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Digital Divide and Social Integration of Rural Elderly People

-- A Grounded Theory Analysis

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Abstract. In the digital era, digital technology has developed rapidly and has filled every aspect of people's lives. However, older people, especially those in rural areas, encounter many difficulties using digital technology and lack appropriate digital skills. Research on the digital divide among older people has mainly focused on the causes and mechanisms of the digital divide, with a relatively simple perspective. Few studies deal with the digital divide for rural elderly people, and the coverage is minimal. This study explores the characteristics of the digital divide among rural elderly people, the primary and secondary factors that contribute to the digital divide, and the differences within the rural elderly people groups. We use the grounded theory method to conduct one-on-one interviews with older people over 60 in a village in the eastern coastal region, then coding the interview data at three aspects. By analyzing the interview data, we find some characteristics. First, influenced by various factors, rural elderly people have significant individual differences in the use of digital technology. Second, the digital divide phenomenon of rural elderly people in the eastern coastal areas with better economic development is not so serious. Many older people have digital devices and can use digital technology. Third, the government is absent in the digital divide among rural elderly people. Fourth, the smart devices and purposes used by rural elderly people are relatively single. Our study opens up a new perspective on the study of the digital divide. In addition, from the perspective of the multiple integration of the individual, society, and government, this study is significant to help rural elderly people eliminate the digital divide and integrate into the digital society.

Keywords: Digital Divide; Social Integration; Rural Elderly People; Grounded Theory.

1. Introduction

The 21st century is an era of rapid population aging, and countries worldwide generally face the status quo of population aging. At the same time, global informatization is also developing rapidly. Digital technology is penetrating every aspect of our lives and changing our lifestyles. However, the development of digital technology tends to be more favorable to young people, and older people tend to be marginalized in digital development (Pirhonen et al., 2020). The young generation of digital natives has grown up in digital technology, while the middle-aged generation of digital immigrants has gradually learned and adapted to digital technology (Marc, 2001). Especially, older people have become the leftovers of the digital era and seem to have been abandoned by the digital era. Digital technology is developing rapidly, but the life of older people is facing a variety of obstacles. Older people cannot acquire the corresponding digital skills and are excluded from digital life, and their social integration faces multiple dilemmas, especially in rural areas. We have seen social news such as “an older man was refused to pay for his health insurance with cash in the rain” and “a 94-year-old man was picked up for face recognition.” Therefore, helping older people eliminate the digital divide and integrate into the digital society is significant.

The first is the origin of the digital divide. The digital divide refers to inequalities in digital utilization and is a gap in people's digital access, skills of use and ability to innovate (Liao et al., 2022). The term digital divide originated in Toffler's book *The Shift in Power*. The United States was the first country to begin studying the digital divide. The second is the conception of the digital divide. The digital divide is the gap between those with access to new forms of information technology and those without (Gunkel, 2003; Van Dijk, 2006). The third is the three-tiered digital divide. They are listed

as digital access divide, digital capability divide, and digital outcome divide (Adhikari et al., 2017; Aydin, 2021). The digital access divide encompasses both hardware access and software use, and it focuses on differences in people's equipment conditions for Internet access and use (Wei et al., 2011). The digital capability divide, which refers to the unequal ability to use information technology by those who already have access to information and communications technology, is concerned with the ability to use digital information technology (Dewan & Riggins, 2005). The digital outcome divide relates to gaps in the ability of individuals to translate Internet access and use into favorable offline outcomes (Van Deursen & Helsper, 2015). The digital outcome divide occurs when having digital skills and using the Internet do not lead to beneficial outcomes (Scheerder et al., 2017). From a global perspective, the research on the digital divide mainly focuses on the first two levels, while the research on the third level of the digital divide is just starting.

