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The Digital Divide Among the Elderly in China in the Context of Aging

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Abstract: From the perspective of China's aging, this study analyzes existing literature, summarizes the definition of the digital divide, and analyzes the characteristics of digital divide in China. Compared with the eastern coastal areas, the digital divide is more serious in the central and western regions, and compared with urban elderly people, the elderly in rural areas is at a disadvantage in using digital resources. The digital divide affects the quality of life among the elderly through mental health, social interaction, and overall life satisfaction. Finally, the causes of the digital divide among the elderly are analyzed, including uneven distribution of infrastructure, poverty, unfriendly interface design, psychological barriers to accepting and applying smart products, limited education, lower digital capabilities, insufficient confidence in participating in digitalization, inaccurate expression of demand information, limited emotional support, and Internet risks. This study proposes five solutions, including providing financial support, improving access to the Internet and information systems, improving digital literacy, strengthening intergenerational communication, and strengthening information privacy protection as measures to bridge the digital divide among the elderly.

Keywords: Digital divide, Elderly, China, Aging

1. Introduction

The arrival of the digital era has brought huge changes to people's production and life. It changes the way the economy works and the way people work and live. Digital products and services have penetrated into every field such as food, clothing, housing, transportation, entertainment, social interaction, education, medical care, and government affairs. With the explosive growth of the internet, various types of internet applications in the world continue to develop, and the number of users of multiple types of applications continues to grow. According to the 55th "Statistical Report on the Development of China's Internet Network" (released in January 2025) by the China Internet Network Information Center (CNNIC), as of December, 2024, China's internet penetration rate reached 78.6 percent. However, the rapid development of digitalization has inevitably brought about the problem of digital divide.

The digital divide exists prevalent among the elderly, with significant gaps in internet access and usage. China's aging problem is becoming more and more serious, and the quality of life among the elderly has attracted widespread attention. However, only 35.25% of Chinese older adults aged 60 and above use the internet, compared to 89.09% of those under 60 (Zhang, 2024). The pandemic has exacerbated the digital divide, with older adults showing limited transitions in ICT use categories, such as minimal and email-only users (Kim et al., 2024). This divide is influenced by various factors, including socioeconomic status, education, and cognitive abilities, and has significant implications for health, social connectivity, and overall well-being. Therefore, in the context of aging society, bridging the digital divide among the elderly to help vulnerable groups avoid being eliminated by the digital society has become an urgent social issue.

This study adopted the method of literature review to analyze relevant literature before 2025, summarized the characteristics of China's digital divide, analyzes the impact of the digital divide on the quality of life among China's

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elderly, attempted to find out the causes of the digital divide, and proposed targeted measures. This study aims to propose an operational practical path to bridge the digital divide among the elderly.

2 Aging Trend in China

China has been struggling with aging since the turn of the millennium. With its economic growth, the aging challenge has escalated. According to data analysis from the "Seventh Census" (2020), the size and proportion of China's elderly population are generally on an upward trend. By the end of 2023, the proportion of people aged 60 and above reached 21.1% of the national population (Ministry of Civil Affairs of China & China National Office on Aging, 2023). Based on the set future fertility level, this proportion is predicted to rise to 30.31% in 2035, and will reach an astonishing 38.81% in 2050 (Wang & Liu, 2023). The Figure 1.1 shows the trends of the proportion of China's population aged 60 and above from 2000 to 2050. Changes in the population structure will trigger a series of social challenges, including labor shortages, fiscal pressure on the pension system, increased medical needs, reduced other fiscal support, and slower economic growth. Consequently, there is a growing imperative to address aging comprehensively, employing diverse strategies to promote social fairness and tackle emerging crises.

