THE EFFECT OF DIGITAL EMPOWERMENT ELEMENTS ON THE QUALITY OF LIFE AMONG THE ELDERLY IN CHINA WITH THE MODERATION OF GENDER

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SULTAN IDRIS EDUCATION UNIVERSITY

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ABSTRACT

This research aimed to determine the direct effect of digital empowerment elements, namely digital awareness (DA), digital motivation (DM), digital technical access (DTA), and digital competence (DC) on quality of life (QOL) among the elderly in China and the moderation of gender in the effect of digital empowerment elements on QOL. This research employed a quantitative research approach. A sample of 576 elderly individuals aged 60 and above was selected through stratified sampling technique from 10 parks in Shandong Province. Data were collected using a self-administered questionnaire, which was distributed through face-to-face surveys. The Structural Equation Modeling (SEM) technique was employed to test the proposed hypotheses. The findings revealed that DA (β=0.262, p-value=0.000), DTA (β=0.223, p-value=0.000), and DC (β=0.298, p-value=0.000) have a significant and positive effect on QOL, while DM (β=0.045, p-value=0.308) showed no significant effect on QOL. The findings also showed that gender significantly moderated the effect of DA ($\Delta\chi^2$=7.62, p-value=0.006), DTA ($\Delta\chi^2$=19.038, p-value=0.000), and DC ($\Delta\chi^2$=19.59, p-value=0.000) on QOL, whereas it did not moderate the effect of DM ($\Delta\chi^2$=0.119, p-value=0.73) on QOL. In conclusion, digital empowerment plays a crucial role in enhancing the quality of life for the elderly, particularly in China, and efforts to promote digital empowerment should account for gender differences. In terms of implications, to improve the quality of life for the elderly, relevant authorities in China should implement policies that focus on enhancing digital empowerment, with particular attention to digital awareness, digital technical access, and digital competence and all related programs should be gender-sensitive, addressing the unique needs and challenges faced by elderly individuals of different genders to ensure more equitable outcomes.

PENGARUH UNSUR PEMANFAATAN DIGITAL TERHADAP KUALITI HIDUP DALAM KALANGAN WARGA EMAS DI CHINA DENGAN PENYEDERHANAAN JANTINA

ABSTRAK

Kajian ini bertujuan menentukan pengaruh langsung unsur pemanfaatan digital, iaitu kesedaran digital (DA), motivasi digital (DM), akses teknikal digital (DTA), dan kompetensi digital (DC) terhadap kualiti hidup (QOL) dalam kalangan warga emas di China serta penyederhanaan jantina dalam pengaruh unsur pemanfaatan digital terhadap QOL. Kajian ini menggunakan pendekatan kuantitatif. Sampel terdiri daripada 576 orang individu warga emas berumur 60 tahun ke atas yang dipilih menggunakan teknik pensampelan berstrata daripada 10 buah taman di Wilayah Shandong. Data dikumpul menggunakan soal selidik tadbir sendiri, yang diedarkan melalui tinjauan bersemuka. Teknik Permodelan Persamaan Struktural (SEM) digunakan untuk menguji hipotesis yang dicadangkan. Dapatan kajian menunjukkan bahawa DA (β=0.262, nilai p=0.000), DTA (β=0.223, nilai p=0.000), dan DC (β=0.298, nilai p=0.000) mempunyai pengaruh yang signifikan dan positif terhadap QOL, manakala DM (β=0.045, nilai p=0.308) tidak menunjukkan pengaruh yang signifikan terhadap QOL. Dapatan kajian juga menunjukkan bahawa jantina secara signifikan menyederhana pengaruh DA ($\Delta\chi^2$=7.62, nilai p=0.006), DTA ($\Delta\chi^2$=19.038, nilai p=0.000), dan DC ($\Delta\chi^2$=19.59, nilai p=0.000) terhadap QOL, manakala tidak menyederhana pengaruh DM ($\Delta\chi^2$=0.119, nilai p=0.73) terhadap QOL. Kesimpulannya, pemanfaatan digital memainkan peranan penting dalam meningkatkan kualiti hidup warga emas, terutamanya di China, dan usaha untuk mempromosikan pemanfaatan digital harus mengambil kira perbezaan jantina. Implikasinya, bagi meningkatkan kualiti hidup warga emas, pihak berkuasa yang berkenaan di China perlu melaksanakan dasar yang menfokuskan kepada peningkatan pemanfaatan digital, dengan perhatian khusus kepada kesedaran digital, akses teknikal digital, dan kompetensi digital, serta semua program berkaitan perlu bersifat sensitif jantina, menangani keperluan dan cabaran unik yang dihadapi oleh individu warga emas mengikut jantina untuk memastikan hasil yang lebih saksama.