The first is the current status of research on the digital divide among older people. In the digital divide research field, scholars have focused more on gender and regional digital divide, while paying less attention to the digital divide in older people (Jun, 2020; Rosales & Fernández-Ardèvol, 2020; Yuan & Jia, 2021). In the existing research on the digital divide of older people, scholars mainly focus on the causes and mechanisms of the digital divide. The second is the causes of the current digital divide among older people. Older people may be reducing their use of Internet digital technology to protect their privacy (Loges & Jung, 2001). The inability to pay for equipment and services and the lack of motivation and interest in using new technologies can create a digital divide for older people (Olphert & Damodaran, 2013). Besides, older people often lack the basic digital literacy needed to use multimedia interactive devices with touchscreen technology, which is the main reason why they experience the digital divide (Blažič & Blažič, 2020; Lee & Kim, 2019). The combination of racial/ethnic minorities and low socioeconomic status is also a source of the digital divide (Yoon et al., 2020). In short, the digital divide among older people is influenced by personal factors such as age, sex, health, income, education, motivation, and social factors such as social background (Friemel, 2016).

Limitations of existing literature. Through the review of previous literature, scholars' research on the digital divide of older people mainly focuses on the causes and mechanisms of the digital divide (Gilleard & Higgs, 2008; Niehaves & Plattfaut, 2014; Wang et al., 2023; Wu et al., 2015; Yu et al., 2016), and the perspective is relatively simple. In addition, few previous studies have involved the digital divide of rural elderly people groups, and the scope of research coverage is also limited.

Based on the grounded theory, this study studies the digital divide and social integration of rural elderly people. Considering that rural elderly people have less access to the Internet, this study uses a qualitative research method to conduct field surveys and interviews with older people in R Village, Shaoxing City. The grounded theory is used to code the collected data in three levels to explore the current situation, causes, and mechanism of the digital divide and social integration of rural elderly people. From the perspective of the multiple integration of the individual, society, and government, the research aims to help rural elderly people eliminate the digital divide and better integrate into technological society. We innovatively explore the contradiction between rural elderly people and the development of the digital society, as well as individual differences among rural elderly people. It explores how to improve the quality of life of rural elderly people and help them better integrate into the digital society.

2. Research Process

2.1. Method and Material

Grounded theory is a research method. The method requires the researcher to make no theoretical assumptions before the start of the study and to rise to a systematic theory directly through practical observation and empirical generalizations in collecting and analyzing data (Dunne, 2011). It is based on the systematic collection of information to find the core concepts, which reflect the essence of the

phenomenon of things and then construct the relevant social theories through the connection between them. It abstracts new concepts and ideas from empirical facts. Grounded theory introduces quantitative research tools in qualitatively dominant research. In grounded theory research, the data collection methods, such as the interview method, are qualitative. However, grounded theory includes steps such as recording, analyzing, and coding in the data analysis stage, which have quantification characteristics. It combines the depth and richness of qualitative research with the logic, rigor and systematic analysis inherent in quantitative research (Walker & Myrick, 2006).

The research process of grounded theory can be divided into six steps from bottom to top, including original materials, defining the concept, coding, categorizing, test saturation, and theoretical construction. Step-by-step coding of data is an essential part of grounded theory, which includes three types, such as open coding, axial coding, and selective coding (Douglas, 2003). The research process of grounded theory is illustrated in Figure 1.

