution" rather than "digital supplementation". Apart from cases where children make appointments on behalf of the elderly, older adults going to the hospital alone may not have all their personal, document, or medical insurance information handy. This affects their medical treatment plans. Third, most hospital guidance signs are attached to the floor and walls. In crowded areas, they are difficult to notice. Also, the dense layout can be confusing, forcing older adults to ask for directions. But, the number of on-site guides and volunteers is often insufficient. This "overemphasis on equipment, neglecting services" resource mismatch ultimately leads to a double shortage of digital tools and human support.

Table 2. Mid-level: Supply-side failures in institutional design and digital product services

Level	Discussion Point Keywords	Interview Keywords	Source Annotation
Elderly	Product Interaction Issues	Complex Interface, Operational Difficulty	L05 (Application too complex), L14 (Button failure at times)
	Operational Process Mechanism	Complex Processes, No Assistance, Lack of Guidance	L03 (Machine card errors), L11 (Need to print reports for unclear issues)
	Service Incompatibility	Payment Method Limitations, Functional Incompatibility	L11 (Dare not use online payment), L03 (Used to cash, only use non-smartphone calls)
	Product Interaction Issues	Complex Interface, Operational Difficulty	L05 (Application too complex), L14 (Button failure at times)
Hospital	Product Interaction Issues	Elderly Mode Surface, Interface Chaos	Hospital H (senior mode only cosmetic), Hospital Z (inconsistent icon styles)
	Operational Process Mechanism	Binding Process Complex, Unfriendly Operation	Health-insurance binding (too hard for the elderly), Hospital Z (must select department before seeing available slots)
	Lack of service inclusiveness	Cash payment rejected, device incompatibility	Hospitals Z & H (self-service devices do not accept cash)

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4.3. Macro level: Weak Family and Social Support Systems

The problem of digital disability among the elderly is not only due to individual capabilities and product design but also stems from the systematic weakness of the social support system. Existing support systems are unable to bridge the digital divide. The weakening of traditional support networks and the lag of new social support systems have left the elderly isolated when facing challenges related to digital healthcare.

First, in family support, there is a common problem of children's assistance mostly remains at the "operating on behalf of" level (such as L06 and L14). Although this type of proxy work temporarily solves the problem, it fails to transform into sustainable ability cultivation. Instead, it unintentionally strengthens their dependence. Simultaneously, public service support has obvious shortcomings. Hospital volunteers, due to insufficient professional competence, are unable to answer core questions such as those in the registration department (L03). During peak hours, "one volunteer has to handle 2 to 5 pieces of equipment", exposing a lack of both staff and professional skill. Community training has fallen into an effectiveness dilemma due to fragmented design, with participants reporting that "after listening for 1 to 2 hours, they forget" (L13), revealing that public services have failed to establish a stepped and supportive implementation mechanism.

Overall, the mismatch of family support and the absence of social support have jointly led to the "compensation failure" of the support system for older adults. The support network, which was supposed to act as a buffer, failed to effectively fill the gap between the skills older adults lack and the difficult technology they face. Instead, it may have solidified their disadvantaged position in the digital society.

Table 3. Macro level: The systematic weakness of the family and social support system

Level	Sub-Argument Keywords	Interview Keywords	Source Annotation
Elderly	Intergenerational substitution dilemma	Children operate on behalf, dependency reinforced	L06 (son makes appointments), L13 (daughter helps set it up), L14 (daughter forbids random pressing)
	Insufficient public service support	Ineffective training, weak community support	L13 (forgets after listening to the lecture)
Hospital	Intergenerational substitution dilemma	Insufficient volunteers, low professionalism	Material 2.3 (1 volunteer responsible for 2-5 devices), Material 3 (limited professional knowledge)
	Insufficient public service support	Unclear guidance signs, high pressure on the service desk	Material 3 (dense and contradictory guidance signs), Material 3 (medical staff repeatedly explain)

5. A Practical Path to Solving the Digital Healthcare Challenge: Building a Collaborative System

5.1. The Role of Government: Better Planning and Policy

As the guardian of public interests, the government should play a key role in top-level design, standard setting, and providing basic guarantees to close the "silver digital gap". The failure of the current "elderly mode" in digital medical services is fundamentally due to the lack of

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mandatory and quantifiable industry standards.o fix this, the government should focus on four key areas.