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LIST OF ABBREVIATION

DE	Digital Empowerment
DA	Digital Awareness
DM	Digital Motivation
DTA	Digital Technical Access
DC	Digital Competence
QOL	Quality of Life
HNT	Hierarchy of Needs Theory
HCT	Human Capital Theory
AIOA	Model of Adaptation to ICT in Old Age
WHO	World Health Organization

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter provides a brief explanation of the research. Following the introduction, section 1.2 presents the research background while section 1.3 specifies the research problem. Next, section 1.4 points out the research objective, section 1.5 outlines the research questions, section 1.6 proposes the research hypotheses, and section 1.7 constructs the research framework. Finally, section 1.8 analyzes the research contributions, section 1.9 provides the operational definition of the constructs, while section 1.10 gives the overall structure of this research.

1.2 Research Background

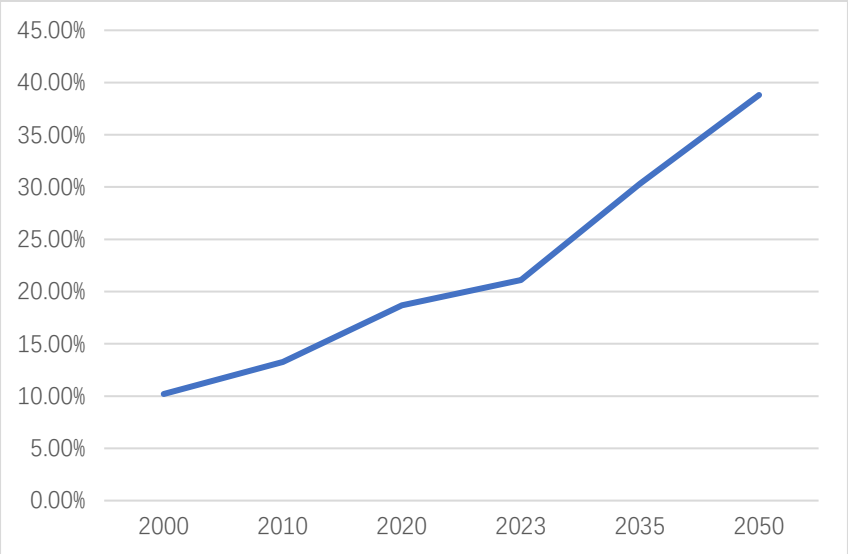
The problem of aging is gradually increasing around the world. The escalating global aging crisis poses enormous challenges to individuals, groups and governments. According to the United Nations' World Population Prospects 2021, the coming demographic changes portend a grim situation. Forecasts show that by 2050, the number of people aged 60 and above in the world will rise to a staggering 2.1 billion (United Nations, 2021). Regional breakdown exacerbates the problem, with projections for Asia, Europe, Latin America/Caribbean, North America and Oceania of 24.4%, 33.6%, 25.0%, 27.0% and 23.5% by 2050, respectively. In Russia, Mexico, India, and South Africa, which have serious population aging problems, the ratios will be 29.9%, 24.6%, 19.1%, and 15.9% respectively (Mondal, 2021). This relentless surge in aging demographics underscores the urgent need for comprehensive intervention to brace societies for the impending global aging crisis.

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 (National Aging Development Bulletin, 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.

Figure 1.1

Trends in the Proportion of China's Population Aged 60 and Above (2000-2050)



Source from Wang & Liu, 2023

According to the data of the seventh national census (2020), Shandong Province has become the province with the largest elderly population, reaching 21.221 million. Studies have shown that the large number of elderly people has brought a series of negative impacts to Shandong Province. The aging population in Shandong Province has led to a decline in the proportion of the labor force, hindered the sustainable development of the economy, and increased the burden on social security (Chen & Xiong, 2023; Zhao, 2024). The increasing demand for medical care and the high incidence of catastrophic health expenditures (60.5%) have led to a decline in health-related quality of life,

especially affecting low-income elderly people who have difficulty accessing medical services (Huang et al., 2022; Li et al., 2023; Zhao et al., 2020). In addition, the aging population in Shandong Province has increased the fiscal burden, had a negative impact on public education fiscal expenditures, and led to a reduction in educational resources (Pan et al., 2022).

According to the above discussion, 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.

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 53rd "Statistical Report on the Development of China's Internet Network" (released in March 2024) by the China Internet Network Information Center (CNNIC), as of December, 2023, China's Internet penetration rate reached 77.5 percent. However, the rapid development of digitalization has inevitably brought about the problem of digital divide. Digital divide refers to the gap in access to

digital technology and the Internet among individuals, families, businesses and geographic regions at different socioeconomic levels (Su & Wu, 2024). The digital divide among the elderly has received widespread attention (Miao, 2023). Bridging the digital divide among the elderly to help vulnerable groups avoid being eliminated by the digital society has become an urgent social issue.