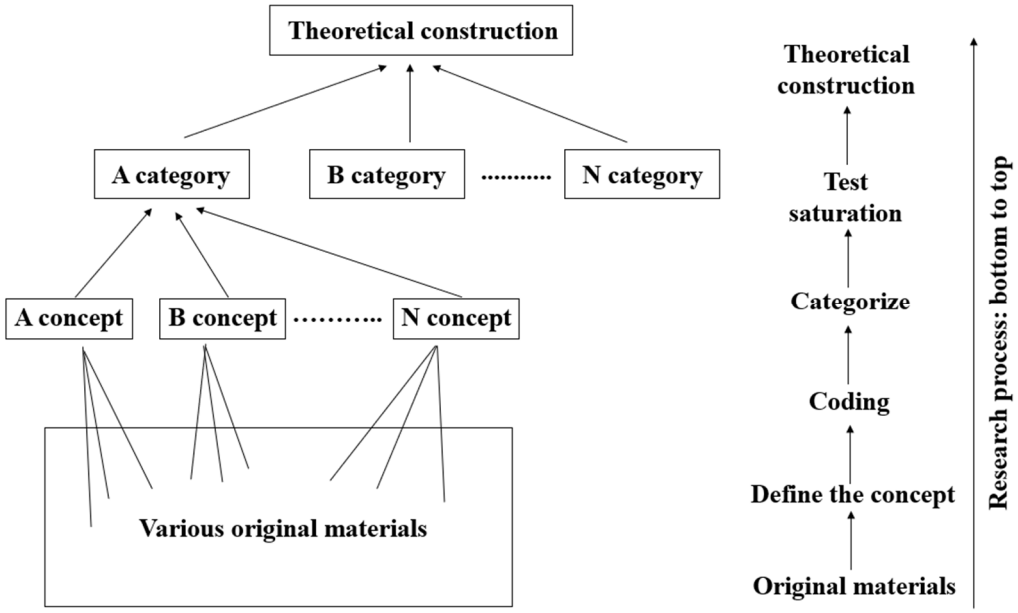

Fig 1. The research process of grounded theory

2.2. Research Design

2.2.1. Specific Implementation Method

This study utilizes the grounded theory research method in conjunction with ageism theory to explore the digital divide and social integration of rural elderly people. Based on reviewing a large amount of relevant literature, field research was conducted on older people over 60 years old in R Village, Shaoxing City. R Village is a moderately economically developed village on the eastern coastal region of China. It has a large number of older people, all of whom are locals, and a relatively even distribution of older people in terms of age and gender (there are older people of all ages, a relatively equal proportion of men and women, and a slightly larger number of female older people), making it representative of villages along the eastern coastal region of China. To explore the digital divide among rural elderly people more deeply, we took the form of one-on-one interviews. This method ensures that both sides can understand each other better, and the investigator can gain the necessary data. Coding the data and constructing a theoretical framework to explore the current situation and causes of the digital divide among rural elderly people, and what can be done to help rural elderly people eliminate the digital divide.

2.2.2. Data Source

A total of 20 older people (11 males and 9 females) from R village were interviewed for this study. There are some clear answers to the question of "how many cases should be interviewed for qualitative research." Charles C. Ragin says that graduate student dissertations generally look like this: Master's thesis: 20, doctoral thesis: 50. Whether there are enough cases to interview depends on "saturation." When there is no more new information, saturation has been reached, and the interview can be terminated (Guest et al., 2006). The information has reached saturation in the interviews of these 20 older people, so the interview cases are sufficient. All of these older people are over 60 years old and have different educational qualifications and occupations. Among these 20 people, there are 9 people with primary and secondary school education or below, 4 people with junior high school education, 1 person with technical secondary school education, 1 person with junior college education, and 5 people with high school education. There are 4 farmers, 3 factory assembly line workers, 3 individual industrial and commercial tenants, 1 sanitation worker, 1 factory laboratory analyst, 1 factory workshop supervisor, 1 janitor,1 canteen worker, 1 teacher, 1 village secretary, 1 factory owner, 1 banker, and 1 vehicle salesman. Unstructured interviews with 20 interviewees were conducted to dig deeper into the use of smart devices and the current status of digital life among rural elderly people.

3. Coding Process

3.1. Open Coding: Extract Concept

Open coding is breaking up data, assigning concepts, and then putting it back together in a new way. Open coding encodes the content of the original data verbatim, abstracting and summarizing the initial concepts from a large amount of rich and fragmented data. Through the interviews, 30 initial concepts were analyzed and generalized from the collected data. They are age, gender, health status, marital status, children's status, living status, imprint of times, highest education, years of education, major, occupational type, job position, job seniority, total assets, economic structure, frequency of use, use fields, use skills, feelings of use, impact on life, digital access dilemma, digital capability dilemma, digital outcome dilemma, "digital welfare refugees", self-study, intergeneration feedback, government, neighbors, friends, and volunteers.

3.2. Axial Coding: Define Main Categories

Axial coding is the classification and analysis of the initial concepts after the completion of the open coding. It mainly focuses on discovering and establishing various organic links between primary and secondary conceptual categories, and identifying various logical and hierarchical relationships between them. By categorizing the previous 30 initial concepts, they were merged into 14 main categories. They are physiological characteristics, family background, imprint of times, educational background, job situation, economic situation, characteristics of using smart devices, digital impact, use dilemmas, "digital welfare refugees", individual pathway, intergenerational feedback, government pathway, and social pathways.