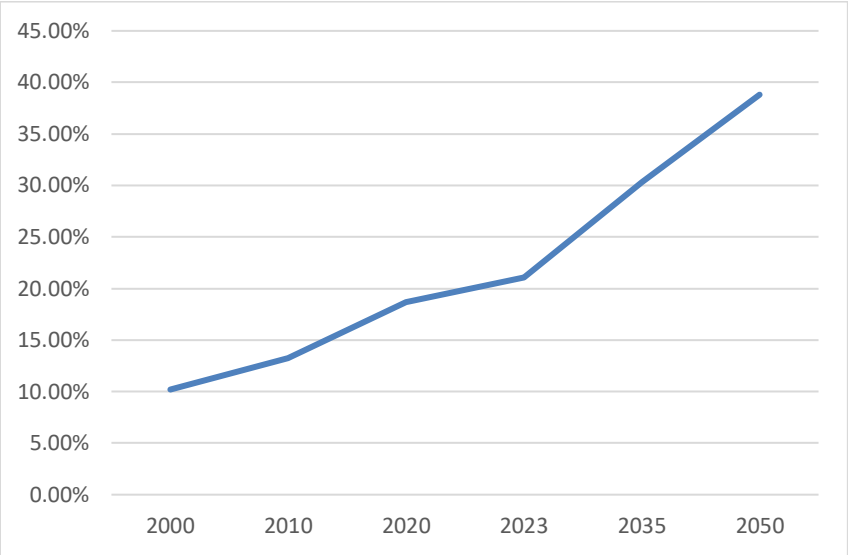

Figure 1. Trends in the proportion of China's population aged 60 and above (2000-2050)
Source: Wang & Liu (2023)

3. Digital Divide

3.1 Definition of the digital divide

The digital divide is an inevitable product of the global digitalization process, which is also called the information divide. The concept of "digital divide" was frist defined in the 1999 US report "Nation Remote: Defining the Digital Divide". It refers the gap that exists between those who have the tools of the information age and those who do not (Ang & Zhang, 2023). Subsequently, in 2000, the World Economic Forum underscored its significance in a report submitted to the G8 Summit ("From Global Digital Divide to Global Digital Opportunity"). Since then, more and more studies have been conducted to understand and overcoming the problems arising from the digital divide among societies (Vassilakopoulou & Hustad, 2023).

Digital divide exists in many forms, mainly between countries with different levels of development, between different regions in the same country, between urban and rural areas, and between different social groups. Based on the "China Digital Divide Research" released by the China National Information Center in 2013, the digital divide refers to the gap between different social groups in the possession and use of modern information technology and can be classified into three types, namely regional digital divide, enterprise digital divide and group digital divide (Wang et al., 2022). Based on the digital divide classification generally accepted by academic circles and previous definition of digital divide, defines the concept of digital divide as the physical gap in digital access, the gap in digital usage, and the gap in tangible benefits or outputs of digital usage between individuals, families, enterprises and regions of different socioeconomic status. It is divided into three levels: access gap, usage gap and knowledge gap (Hao, 2023).

The digital divide is a profound sociotechnical issue illustrating disparities in information access across countries, regions, industries, and demographics. This divide manifests across various dimensions, including socioeconomic status, geographic location, and demographic factors, leading to significant inequalities in digital inclusion and participation. Furthermore, the digital divide is not only a technological issue but also a social challenge, as it affects individuals' ability to engage in education, employment, and social activities. From a socio-economic perspective, the digital divide is prominently characterized by the gap between different socioeconomic groups in terms of access to the Internet and ICT resources. Individuals from lower socioeconomic backgrounds often lack the financial means to afford digital devices and Internet services, exacerbating existing inequalities (Matracia et al., 2023; Kem, 2024). Geographic disparities also play a crucial role, with rural and remote areas frequently experiencing limited access to digital infrastructure compared to urban regions. This geographic divide is evident in both developed and developing countries, affecting the ability of individuals in these areas to participate in the digital economy ("Digital Divide and Its Current State", 2022) (Đorić, 2022). In addition, age, education, and income are significant demographic factors contributing to the digital divide. Older adults, individuals with lower educational attainment, and those with lower incomes are less likely to have access to or use digital technologies effectively (Kem, 2024).

3.2 Characteristics of the digital divide in China

The digital divide in China is a multifaceted issue which reflects the differences in access to and use of digital technology between different regions and population groups. In China, the factors affecting the digital divide mainly include gaps in economy, education, infrastructure construction, regional development, and differences in age and digital literacy among different population groups. Further, the factors affecting the digital divide can be classified into nine main categories: sociodemographic, socioeconomic, personal elements, social support, type of technology, digital training, rights, infrastructure, and large-scale events (Lythreatis et al., 2022).

Economic development and foreign trade significantly affect the digital divide, creating a marked disparity between affluent, technologically advanced regions in the east and underdeveloped areas in the west (Zhou et al., 2024). Eastern provinces maintain technological advantages, while central and western regions lag significantly behind eastern regions in digital technology access (Huang, 2024). Education level is closely related to digital technology penetration, and the lower education level in the west has exacerbated this gap (Sang, 2024). The accessibility of information and communication technology (ICT) infrastructure varies greatly, with urban areas having better connectivity than rural areas (Pick et al., 2024). For the population, the elderly, especially those in rural areas, have significantly lower internet usage and digital health literacy than younger people (Zhang, 2024). Therefore, the digital divide in China shows obvious regional and population group differences. The elderly population, especially in rural and Midwestern areas, are at a disadvantage in using digital resources due to low digital literacy.