The use of information systems is closely related to the quality of life. The lack of skills in using information technology means that the proportion of elderly people using information, social interaction, shopping and entertainment is lower than that of young Internet users (Xie, 2023). The per capita software installation volume of young netizens is nearly 2.2 times that of the elderly, and the proportion of using WeChat is also three times that of the elderly (Huang, 2020). Due to the lack of information and smart technology, it is difficult for the elderly to obtain life services based on digital technology, which has adversely affected the quality of life.

From the perspective of physical health, with the widespread popularity of paperless registration in hospitals, more and more elderly people face difficulties in making appointments or checking medical examination reports. They often find it difficult to operate self-service registration systems through smartphone medical applications (Wang, 2023), which may lead to delays in medical treatment and treatment. In terms of mental health, some elderly people feel frustrated by obstacles in the use of digital technology, and gradually feel a sense of social isolation, and then choose to withdraw from social activities. Low proficiency in using social media and digital

communication tools has further exacerbated loneliness and anxiety (Zhu, 2023). Moreover, concerning social relationships, the absence of digital skills significantly impedes this demographic from engaging confidently and equitably in social activities, consequently impacting their subjective well-being (Fan & Huang, 2023).

In addition, the digital environment also brings many challenges to the elderly. For example, the design of modules and interfaces of digital education platforms is not user-friendly, which hinders their access to remote learning (Liu, 2023). Some mobile applications have problems such as hidden old version entrances, complex option controls and cumbersome navigation processes, which hinder the elderly from participating in online activities, thus affecting subjective well-being and self-efficacy (Wu & Shen, 2023). In addition, the inability to download taxi applications or complete online payments through smartphones has brought obstacles to travel, further limiting their mobility (Li & Guo, 2023).

In a sense, in the era of technological progress, the lives and well-being of the elderly are moving in the opposite direction, both in terms of physical needs and in terms of feelings (Chai, 2022), especially for rural elderly people (Jiang et al., 2022). The interweaving of digitalization and aging has made social gaps more obvious, and it is urgent to help vulnerable groups learn digital skills and cope with life crises. By taking effective measures to enhance the digital empowerment of the elderly, social equity can be better promoted.

1.3 Research Problem

Due to the absence of a unified definition of digital empowerment (Chen & Zhuo, 2019; Wu & Zhong, 2022; Yao, 2021), most existing studies treat it as an entirety. Many researchers equate digital empowerment with advanced digital technologies, such as big data, artificial intelligence, and cloud computing (Wu et al., 2023; Ying, 2022). Only few studies have focused on the digital empowerment elements (Akkoyunlu, 2011; Mäkinen, 2006; Safira & Irwansyah, 2019). Although some research has explored its underlying mechanisms, including empowerment subjects, means, scenarios, and outcomes (Xu, 2022), there remains a significant gap in understanding the internal mechanisms of digital empowerment, which highlights the necessity to study digital empowerment elements.

In the era of coexistence of digitalization and ageing, many researchers have recognized the profound impact of digital technologies on the lives of the elderly. Many studies have conducted investigations of the quality of life among the elderly (Gao et al., 2022; Wang, 2022; Zin et al., 2020), and the digital divide has been proven to exist among older people (Miao, 2023; Wang, 2023; Liang & Luo, 2023). However, these studies mainly start with information system application and are dedicated to bridging the digital divide among the elderly, without providing an accurate and comprehensive relationship between the use of digital technology and quality of life. Little attention was focused on both favorable and unfavorable predictors of quality of life among the elderly (Nopour et al., 2023).

In China, there are relatively few studies on digital empowerment of the elderly. The existing research mainly focuses on the effect of digital empowerment on elderly education, smart elderly care, and elderly consumption (Zhou et al., 2023; Pan, 2023; Chen, 2023; Wu, 2023; Hao, 2022; Li et al., 2021), as well as its overall contributions (Jing, 2023; Zhao, 2022; Nam, 2022), However, the concept of quality of life has been ignored. Although some researchers have recognized digitization, informatization, big data, and artificial intelligence significantly influence the quality of life, and have examined the effects of the digital economic environment, new media applications, Internet use, and smartphone use on the quality of life among the elderly (Hui, 2021; He & Shi, 2021; Wang, 2022; Liu et al., 2022), the concept of digital empowerment has been overlooked. The above concepts are all related to digital empowerment, but they differ considerably in terms of subjects, target groups, tools, and objectives (Chen & Zhuo, 2019). These limitations highlight a clear research gap, underscoring the necessity to examine the effect of digital empowerment on the quality of life among the elderly.