3.3. Selective Coding: Define Core Categories

Compared to other categories, core categories dominate and can encompass most research results within a relatively broad theoretical scope. The core categories play the role of "guiding the outline." We generalized the previous 14 main categories into three core categories in the selective coding. They are digital portraits, digital functions, learning pathways.

3.4. Test Saturation

When organizing the text content generated by the interviews, three core categories, including digital portraits, digital functions, learning pathways, and 14 main categories and 30 initial concepts, were

discovered through interviews with the first 16 older people. It was found that no new category of information content appeared during the interview with the 16 older people. However, to ensure the study's credibility, we still selected four older people for interviews again and did not find any new important information. From this, it can be seen that the research conclusion has good saturation.

4. Causes of Digital Divide of Rural Elderly People

4.1. Digital Portraits

The digital portrait depicts people by collecting, analyzing, and processing various data about them. It is a way of revealing the characteristics of the characters through their depiction. When studying the digital divide of rural elderly people, digital portraits help us know basic information about older people, such as age, gender, educational background, social background, etc. The digital portraits of rural elderly people enable the identification of different characteristics between their individuals and enable further exploration of the factors influencing the digital divide of rural elderly people. The use of digital technology is influenced by age, marital status, education, and health (Charness & Boot, 2009; Heart & Kalderon, 2013). These factors are crucial in the digital divide between rural elderly people. These factors contribute to inequalities in rural elderly people's access to and use of digital devices. The interview data shows that digital portrait factors that play an important role in the rural elderly people's digital divide are physiological characteristics, family background, imprint of times, educational background, job situation, and economic situation (see Fig. 2).