First, create real, enforceable standards for age-friendly design. The widespread "false elderly assistance" problem in the "elderly mode" of digital medical services currently exists because of the absence of top-level design and the failure of market self-regulation. Therefore, government regulatory authorities must shift from advocating to regulating, take the lead in collaborating with industry associations and representatives of elderly users, and introduce legally binding national standards for the design of digital services for the elderly. This standard should go beyond simple visual changes and cover specific technical indicators, such as interaction process simplification and multimodal interaction, and establish a long-term certification and supervision mechanism.

Second, pass laws to protect offline rights.legislation should be enacted to protect offline rights. Digitalisation should not be used as an excuse to deprive citizens of their basic rights. Therefore, through legislation, it is necessary to guarantee citizens' right to choose non-digital services for key public services, such as medical treatment. This means that hospitals must retain and fully operate manual registration and payment windows to ensure that any elderly person, regardless of their digital capabilities, can obtain core medical services with dignity and without any obstacles.

Third, promote balanced development of digital infrastructure to close the urban-rural gap.Wang (2024) and Liu (2022)'s quantitative research have both confirmed that rural elderly people face more severe negative impacts of digital disability and digital divide. Therefore, the national new infrastructure strategy and smart elderly assistance action should tilt towards rural and underdeveloped areas. In addition to constructing network hardware, community digital service stations and training systems should be invested in to ensure that the benefits of digital development can be enjoyed by all elderly people in all regions.

Fourth, strengthen data security and rebuild the trust of older adults. The core of the "fear of using" dilemma is a crisis of trust. Therefore, the government must collaborate with the judicial department to establish a rapid response and punishment mechanism for online fraud and information leakage targeting the elderly group. It must also require digital medical products to publicly display their privacy policies as concisely as possible. Only by creating a safe and trustworthy network environment can we fundamentally alleviate the technological phobia of the elderly and provide a solid psychological security guarantee for their digital integration.

5.2. The Role of the Market and Companies: Making Genuinely Age-Friendly Products

At present, most elderly-friendly medical applications on the market remain at the superficial level of interface enlargement and icon simplification, failing to truly meet the real needs of the elderly due to their physiological decline and cognitive load limitations. Enterprises need to break through in three aspects: technical adaptability, real-world use, and service continuity, to optimise the human-computer interaction experience.

First, on a technical level, the design focus should shift from adding more features to making processes simpler. It should follow the principle of inclusive design, simplify core medical procedures such as appointment and registration to within three steps, actively develop other ways to interact like dialect recognition voice systems and AI voice interpretation of reports to compensate for the physiological decline of the elderly. On the other hand, a family collaboration mode should be developed to bridge the gap in social support through technology. Enterprises should develop functions allowing children to remotely make appointments, inquiries, and payments.

Second, in terms of real-world use and interaction, it should be acknowledged that due to physiological limitations, operational errors are normal rather than accidental for the elderly.

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System design must have a high degree of fault tolerance to avoid a complete failure due to a single accidental touch, which would exacerbate the anxiety of the elderly in using the product. An emergency channel for manual transfer should be added. In any complex operation process, clear and visible buttons should be provided to allow users to transfer to an agent customer service or on-site service personnel with one click.

Third, at the conceptual and service level, companies should design products with older adults, not just for them. Medical institutions and developers must abandon the closed-door research and development model. Older adults with different needs and abilities should be invited into the entire process of product design, development, and testing. Enterprises should also attach importance to exploring the real needs of the public to ensure that the technology truly serves people rather than creating new barriers. Through the establishment of a regular user feedback mechanism, the evolution of elderly-friendly products should closely follow the changes in the actual needs and capabilities of the elderly, achieving a fundamental transformation from designing for the elderly to designing together with the elderly.

5.3. The Role of Society and Family: Stronger Support Networks

To address the digital challenges lder adults face in healthcare, relying solely on technological optimisation and policy guarantees is not sufficient. Instead, it is necessary to rely on social and family support networks. By helping build skills and providing emotional care, we can create an inclusive environment.