In an effort to enhance the digital capabilities of young learners, several studies have developed and validated digital empowerment measurement tools for students (De, 2018). Moreover, some researchers have targeted specific subgroups by creating measurement tools, such as for college students (Akkoyunlu et al., 2010) and primary school students (Kong et al., 2019). Additionally, to boost the overall digital proficiency of society, De and Singh (2017) developed a digital empowerment scale for individuals. Despite these advances, little attention has been paid to developing similar tools for the

elderly. As a vulnerable group in society, the elderly people are facing varying degrees of digital divide. Adapting and validating an instrument for measuring the digital empowerment of the elderly is of significant value in addressing this research gap.

Digital gender differences have been demonstrated in many studies (Bernhard & Kübler, 2023; Fauziah et al., 2023; Sun & Zhou, 2022; Wang et al., 2022; Peng & Dong, 2020). Although gender affects the level of digital empowerment (Martínez-Cantos, 2023; Wang et al., 2022), there is a lack of evidence that gender moderates the effect of digital empowerment or its elements on quality of life among the elderly. Therefore, empirical research confirming the moderating effect of gender on digital empowerment on quality of life can provide valuable reference for formulating corresponding policies to address the digital gender gap.

In summary, there are four research problems. First, most of the existing literature focuses on digital empowerment as a entirety, and few studies are specific to its elements (Wu et al., 2023; Ying, 2022; Akkoyunlu, 2011; Mäkinen, 2006; Safira & Irwansyah, 2019). There is a lack of research on the internal mechanism of digital empowerment. Second, the existence of digital divide among the elderly has been confirmed (Miao, 2023; Wang, 2023; Liang & Luo, 2023), emphasizing the impact of digital empowerment on elderly education, smart elderly care, and elderly consumption (Zhou et al., 2023; Pan, 2023; Chen, 2023; Wu, 2023; Hao, 2022; Li et al., 2021), but the concept of digital empowerment only involves advanced digital technologies such as big data and artificial intelligence (Hui, 2021; He & Shi, 2021; Wang, 2022; Liu et al., 2022), and does not

provide an accurate and comprehensive relationship between digital empowerment elements and quality of life. Third, digital empowerment measurement tools for students have been developed and validated (Akkoyunlu et al., 2010; De, 2018; De & Singh, 2017; Kong et al., 2019), but few have been developed for the elderly. Fourth, although gender differences in digital empowerment exist (Martínez-Cantos, 2023; Wang et al., 2022), there is a lack of evidence that gender moderates the effects of digital empowerment or its elements on the quality of life among the elderly.

1.4 Research Objectives

The main objective of this research is to determine how digital empowerment could improve the quality of life among the elderly in China. Specifically, this research seeks:

RO1: To determine the effect of digital empowerment elements [digital awareness (DA), digital motivation (DM), digital technical access (DTA), and digital competence (DC)] on quality of life (QOL) among the elderly in China.

RO2: To determine the moderating effect of gender in the effect of digital empowerment elements [digital awareness (DA), digital motivation (DM), digital technical access (DTA), and digital competence (DC)] on quality of life (QOL) among the elderly in China.

1.5 Research Questions

This research seeks to provide answers to the main question, which is how to improve the quality of life among the elderly in China through digital empowerment. Accordingly, this research will address the following research questions:

RQ1: How do digital empowerment elements [digital awareness (DA), digital motivation (DM), digital technical access (DTA), and digital competence (DC)] affect the quality of life (QOL) among the elderly in China?

RQ2: Does gender moderate the effect of digital empowerment elements [digital awareness (DA), digital motivation (DM), digital technical access (DTA), and digital competence (DC)] on quality of life (QOL) among the elderly in China?

1.6 Research Hypothesis

Overall, eight hypotheses are proposed to provide answers to the main research question, which can be classified into two groups. The first group consists of four hypotheses on the direct effects, which aim to achieve the first research objective (RO1) and provide answers to the first research question (RQ1). The proposed hypotheses are as follows:

H1: Digital awareness (DA) significantly affects quality of life (QOL).

H2: Digital motivation (DM) significantly affects quality of life (QOL).

H3: Digital technical access (DTA) significantly affects quality of life (QOL).

H4: Digital competence (DC) significantly affects quality of life (QOL).

The second group of hypotheses consists of four hypotheses on the moderating effects, which aims to achieve the second research objective (RO2) and provide answers to the second research question (RQ2), namely:

H5: Gender significantly moderates the effect of digital awareness (DA) on quality of life (QOL) among the elderly in China.

H6: Gender significantly moderates the effect of digital motivation (DM) on quality of life (QOL) among the elderly in China.

H7: Gender significantly moderates the effect of digital technical access (DTA) on quality of life (QOL) among the elderly in China.

H8: Gender significantly moderates the effect of digital competence (DC) on quality of life (QOL) among the elderly in China.