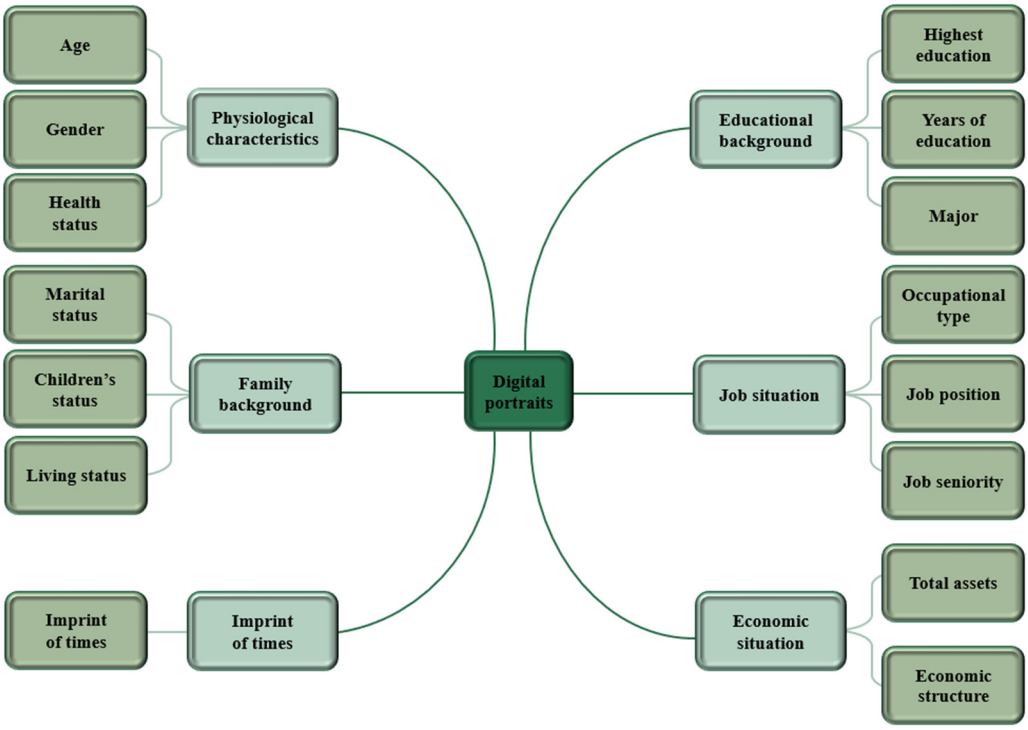

Fig 2. Digital portraits causing the digital divide of rural elderly people

4.1.1. Physiological Characteristics

Physiological characteristics are mainly reflected in age, gender, and health status. Generally speaking, younger and healthier older people are more likely to use smart devices and are more energetic to learn about digital technology. The decline of older people's physical functions, such as vision, hearing and memory, directly affects their use and operation of smart devices. Difficulties in learning digital technology give rise to powerlessness and psychological resistance among older people, creating a fear of digital technology. Compared to other factors, gender has less of an impact on the use of digital technology among rural elderly people, and most studies have not found gender

differences in digital technology access and use (Gazibara et al., 2015; Graham, 2010; Neves & Amaro, 2012). However, these factors must be combined to make a more convincing analysis.

4.1.2. Family Background

Family background mainly includes marital status, children's status, and living status. People are generally more likely to seek help from those close to them. When older people have digital difficulties, they are more likely to find someone to turn to if they live with families. Conversely, if an older person lives alone, he may have difficulty finding someone to help him with his digital difficulties. Suppose family members care less about older people over the use of digital technology and do not have the time and patience to guide them in the use of smart devices. In that case, older people will enter a digital divide, hindering their digital technology integration.

4.1.3. Imprint of Times

The imprint of times symbolizes the cultures and characteristics of that era. Each generation has different imprints of times and cultures. Different imprints of times and cultures create different personalities and lifestyles of different generations. The older people I interviewed were mainly born in the 1940s and 1950s. At that time, digital technology was not well developed, and rural elderly people had little access to smart devices and no skills to use them. Therefore, with the rapid development of digital technology today, these older people who have not kept up with the progress of digital technology can quickly become “digital refugees” (Liu et al., 2021; Wu et al., 2021). They face huge dilemmas in integrating into the digital era. Their use of digital technology lags behind the pace of development of digital technology itself, forming a huge gap.

4.1.4. Educational Background

Educational background also significantly impacts the digital divide of older people. Older people with a higher level of education usually have a greater capacity to learn than those without. They tend to be more willing and able to access and use digital technology more quickly. At different levels, younger and more educated people use the mobile Internet, especially smartphones, compared to feature phones owned by less educated and older people (Puspitasari & Ishii, 2016). Indeed, I found in this survey that older people with junior high school education and above use smartphones. In comparison, older people with elementary school education and below generally use feature phones. Their educational background makes a huge difference in their use of smart devices.

4.1.5. Job Situation

Job situation includes occupational type, job position, and job seniority. The use of digital technology varies among older people engaged in different occupations. From the interview data, it was found that farmers seldom use smart devices. They use feature phones, while enterprise workers, self-employed business people, and village cadres use smartphones and sometimes other digital products such as computers. Some occupations have mandatory requirements for the use of digital technology. For example, many administrative personnel in enterprises need to be able to use computers, so rural elderly people who worked in such occupations before retirement rarely have a digital divide in using digital technology. Older people usually have a higher economic and social status if they have a higher job position and seniority, and they are more capable and more easily integrated into the new digital era than others.

4.1.6. Economic Situation

Differences in economic situations contribute to discrepancies in the use of digital technology among older people. People with higher incomes can afford to buy digital devices and use them more frequently than people with lower incomes, while people with lower incomes lack opportunities to acquire digital devices (Cuervo & Menéndez, 2006; Lindblom & Räsänen, 2017). The economic situation is a critical factor contributing to the inequality of rural elderly people in the digital divide. Purchasing smart devices can be financially stressful for many rural elderly people, so they are less

willing to invest their money in purchasing smart devices. It leads to a discrepancy between such older people and those rural elderly people who can pay for smart devices.

4.2. Digital Functions

By analyzing the interview data, we find that rural elderly people have a lot of characteristics and current situations in the contact and use of digital technology. The combined effects of the above factors in digital portraits have resulted in significant differences and polarization among older people regarding their contact and use of digital technology. The digital devices most commonly used by older people in the village are mainly mobile phones, some using smartphones and others using feature phones. The older people who use smartphones believe that they don't experience any digital divide and can use all their smartphones' functions. In contrast, those who use feature phones think they can only make calls and have many difficulties using digital devices. Based on the analysis of the interview data, digital functions include characteristics of using smart devices, digital impact, use dilemmas, and "digital welfare refugees" (see Fig. 3).