3.3 Factors Affecting the Digital Divide among the Elderly

In most of the past studies, the digital divide among the elderly is reflected in multiple dimensions. They exhibit lower empowerment and utilization of digital devices, a prevalent gap in digital inclusion, and fewer skills (Wang & Zhang, 2021) and limited technology access and use compared to younger counterparts (Martins, 2020). Factors that affect the digital divide among the elderly can be divided into external factors and internal factors. External factors, like poorly designed digital products，complicated operating procedures and inadequate social support, compound internal factors such as physical and cognitive limitations and psychological barriers like fear of technology and online scams, which will directly and indirectly affect the elderly awareness, intention to use of the internet and consequently digital empowerment.

The digital divide among the elderly is mainly reflected in the access gap to infrastructure, the usage gap of smart devices, and the knowledge gap in digital literacy. The access gap to infrastructure refers to the gap between the elderly group and other youth groups in terms of digital infrastructure, information terminal equipment and other hardware. In the current digital product market, the elderly has fewer choices, and the functions of most digital products fail to meet the needs of the elderly (Qu, 2023). The usage gap refers to differences in how and to what extent digital technologies are used. In China, especially rural elderly groups are still in the initial stages of using digital devices. The inability to operate smart devices proficiently makes it difficult for them to participate in digital life, which directly affects social living conditions and digital rural construction. Knowledge gap refers to the ability and literacy gap in the acquisition and application of information resources and knowledge. They cannot adapt to the environment that are susceptible to false advertisements and online rumors. Most digital products on the market lack aging-friendly modifications, and have problems such as complex interactive interface functions, poor visual effects, and lack of non-text communication, which reduce the use experience of the elderly group (Qu, 2023).

3.4 The impact of the digital divide on the quality of life among the elderly

The effect of the digital divide on quality of life among the elderly mainly involves mental health, social interaction, and overall life satisfaction. Since the COVID-19 pandemic, young people have continued to socialize, study, work and access healthcare during the lockdown via digital tools, However, the elderly faced a large inequality in digital access and technology usage, which increased risks of mental and physical health problems (Martins, 2020). The digital divide has a negative impact on mental health, especially in rural areas, because limited access to information can exacerbate loneliness (Tang et al., 2024), highlighting the importance of information access to mental health. Older adults who face barriers to using the internet, such as lack of skills or inability to access the internet, are more likely to experience depressive symptoms (Kang, 2022). Higher digital efficacy and the ability to use digital technologies for social networking are associated with increased life satisfaction and reduced depressive symptoms among older adults (Jun et

al., 2024). Self-rated computer skills are positively correlated with mental health among older adults . The digital divide is more pronounced in economically backward rural areas, which has a negative impact on the psychological quality of life of rural elderly people. Information access is a key mediating factor in the relationship between the two (Xu & Zhang, 2023).

The digital divide limits older adults' access to digital technologies, which are increasingly important for maintaining social connections and accessing services. The digital divide exacerbates older adults' social isolation, as they may lack the skills or resources to use digital communication platforms. Social interaction technologies (SITs) have been critical in alleviating loneliness during the COVID-19 pandemic, but many older adults face barriers to using them due to the digital divide (Katey & Chivers, 2025). In addition, the digital divide limits opportunities for intergenerational communication, which can bridge the generation gap (Corti et al., 2023).

Hong et al. (2023) has proved that products for the elderly with suitable functions and easy to use, as well as targeted guidance and assistance from families, communities and governments, can greatly improve the satisfaction of the elderly with their digital lives. In addition, higher digital communication skills are associated with digital life satisfaction among the elderly (Hu, 2020). This means that when the elderly is able to use various digital tools proficiently and communicate effectively online, they show higher satisfaction in obtaining information, maintaining social connections, and social participation. At the same time, Jun et al. (2024) further pointed out that this positive impact is largely mediated by technology perception. In other words, the elderly's attitude towards new technologies and their perceived ease of use will directly affect the effect of digital skills on improving life satisfaction.