1.7 Research Framework

This research is to look more deeply at the human needs and resources. Therefore, Maslow's Hierarchy of Needs (HNT) can be used as underpinning theory of this research. This research also constructed the relationship of digital empowerment elements on quality of life, hence, Human Capital Theory (HCT) is an appropriate support theory. Blažun's Information and Communication Technology (ICT) Adaptation Model for Older Adults (AIOA) demonstrates the effect of ICT interaction on the quality of life among

older adults. The formulation of this research framework is based on HNT, HCT, and AIOA (Chmielewska, 2022; Lai, 2023; Wei & Zhang, 2021; Blazun, 2013).

HNT is a psychological theory of motivation. Referring to Maslow's Hierarchy of Needs Explained (Hopper, 2020), 24 items of the four dimensions of QOL (WHO, 2012) were classified in this research, forming the five levels of the pyramid. Maslow believed that people need to learn new information and better understand the world around them because learning more about the world can help us feel safer. Maslow also believed that this call to understand the world around us is also an innate need (Hopper, 2020). Therefore, in the context of digitalization, the elderly are motivated to learn to use digital technologies by their surroundings and when their needs are met, they will be able to achieve a certain level of quality of life (Rock et al., 2022).

Digital awareness (DA) is explained as the safe and responsible use of digital technologies (Corradini & Nardelli, 2021; Vidal Ferré et al., 2022), which includes not only the active use of digital tools in learning, communication, and entertainment (Khanal et al., 2021), but also being aware of online risks, being able to identify the reliability of social media, protecting personal data, and avoiding cyberbullying, online fraud, gaming addiction and pornography (Chibbaro et al., 2019; Corradini & Nardelli, 2020; Aldawood & Skinner, 2020). Therefore, digital awareness involves bringing convenience to learning and life, improving life satisfaction, and avoiding the physical and psychological harm caused by various online risks (Aldawood & Skinner, 2020). The above discussion provides the possibility for H1 to be proposed.

Digital motivation (DM) refers to an individual's confidence in learning and using digital technologies, and the use of software-based solutions to change, enhance, or sustain people's attitudes and behaviors, such as gamification, persuasive technologies, and entertainment computing (Shahri et al., 2020). There are many motivations for older adults to learn digital technologies, such as to avoid relying on others to use technology, to help grandchildren and their studies, to find a new job, or to stay informed (Martínez-Alcalá et al., 2021). However, in essence, the elderly's digital motivation comes from their awareness of the advantages of the Internet and their own actual needs (Li, 2021). Therefore, digital motivation plays an important role in the development of digital capabilities and the use of digital technologies (Vermote et al., 2020), which further affects need satisfaction and subjective life satisfaction. Therefore, it provides a basis for the proposal of H2.

Digital technical access (DTA) involves the access of hardware, software and networks (Ng et al., 2023; Litchfield et al., 2021; Alhassan & Adam, 2021). Some researchers also believe that computing equipment, digital literacy and Internet access are considered three key components of digital access (Ng et al., 2022). It has proven to be a key factor in bridging the digital divide (Litchfield et al., 2021), and has enabled the elderly to benefit from various aspects such as finance, medical care, and travel. In particular, telemedicine has improved physical health for the elderly (Haimi & Gesser-Edelsburg, 2022; Chu et al., 2022). Additionally, it has been proven that access to ICT has a positive impact on quality of life (Alhassan & Adam, 2021). Therefore, DTA is a

need for the elderly to integrate into the digital society in the digital age, which can improve quality of life. Based on the above discussion, H3 is proposed in this research.

Digital competence (DC) refers to the knowledge, skills and abilities to use digital products confidently, critically and responsibly in study, work, life and social participation (Liu, 2022; Slodkowski et al., 2022; Hu et al., 2023). The improvement of DC will improve the psychological health of the elderly (Kou, 2023; Liu & Xie, 2021; Buckingham et al., 2023). Specifically, in order to escape social isolation and emotional loneliness, the elderly are willing to use technological resources to improve their digital capabilities, which is considered an important factor affecting the quality of life (Murciano-Hueso et al., 2022). To sum up, DC improve the quality of life by maintaining necessary social interactions, delaying cognitive decline, improving information participation capabilities, meeting health needs, etc. (Wu & Yang, 2021). The above discussions provide evidence for H4.

In addition, this research constructed the relationship between digital empowerment elements (DA, DM, DTA, and DC) and quality of life (QOL). According to HCT, education is the basis for improving human capital, and education investment has a huge impact on the development of individuals and society (Fang, 2024). Through education investment, individuals gain more knowledge, skills and expertise, thereby obtaining better employment opportunities and higher income, which affects the quality of life. In addition, the improvement of quality of life in turn increases education investment, thereby promoting personal competence.