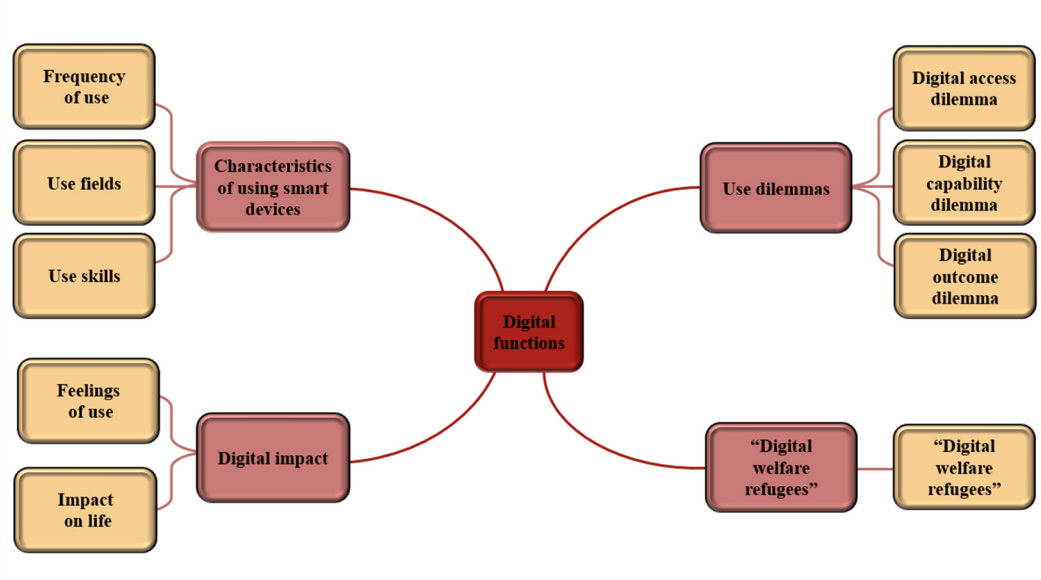

Fig 3. Digital functions of rural elderly people with digital divide

4.2.1. Characteristics of Using Smart Devices

Mobile phones are the primary digital devices older people use in the village. As mentioned earlier, some older people use smartphones, and others use feature phones. Two-thirds of older people I interviewed own a smartphone, and one-third of older people use a feature phone. The older people who use feature phones are deficient in using digital devices and are almost incapable of using anything. The other group of older people who use smartphones, although they think they can use almost all the software, mainly focus on a few apps and use them for a single purpose, just for simple entertainment or basic living needs. Compared to young people, some older people don't use smartphones as often. They prefer other activities, such as chess and square dancing.

4.2.2. Digital Impact

Most older people expressed a positive attitude towards the development of digital technology and thought it to be convenient. For older people who do not have smartphones, digital technology does not affect their lives as much, but they also get some convenience, such as being able to call their children who are far away. Older people with smartphones get a lot of convenience in their lives, such as scanning codes for payment and watching short videos on their smartphones for entertainment. But there is no denying that there are still some digital challenges in practice. Rural elderly people who hardly use any digital technology rarely enjoy the dividends of the digital era.

4.2.3. Use Dilemmas

Use dilemmas are reflected in the digital access dilemma, digital capability dilemma, and digital outcome dilemma. Many of the older people I interviewed own some digital devices and can use some digital devices, and there is no big problem with access to digital technology or the use of skills. So, the digital access and capability dilemmas are not major dilemmas. However, their use of digital technology does not produce beneficial outcomes or positive effects. Therefore, the digital outcome dilemma is the main dilemma for them. At the same time, the differences within the rural elderly people groups lead to different older people facing different digital dilemmas. The majority of rural elderly people who can access and use digital devices face mainly the digital outcome dilemma. In contrast, those who can hardly access and use digital devices face three dilemmas, including digital access, capability, and outcome dilemmas.