The above studies show that the digital divide can have a profound impact on the quality of life of older adults by affecting their mental health, social interactions, and overall life satisfaction, as shown in Table 1. The elderly who have difficulty adapting to emerging technologies may feel frustrated and anxious and overwhelmed by digital advancements. This technology-related stress can exacerbate existing mental health issues, such as depression or feelings of isolation, and limited access to digital tools can lead to loneliness. In today's interconnected world, digital platforms are now key to maintaining relationships. When older adults are unable or unwilling to use these platforms, they may communicate less with family and friends, ultimately leading to a decline in social connections, which can deepen loneliness and negatively affect mental health. Many social and community services, such as online support groups or community events, have moved to digital formats. Therefore, the digital divide may hinder older adults from easily accessing social support and participating in community activities. As many daily tasks, such as banking, shopping, and even booking transport, are increasingly conducted online, those who are digitally excluded may find it difficult to remain independent. This can damage their self-esteem, leading to a decrease in their sense of autonomy and life satisfaction.

Table 1. The impact of the digital divide on quality of life among the elderly in China

Dimensions of Impact	Source
Mental health	(Martins, 2020; Tang et al.，2024; Kang，2022; Jun et al.，2024; Xu & Zhang，2023)
Social interaction	(Katey & Chivers，2025; Corti et al., 2023)
Life satisfaction	(Hong et al., 2023; Hu, 2020; Jun et al., 2024)

4. Causes and solutions to the digital divide among the elderly

Many reasons lead to the digital divide among the elderly, such as uneven distribution of infrastructure and physiological decline among the elderly, which leads to difficulties in digital operations and insufficient digital capabilities. Uneven distribution of digital infrastructure and service levels mean that older people in economically disadvantaged areas do not have equal digital participation opportunities (Menéndez et al., 2022). In addition, the design of modern technology products ignores the needs of the elderly, the physiological decline of the elderly, the fear of digital devices, educational limitations are also the reasons that the elderly encounters digital divide.
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The elderly's ability to acquire and use information lags far behind that of young people. There are psychological and physical barriers to accepting and applying smart products and devices. The disadvantage is mainly reflected in the inability to effectively use the knowledge and skills of digital technology. Now, many older adults in China still face digital challenges. Legal supervision is not in place, and the elderly use the Internet at greater risks; social support is insufficient, and the elderly have insufficient confidence to participate in digitalization; new technological innovations are still insufficient, making it more difficult for the elderly to operate. Furthermore, if the information about the needs of the elderly is not expressed accurately, even if big data processes and analyzes the data very accurately, it still cannot provide effective elderly care services for the elderly (Sui & Lv, 2023). Overall, certain factors, such as advanced age, poverty, lack of motivation, low education, etc., create a digital divide that excludes certain groups. Accordingly, addressing this divide demands in-depth research by taking into consideration of multi-stakeholder approach involving government, communities, and families to empower the elderly digitally, ensuring their equitable participation in the digital society (Miao, 2023).

The digital divide among the elderly is a global problem that many countries and international organizations have taken measures to address it. In the 1990s, the U.S. government issued a report "Closing the Digital Divide" and promulgated the "Communications Act", requiring telecommunications companies to provide equal services to the elderly. In 1998, Spain and Sweden issued "Computer Accessibility Regulations" and "Computer Accessibility

Guidelines" respectively. In, 2003, the Netherlands formulated the “Internet Accessibility Regulations”. In 2007, the European Union formulated "E-Skills for the 21st Century: Promoting Competitiveness, Growth and Employment". In, 2020, China issued the "Notice on the Implementation Plan to Effectively Solve the Difficulties in Using Smart Technology for the Elderly". All these measures are aimed at protecting the interests of the elderly as a vulnerable digital group and helping to bridge the digital divide (Hong et al., 2023).

Bridging the digital divide among older adults is a multifaceted challenge that requires a comprehensive approach that encompasses technology, education, and social strategies. To effectively bridge this divide, the focus is on providing financial support, improving access to the Internet and information systems, promoting digital literacy, strengthening intergenerational communication, and strengthening information privacy protection. As shown in Table 2, this study proposed corresponding solutions based on the causes of the digital divide among the elderly in China. First, overcoming financial barriers is critical to ensuring that older adults have access to necessary digital technologies. This may involve subsidies or financial assistance programs to reduce the price of devices and Internet services (Clarke, 2022). Regulating the telecommunications industry to ensure that older adults have access to affordable and accessible digital services is essential. This includes providing systematic support to promote equitable social development and eliminate the digital divide (Yang, 2024).