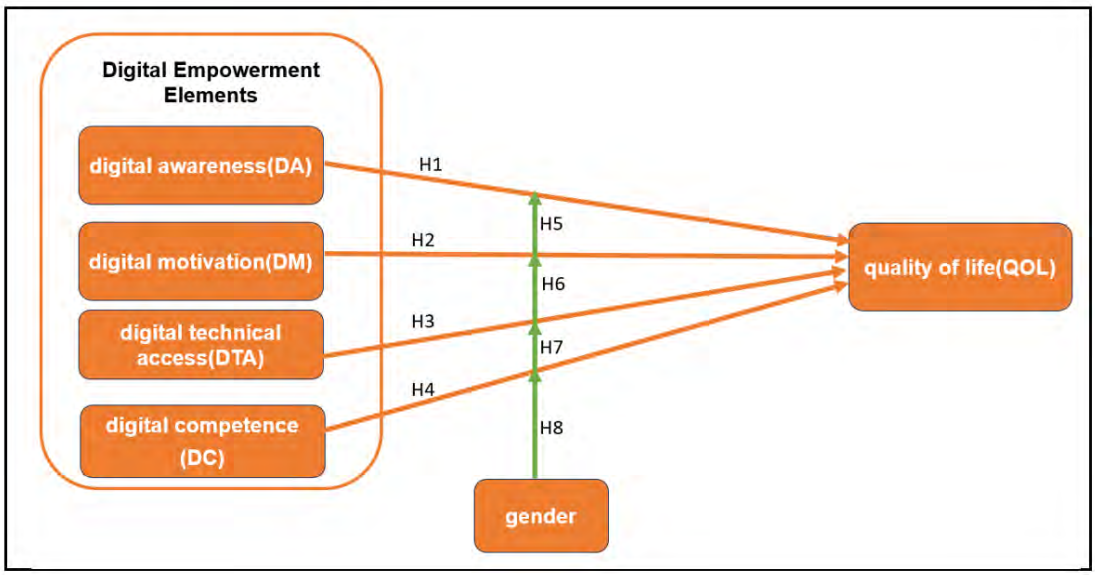
In China, education and training courses offered by senior universities and communities are the most common ways for the elderly to improve their digital competence, which can help them narrow the digital divide, and integrate into the digital environment (Su, 2024; Wu, 2023). Education can improve human capital level (Hao, 2023). In the context of digitalization, HCT helps explain the elderly invest time and money to improve their digital competence through training and learning, thereby improve labor productivity at work or in life, and ultimately improve economic status and quality of life (Chen, 2024).

Blažun's ICT Adaptation Model for the Elderly (AIOA) consists of four stages: willingness, community, lifelong learning and outcomes, and the content of each stage is divided in detail. The elderly become equal members of the digital age by continuously learning to use ICT, and ultimately achieve personal empowerment, which affect their quality of life (Blazun, 2013). The effect of digital empowerment elements (DA, DM, DTA, and DC) on QOL are powerfully explained in the AIOA model.

Many researchers believe that when digital technology gradually becomes popular, the digital gender gap still exists (Martínez-Cantos, 2023; Wang et al., 2022; Peng & Dong, 2020). The digital gender divide is not only reflected in the gap in digital usage, but also in digital skills (Sun & Zhou, 2022; Fauziah et al. 2023) and confidence (OECD, 2020). Therefore, gender is proposed as a moderator (H5, H6, H7, H8) variable in this research. Figure 1.2 shows the conceptual framework of this research.

Figure 1.2

Conceptual Framework



1.8 Research Contributions

This research provides the operational definitions of digital awareness (DA), digital motivation (DM), digital technical access (DTA), digital competence (DC), and quality of life (QOL) (Vidal Ferré, et al., 2021; Vidal Ferré et al., 2022; Karakuş & Kılıç, 2022; Beardsley et al., 2021; Kurniasih et al., 2022; Ng et al., 2023; Litchfield et al., 2021; Alhassan & Adam, 2021; Holguin-Alvarez et al., 2021; Colombo-Ruano & Gonzalez-Gonzalez, 2022; WHOQOL User Manual, 2012). By clarifying these core concepts, it provides a basis for the theoretical construction of the relationship between digital

empowerment elements and quality of life among the elderly. In addition, the clarification of the concepts of the four dimensions of digital empowerment for the elderly provides a theoretical basis for policymakers and social service agencies, enabling them to more accurately grasp the opportunities and challenges faced by the elderly in digital age, and then formulate more targeted public policies and service measures to improve the quality of life and social participation of the elderly.