4.2.4. "Digital Welfare Refugees"

Digital welfare is a variety of welfare policies introduced by the government to eliminate the digital divide and social inequality. Digital welfare policies include internet infrastructure construction and skills training. The goal of many forms of digital welfare is to provide a humanized and holistic service that is affordable, sustainable, efficient, and inspiring, leaving room for voluntary action (Coles-Kemp et al., 2020). Internet infrastructure is inadequate in rural areas, and there is also almost little digital skills training for rural elderly people. Inadequate Internet infrastructure and a lack of training in digital skills have contributed to rural elderly people becoming "digital welfare refugees." It dramatically hinders the integration of rural elderly people into digital life.

4.3. Learning Pathways

There are multiple learning pathways when faced with digital technology problems. Different social subjects significantly impact rural elderly people's elimination of the digital divide and integration into the digital society. Through communication and interaction with different subjects, rural elderly people can solve digital problems, improve digital skills, and narrow digital disparities and inequalities. Learning pathways comprise individual pathway, intergenerational feedback, government pathway, and social pathways (see Fig. 4). Among them, self-study and intergenerational feedback are the main learning pathways.

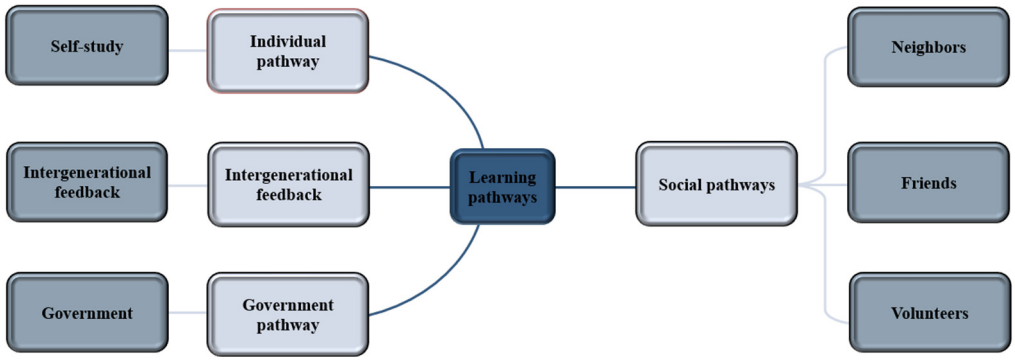

Fig 4. Learning pathways of digital technology

4.3.1. Individual Pathway

According to the results of data analysis from interviews, it was found that many older people use smartphones for self-study. On the one hand, this is because their children are not around, and they cannot easily find someone to help them with their digital usage difficulties. On the other hand, because they have some ability to learn digital skills. This segment of rural elderly people usually does not experience systematic training in digital technology and is learning independently and

figuring things out as they use their smart devices. Older people can increase their confidence in using digital technology through self-study.

4.3.2. Intergenerational Feedback

In addition to self-study, intergenerational feedback is another major learning pathway, mainly among older people living with their children. Family support is critical for older people to adopt new technologies (Hill et al., 2008). Intergenerational feedback within the family is an essential channel for eliminating the digital divide and promoting the social integration of older people. Intergenerational feedback from family members, especially children, can provide more direct and practical support for older people. Information sharing and intergenerational interaction within the family can fully motivate older people to adapt to digital life.

4.3.3. Government Pathway

The reason for the digital divide is not in the technology itself but in the lack of support for digital training of older people (Dickinson & Gregor, 2006). Strengthening digital training can help older people eliminate the digital divide (Ma et al., 2020). However, the older people I interviewed said they did not receive any training in digital skills, so the government is absent. The lack of digital skills training for older people in rural areas has led to government failures that hinder rural elderly people's integration into the digital society. Providing digital technology infrastructure and related training by the government to help rural elderly people enjoy an intelligent life is a fundamental way to eliminate the digital divide.

4.3.4. Social Pathways

Older people can ask their neighbors or friends for help when they have difficulties using digital devices. Volunteers also assist older people in using smart devices. For example, volunteers are often found in hospital lobbies next to the machines guiding older people in registering and paying their bills. In some urban areas, some volunteers specialize in providing digital technology instruction to older people in their communities. However, such activities are lacking in rural areas. Therefore, investing in social efforts in rural areas is crucial to eliminate the digital divide for older people in villages.

