DEVELOPMENT OF STRATEGIES TO PROMOTE SUSTAINABLE INFORMATION LITERACY AMONG THE ELDERLY IN XI'AN CITY

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A thesis paper submitted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy Program in Educational Management for Sustainable Development

Academic Year 2025

Thesis Title Development of Strategy to Promote Sustainable Information Literacy among the Elderly in XI'AN City

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ABSTRACT

The objectives of this research were: 1) to study the current situation of information literacy among the elderly in Xi'an city; 2) to develop strategies for information literacy among the elderly in Xi'an city; 3) to evaluate the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city. This study employed a mixed-methods research design. This study adopted systematic sampling method and selected 384 elderly people from 5 communities in Xi'an city as the sample group, using the Krejcie and Morgan and 10 interview experts and 8 evaluation experts, using purposive sampling method. The research instruments included 1) Questionnaire; 2) Interview form; 3) Evaluation form. Data analysis included Index of Item-Objective Congruence (IOC), Percentage, Mean, Standard deviation. Statistical analysis revealed an objective consistency index (IOC) is 1, and ensure the reliability of the questionnaire.

The study found that: 1) the current situation of information literacy among the elderly in Xi'an city was at a high level; 2) the study developed 42 strategies for improving information literacy among the elderly in Xi'an city, including 9 for information awareness, 10 for information knowledge, 9 for information competence, and 14 for information ethics; 3) the feasibility and adaptability of these strategies for information literacy were evaluated at the highest level. The study revealed that in

information awareness recorded the highest mean and standard deviation among the four variables, indicating that the elderly in Xi'an city possess a strong level of information awareness. Consequently, the strategies proposed also demonstrate the highest feasibility and adaptability.

Keywords: Sustainable development strategies, Information literacy, The elderly

ชื่อเรื่อง	**กลยุทธ์การพัฒนาเพื่อส่งเสริมการรู้เท่าทันสารสนเทศอย่างยั่งยืน ของผู้สูงอายุในเมืองซีอาน**
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สาขาวิชา	**การจัดการการศึกษาเพื่อการพัฒนาที่ยั่งยืน**
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บทคัดย่อ

การศึกษาวิจัยนี้มีวัตถุประสงค์หลัก 1) เพื่อศึกษาสถานการณ์ปัจจุบันของการรู้เท่าทันสารสนเทศ อย่างยั่งยืนของผู้สูงอายุในเมืองซีอาน 2) เพื่อพัฒนากลยุทธ์เพื่อส่งเสริมการรู้เท่าทันสารสนเทศ อย่างยั่งยืนของผู้สูงอายุในเมืองซีอาน และ 3) เพื่อประเมินความเหมาะสมและความเป็นไปได้ของกลยุทธ์เพื่อส่งเสริมการรู้เท่าทันสารสนเทศอย่างยั่งยืนของผู้สูงอายุในเมืองซีอานการวิจัยนี้เป็นการวิจัยแบบผสมผสาน (Mixed Methods Research) กลุ่มตัวอย่างในการวิจัยนี้ ได้แก่ผู้สูงอายุในเมืองซีอาน จำนวน 384 คน ซึ่งคัดเลือกด้วยวิธีการสุ่มตัวอย่างแบบเป็นระบบ (Systematic random sampling) ใช้ตาราง Krejcie และ Morgan และใช้การคัดเลือกแบบเจาะจง (purposive random sampling) ในการเลือก ผู้เชี่ยวชาญสำหรับสัมภาษณ์ จำนวน 10 คน และผู้บริหารระดับสูงสำหรับอภิปรายกลุ่มสนทนา จำนวน 8 คน เพื่อประเมินความเหมาะสมและความเป็นไปได้ของกลยุทธ์ เครื่องมือที่ใช้ในการวิจัยประกอบด้วย 1) แบบสอบถาม 2) แบบสัมภาษณ์ 3) แบบกลยุทธ์ และ 4) แบบประเมินผลกลยุทธ์ สถิตที่ใช้ในการวิเคราะห์ข้อมูล คือ ค่าดัชนีความสอดคล้อง (IOC) ค่าร้อยละ ค่าเฉลี่ย ค่าเบี่ยงเบนมาตรฐาน และการวิเคราะห์เนื้อหา ผลการวิเคราะห์ความเชื่อมั่นของแบบสอบถาม พบว่าค่าดัชนีความสอดคล้องกับวัตถุประสงค์ (IOC) เท่ากับ 1 และยืนยันความเชื่อมั่นของแบบสอบถาม