This research expands Blazun's model of elderly people adapting to AIOA (Blazun, 2013) to explain the impact of digital empowerment elements (DA, DM, DTA, and DC) on QOL among the elderly. ICT covers all communication equipment or application software: such as televisions, mobile phones, computers, network hardware and software, and various services and application software related to them. In recent years, the emergence of advanced digital technologies such as artificial intelligence, the Internet of Things, and big data has gradually made people's lives move from digitalization to intelligence. Wearable devices, robots, etc. have gradually become digital devices for the elderly to assist in their elderly care. Therefore, in the current context of the times, this research expands the application of this model. AIOA decomposes the process of elderly people adapting to ICT by elements as an internal driving force affecting quality of life. This research also highlights AIOA as an alternative model that other researchers can adopt when studying the relationship between digital empowerment and quality of life. There is little evidence on the applicability of digital empowerment elements, and this research demonstrates the

applicability of AIOA in explaining the effect of digital empowerment elements on quality of life among the elderly.

Digital empowerment scales for students are adopted and slightly adapted to fit the elderly in this research (Akkoyunlu et al., 2010; De & Singh, 2017; De, 2018; Kong et al., 2019). The dimensions of DA, DM, DTA, and DC are examined, and the validity and reliability of the measurement scale used to measure these dimensions are verified. Therefore, the validated scale can provide a reliable source of research information for future researchers to conduct in-depth studies on digital empowerment. In addition, this research adopts and adapts the quality of life scale for the elderly based on the Chinese cultural background (Bowling, A., 2013). After all items are tested for reliability and validity, it can provide a measurement tool for empirical research on quality of life of Chinese elderly people.

Additionally, a few literatures have indicated the moderating role of gender on the effect of digital empowerment on quality of life (Hasan & Linger, 2019; Hwang et al., 2023; Adnan & Özbek, 2023; Soundararajan et al., 2023; Bernhard & Kübler, 2023). However, there is a lack of empirical evidence. Therefore, through testing the moderating effect of gender in the effect of digital empowerment elements (DA, DM, DTA, and DC) on QOL among the elderly in China, this research contributes to a deeper understanding of the effect of digital empowerment elements on quality of life. This can not only fill the gaps in theoretical and empirical research in the existing literature, but also provide scientific basis for relevant policymakers. The research results are expected to provide

new perspectives and strategic suggestions for promoting digital equal empowerment and promoting balanced digital development for all elderly people, thereby promoting the coordinated development of the digital economy and the overall well-being of society in a more comprehensive way.

The results of this research have certain policy contributions. When formulating policies related to quality of life, policymakers should consider providing digital infrastructure suitable for the elderly, and targeted investments should be devoted to developing hardware and software for digital products to create a more convenient and smarter digital society. Furthermore, having affordable access to digital technologies (through lower broadband costs, lower smartphone prices, etc.) will enable the elderly to enhance their capabilities, prevent social exclusion, and enhance digital inclusion, thereby promoting their quality of life. According to the existing research results, there is a digital divide among the elderly (Wang & Zhang, 2021). This research can provide a reference for decision-making to improve the quality of life among the elderly by narrowing the digital divide. The research contributions are summarized in Table 1.1.

Table 1.1

Contributions of This Research

Area of Contribution	Level of Contribution	
	Replication	**Extension**
Conceptual	-Clarify the concept of digital access (DA), digital motivation (DM), digital technical access (DTA), and digital competence (DC), and quality of life (QOL)	-
Methodological	-Verify the validity and reliability of scales to measure digital empowerment elements [digital access (DA), digital motivation (DM), digital technical access (DTA), and digital competence (DC)] and quality of life (QOL) among the elderly	-Test the applicability of Adaptation to ICT in the Old Age model (AIOA) in digital empowerment context -Test the effect of the moderator
Empirical	-Confirm the correlation between digitalization and quality of life	-Verify the effect of digital empowerment elements on quality of life, moderating the effect of gender
Practical	-Provide accurate and comprehensive guidance for developing policies about quality of life in the field of information systems	-Provide a tool to evaluate quality of life

1.9 Operational Definition

1.9.1 Quality of Life

Quality of life (QOL) refers to the individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns (WHOQOL User Manual, 2012). Hence, in the context of this research, QOL relates to how the elderly perceive the wellbeing of his/her life concerning the health, happiness, relationships, and the cultural and social context in which they live.

1.9.2 Digital Empowerment

Digital empowerment (DE) refers to groups or individuals achieving independent development in study, work and life through advanced digital technologies such as mobile Internet, artificial intelligence, Internet of things, and can effectively use digital skills to participate in and express themselves in the network society (Wu et al., 2023; Wu & Zhong, 2022; Chen & Zhuo, 2019; Akkoyunlu et al., 2010; Makinen, 2006). Therefore, in this research, digital empowerment is related to how the elderly use digital technology to achieve learning, life, social participation, and social expression.

1.9.2.1 Digital Awareness

Digital awareness refers to the individual's awareness of the opportunities and risks associated with digital technologies and the environment, including reliable information, digital citizenship, cybersecurity, data protection, etc (Vidal Ferré, et al., 2021; Vidal Ferré et al., 2022; Karakuş & Kılıç, 2022; Akkoyunlu, 2011). Therefore, in this research, digital awareness refers to the elderly's perceptions of a range of opportunities and risks associated with digital technologies and environments.