4.4. Interaction of Elements

There are interactions between the various factors. A better educational background leads to a better job situation, and a better job situation leads to a better economic situation. So, rural elderly people with good educational backgrounds, job situations and economic situations are more likely to be able to afford and use smart devices. Living status has an impact on learning pathways. Rural elderly people who live with their children learn digital skills mainly through intergenerational feedback. In contrast, those who live alone learn mainly through self-study or occasionally by seeking help from their neighbors. Older people in rural areas who live with their children can have more interaction and communication between them and their children, who can teach them how to use their smart devices, help them improve their digital skills and give play to the family's intergenerational information feedback capabilities. Age and health status affect the willingness of rural elderly people to access smart devices. Rural elderly people who are younger and in good health status have more energy to access and use smart devices than rural elderly people in bad health status, and they use smart devices more frequently.

Various primary and secondary factors lead to a digital divide among rural elderly people. In digital portraits, primary factors such as educational background, job situation, and economic situation contribute to significant individualized differences in digital skills among older people. Many factors in digital portraits are innate conditions that cannot be changed. But we can help rural elderly people eliminate the digital divide by providing digital skills training. Older people are more satisfied and willing to adopt new technologies and digital applications when they accept some technology training or support (Tsai et al., 2017). High digital literacy benefits health literacy and welfare (Fazeli et al.,

2013). Eliminating the digital divide and integrating rural elderly people into the digital society requires joint actions by the individual, society, and government.

5. Conclusion and Discussion

By analyzing the interview data, the following characteristics are found: (a) Influenced by various factors, mainly educational background, job situation, and economic situation, rural elderly people have significant individual differences in using digital technology. Some older people hardly use digital technology, while other owns digital devices and can use digital technology. (b) The digital divide phenomenon of rural elderly people in the eastern coastal areas with better economic development is not so serious. Many older people have digital devices and can use digital technology. (c) Government is absent. And the government provides little digital skills training for rural elderly people. Rural elderly people also seldom enjoy the dividends of the digital welfare policies offered by the government. (d) The smart devices used by rural elderly people are relatively single, with most of them using smartphones instead of other smart devices, such as computers. In addition, among those who have smart devices and can use them, they use them for a single purpose, mainly focusing on some apps, such as WeChat and TikTok, to meet entertainment or basic life needs.

The digital divide harms the lives of older people in rural areas and is also not conducive to social development and progress. The following recommendations are made from the perspective of the multifaceted integration of the individual, society, and government: (a) At the individual level, older people should overcome their fear and anxiety about digital technology, increase their confidence, and actively participate in learning digital technology. In addition, when faced with digital challenges, rural elderly people can be proactive and seek help from those around them. (b) At the social level, we should actively help older people around us to solve digital technology problems. Intergenerational feedback from children can provide the most direct help to older people, with children being able to guide them in using digital devices through direct communication and interaction. Learning exchanges with neighbors and friends can also help rural elderly people improve their learning efficiency, and peer learning is also essential. In addition, establish volunteer organizations to visit rural elderly people regularly to help them with digital skills. In developing and designing smart devices, it is important to consider the actual situation of older people and develop smart devices that are more friendly to older people. (c) At the governmental level, the government should consider the orientation of value rationality instead of convenience and efficiency. And the needs of older people and disadvantaged groups deserve to be valued. Besides, the government provides digital skills training to rural elderly people. Focus on older people who can't use digital technology and reduce the individual differences among older people. The government should strengthen the construction of digital infrastructure, incorporate digital information services into free essential public services, and improve the accessibility of digital information services to rural elderly people. Every older person should be able to enjoy the digital dividend.

This study has some limitations. This study provides a framework to recognize the digital divide phenomenon in a specific region and compensate for or improve the situation, thus giving older people more technological, digital, and generational benefits. This study focuses on the digital divide of the rural elderly people, and there is room for further research on the digital divide of other groups. Therefore, future research may be based on this theoretical framework to study the digital divide of other groups, such as people with disabilities, in more detail.

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