On one hand, communities, as key actors, should become the core hub for bridging the knowledge gap and carry out scenario-based digital literacy training. They should provide multi-party support to comprehensively enhance the information literacy capabilities of the elderly. Specifically, communities should integrate resources and rely on venues such as senior activity centers and community health service stations to regularly conduct practical training on "smart medical treatment", covering practical key steps from making appointments for medical visits, understanding hospital electronic navigation maps, to operating online medical insurance payments, helping the elderly systematically master relevant digital skills and establishing a formal learning support mechanism. At the same time, communities should establish a digital assistance volunteer pairing mechanism, focusing on providing accessible and scheduled home tutoring or accompanying medical visits services for vulnerable elderly individuals, such as the elderly with advanced age, living alone, or those with disabilities. Through continuous interpersonal interaction, their practical operational abilities and confidence can be enhanced, and non-formal learning channels can be expanded. Additionally, efforts should be made to cultivate and develop elderly mutual assistance organisations and community support forces. Healthier and more digitally skilled older adults can share their experiences and help with problem-solving. This kind of informal learning based on peer identity can not only effectively transfer digital skills but also enhance the social integration and mutual assistance awareness of the elderly group, thereby building a multi-level and inclusive network for the improvement of elderly digital literacy.

Families, as a source of emotional support and trust, play a unique and vital role. Children and younger generations should not only patiently teach their parents to understand and learn relevant medical treatment operations, focusing on enhancing the elderly's ability to identify information, but also pay attention to their anxiety and frustration when facing digital barriers, providing positive encouragement and acceptance, and achieving a transformation from passive adaptation to active integration of the elderly group.

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6. Conclusion

This article focused on the digital integration difficulties faced by the elderly in healthcare. The research reveals that this difficulty is not a single problem of technical access or skill deficiency, but presents as a three-dimensional structural predicament composed of "inability to use", "unwilling to use", and "lack of access to use". Among them, "inability to use" stems from operational and comprehension impairments caused by both physiological decline and cognitive load; "unwilling to use" is rooted in technological phobia and internalized age discrimination, which lead to decision-making impairments and trust crises; while "lack of access to use" exposes the systemic obstacles caused by technological exclusionary design and the breakdown of social support.

Further analysis reveals that at the micro level, age-related cognitive and physiological decline constitutes the biological core of the elderly's digital disability. At the meso level, the technological exclusionary design of products and services and a lack of offline services make these barriers worse. At the macro level, the weak failure of family and community support systems ultimately solidifies the marginalized status of the elderly group. These three factors interact with each other, jointly leading to a series of chain negative impacts such as health inequality, social isolation, and structural injustice.

The theoretical contribution of this paper lies in the fact that by constructing and demonstrating a three-dimensional dilemma analysis framework, it deepens the understanding of the classic three-level digital divide theory. It provides a more explanatory analysis tool for understanding the specific manifestations and user experiences of digital inequality in specific high-risk scenarios such as medical treatment. The concepts of "inability to use" and "lack of access" profoundly reveal the physiological and cognitive roots behind the access and usage gap. Meanwhile, the concept of "unwillingness to use" and the ultimate chain of negative impacts, concretise the manifestation of the effect gap at the psychological and social levels. At the same time, by introducing and localising the frontier concept of elderly digital disability, this research shifts the attribution of digital inequality from the traditional resource-skill perspective to a holistic perspective that integrates physiological decline, technological interaction, and social support, providing a new theoretical perspective for research in this field.

Ultimately, solving the digital medical treatment dilemma of the elderly population is a systematic project that requires multi-party collaborative governance. The paper argues that a collaborative governance system led by the government for top-level design and foundational guarantees, supported by the market creating genuinely age-friendly products, and reinforced by stronger support networks from society and families is the practical path to the solution. Looking forward, the tide of technology is irreversible, but the temperature of technology can be chosen. Promoting society from digital governance to digital good governance, ensuring that every elderly person can access medical services with dignity and without obstacles in the digital era. This is not only a technical issue, but also a yardstick for measuring social civilisation.

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