1.9.2.2 Digital Motivation

Digital motivation refers to an individual's attitudes, interests, values and self-confidence in using digital technologies to achieve goals (Calderón et al., 2020; Beardsley et al., 2021; Kurniasih et al., 2022; French et al., 2019; Wan, 2019). Therefore, in this research, digital motivation refers to the elderly's attitudes, interests, values and self-confidence in using digital technologies to achieve goals.

1.9.2.3 Digital Technical Access

Digital technology access refers to the necessary hardware, software, and Internet services for accessing technological applications (Ng et al., 2023; Litchfield et al., 2021; Alhassan & Adam, 2021). Therefore, in this research, digital technical access refers to the necessary hardware, software, and Internet services for the elderly to access technological applications.

1.9.2.4 Digital Competence

Digital competence refers to the knowledge, skills and ability to use digital products, involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, life, and social participation (Holguin-Alvarez et al., 2021;

Colombo-Ruano & Gonzalez-Gonzalez, 2022; Bustillo et al., 2022). Therefore, in this research, digital competence refers to the knowledge, skills, and abilities of the elderly to use digital products confidently, critically, and responsibly in study, life, and social participation.

1.9.3 The Elderly

The elderly refers to people aged 60 and above (WHO, 2020; “Law of the People's Republic of China on the Protection of the Rights and Interests of the Elderly”, 2018). Therefore, in this research, the elderly refers to Chinese citizens aged 60 and above.

1.10 Research Structure

This research is divided into five chapters. Chapter 1 introduces the issue related to the topic under investigation and explains the basic idea of the research. Chapter 2 critically reviews the relevant literature about digital empowerment elements (digital awareness, digital motivation, digital technical access, and digital competence) and quality of life, identifies essential constructs for the proposed framework, and formulates hypotheses to be tested. Chapter 3 describes the research methodology adopted to test the proposed hypotheses. Chapter 4 presents and interprets the empirical results drawn from hypothesis

testing. Chapter 5 discusses the main finding of the research; points out the research limitations and implications, and offers recommendations for future research.

1.11 Summary

This chapter introduced the issues related to the research topic and explains the basic idea of the research. This chapter begins by discussing the background of the research and delving into the issues surrounding digital empowerment elements and quality of life among the elderly, and highlighting gaps in the existing literature. The research background highlights three aspects. First, the issue of aging. Aging is a social crisis that many countries in the world are facing, especially in China, which has the largest elderly population in the world. According to statistics, China's elderly population has exceeded 20% now. And this problem will become more and more serious in the future. Second, there is digital divide among the elderly. Due to physical functions and cognitive ability decline, there is a gap between the elderly and digital empowerment. This prevents the elderly from enjoying the digital convenience, lead to social inequality. Third, the quality of life among the elderly has become the focus of world attention. There is an urgent need to care for the vulnerable groups.

Next, two research questions were proposed. First, how do digital empowerment elements [digital awareness (DA), digital motivation (DM), digital technical access (DTA), and digital competence (DC)] affect the quality of life (QOL) among the elderly

in China? Second, Does gender moderate the effect of digital empowerment elements [digital awareness (DA), digital motivation (DM), digital technical access (DTA), and digital competence (DC)] on quality of life (QOL) among the elderly in China? In light of these two questions, two research objectives were determined, and eight hypotheses were proposed, consisting of four direct effects and four moderating effects.

The underlying theory is Maslow's Hierarchy of Needs Theory (HNT) in this research. It includes a five-level model of human needs. The elderly continues to meet their needs at all levels through digital empowerment.The supporting theory is Human Capital Theory (HCT). According to HCT, education and training are the basis for improving human capital. Through education investment, workers gain more knowledge and skills, thereby obtaining better employment opportunities and higher income, which can affect their quality of life. Blažun's ICT Adaptation Model for the Elderly (AIOA) has shown that ICT interaction significantly affects the quality of life among the elderly, which helped to propose the conceptual framework. The digital empowerment elements (DA, DM, DTA, and DC) were powerfully explained in this model.

Next, anticipated research contributions were analyzed, including conceptual, methodological, empirical, and managerial areas. Seven operational definitions were explained, including quality of life (QOL), digital empowerment (DE), digital awareness (DA), digital motivation (DM), digital technical access (DTA), digital competence (DC), and the elderly. Finally, an overview of the research's general structure is explained and

the summary is presented. The next chapter provides a comprehensive review of existing literature about digital empowerment elements (digital awareness, digital motivation, digital technical access, and digital competence) and quality of life among the elderly and detail the theoretical framework and hypothesis development.