Second, improving access to technology and creating age-friendly information systems. Developing systems that integrate online and offline resources can significantly improve Internet access and usability for older adults. These systems are designed to be intuitive and easy to use and meet the specific needs of older adults, thereby enhancing their ability to use mainstream applications and mobile Internet (Li et al., 2021). Striking a balance between media intelligence and age-friendly design can help older adults not feel overwhelmed when exposed to digital content. This includes using big data and cloud computing to provide personalized content that meets the usage habits and needs of the elderly (Wang, 2024). Third, improve the digital literacy of the elderly through community education, training courses at senior universities, etc. It has been proven that digital education can improve the digital divide of the elderly. Community elderly care services can play a key role by providing digital technology training and helping the elderly become familiar with digital technology. This approach can not only improve the digital literacy of the elderly, but also improve the professional level of caregivers who assist the elderly in using digital tools (Li, 2024).

Fourth, strengthen intergenerational communication and provide emotional support for the elderly. The three variables of cognitive support, emotional support, and behavioral support have a significant impact on bridging the digital divide of the elderly (Hao, 2023). Some researchers believe that the use guidance of the younger generation is a necessary condition for the elderly to bridge the digital divide (Hong et al., 2023). Strengthening intergenerational communication and family interaction, and encouraging young people to support and help the elderly use digital technology can effectively eliminate the fear and rejection of new technologies among the elderly, help them adapt to digital life faster, increase Internet usage, and promote digital inclusion, thereby alleviating the adverse effects of aging on digital interaction, which is crucial to improving the quality of life of the elderly. Fifth, strengthen information privacy protection. Establishing a sound data security management and privacy protection mechanism is essential to protect the elderly from potential digital threats and ensure their trust in using digital services (Li, 2024). When the elderly’s privacy and data are robustly protected, they are more inclined to explore and adopt new digital tools and services, thereby gradually bridging the digital divide.

Table 2. Causes and countermeasures of the digital divide among the elderly in China

Causes	solutions
Uneven distribution of infrastructure and poverty	Provide financial support
Unfriendly interface design, resulting in difficulties in digital operation	Improve access to the Internet and information systems
Psychological barriers in accepting and applying smart products, limited education level, insufficient digital capabilities, limited confidence in participating in digitalization, and inaccurate expression of demand information	Promote digital literacy
The ability to obtain and use information lags far behind young people, and emotional support is insufficient	Strengthen intergenerational communication
inadequate legal supervision, facing the risk of using the Internet	Strengthen information privacy protection

According to the above discussion, the causes of the digital divide among China's elderly are multifaceted, including economic, educational, legal, social support, family intergenerational support, and digital product design, which require

comprehensive governance from multiple aspects. Specifically, the causes include uneven distribution of infrastructure and poverty; unfriendly interface design, resulting in difficulties in digital operation; psychological barriers in accepting and applying smart products, limited education level, insufficient digital capabilities, limited confidence in participating in digitalization, and inaccurate expression of demand information; the ability to obtain and use information lags far behind young people, and emotional support is insufficient; inadequate legal supervision, facing the risk of using the Internet. In response to these difficulties, the following measures can be taken, including providing financial support; improving access to the Internet and information systems; promoting digital literacy; strengthening intergenerational communication; strengthening information privacy protection.

5 Conclusion

This study aims to understand the characteristics, causes and impact of the digital divide on the quality of life among the elderly in China, and propose targeted solutions. The results of this study show that the digital divide among the elderly in China showing obvious regional and population differences, and the elderly in the central and western regions and rural areas are at a disadvantage in using digital resources. Quantitative methods can be used to study the comprehensive impact of digital applications on the mental health, social interaction and overall life satisfaction of the elderly in the future research, exploring the inherent connections and interactions between these variables, and providing a scientific basis for policy making.

There are many causes for the digital divide among the elderly, including uneven distribution of infrastructure, poverty, unfriendly interface design, psychological barriers in accepting and applying smart products, limited education level, insufficient digital capabilities, limited confidence in participating in digitalization, and inaccurate expression of demand information, insufficient emotional support, and Internet risks. The results of this study also show that providing financial support, improving access to the Internet and information systems, promoting digital literacy, strengthening intergenerational communication, and strengthening information privacy protection are targeted measures to improve the digital divide among the elderly. Although this study provides valuable references for the formulation of policies that are conducive to bridging the digital divide among the elderly, it still has certain limitations. Future research can explore training models suitable for Chinese elderly people, compare the actual effects of community activities and intergenerational mutual assistance, evaluate the role of data security and privacy protection measures in enhancing the elderly's trust in digital services, and explore how to establish a multi-dimensional protection system at the technical, legal, and policy levels to reduce the technical barriers and psychological concerns of the elderly.

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