ผลการวิจัยพบว่า 1) สถานการณ์ปัจจุบันของการรู้เท่าทันสารสนเทศอย่างยั่งยืนในกลุ่มผู้สูงอายุในเขตเมืองซีอานอยู่ในระดับสูง 2) การพัฒนากลยุทธ์เพื่อส่งเสริมการรู้เท่าทันสารสนเทศของผู้สูงอายุในเมืองซีอาน รวม 42 ข้อ ซึ่งจำแนกออกเป็น 4 ด้าน ได้แก่ ความตระหนักด้านสารสนเทศ 9 ข้อ ความรู้ด้านสารสนเทศ 10 ข้อ ทักษะด้านสารสนเทศ 9 ข้อ และ จริยธรรมด้านสารสนเทศ 14 ข้อ 3) ความเหมาะสมและความเป็นไปได้ของกลยุทธ์การรู้เท่าทันสารสนเทศที่พัฒนาขึ้นนี้ได้รับการประเมิน

ว่าอยู่ในระดับสูงสุด และจากผลการศึกษามีข้อเสนอแนะ ด้านการตระหนักรู้สารสนเทศมีค่าเฉลี่ยและส่วนเบี่ยงเบนมาตรฐานสูงที่สุด เมื่อเทียบกับตัวแปรทั้งสี่ แสดงให้เห็นว่าผู้สูงอายุในเมืองซีอานมีระดับการตระหนักรู้สารสนเทศในระดับสูง ดังนั้น กลยุทธ์ที่พัฒนาขึ้นมีความเป็นไปได้และมีความเหมาะสมในการนำไปใช้จริงได้อย่างมีประสิทธิภาพในระดับสูงที่สุด

คำสำคัญ : การพัฒนาที่ยั่งยืน การรู้เท่าทันสารสนเทศ ผู้สูงอายุ

Acknowledgements

I would like to express my heartfelt gratitude to Thailand's higher education system for providing me with a valuable opportunity to study in this vibrant and multicultural land. During the process of pursuing my doctoral degree, I not only gained rich academic knowledge and research ability, but also deeply experienced the unique social customs of Thailand.

I would like to express my special gratitude to my supervisor, Assistant Professor Dr. Areeya Juichamlong. Her profound knowledge, rigorous academic attitude and tireless guidance have exerted a significant influence on my research work. Whenever I encountered difficulties and challenges, the teacher always patiently provided support and encouragement, enabling me to overcome obstacles and continue moving forward.

Express my gratitude to my doctoral committee for their invaluable suggestions on my research. I am particularly thankful to Associate Professor Dr.Sunate Thaveethavomsawat and Assistant Professor Dr. Phisanu Bangkheow, whose professional insights and wisdom have greatly enriched my research outcomes.

Thank you to my family, whose meticulous love and support are the solid backing for me to complete my study. During my long academic exploration and writing process, they always give me understanding, encouragement and comfort.

Additionally, I would like to express my gratitude to my classmates and friends. They have shared academic insights with me, grown together through mutual learning, and provided selfless support and joy in our daily lives. Your companionship has allowed me to feel the warmth of home even while abroad.

I extend my deepest thanks to everyone who has offered assistance and encouragement.

Hui Shan

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Chapter 1
Introduction

Rationale

The global population aging process is advancing at an accelerated pace. Since the beginning of the 21st century, the rapid development of information technology has injected strong new impetus into the economic growth of various countries and transformed people's lifestyles. However, the problem of population aging has become increasingly severe. The aging phenomenon exists to varying degrees across the world, and it has evolved into a major issue of high common concern to governments, academic circles and all sectors of society globally. On 11 July 2024, the Population Division of the United Nations Department of Economic and Social Affairs released its latest report on the occasion of the 35th World Population Day (World Population Prospects, 2024).

The global population aged 65 and above will reach 2.2 billion by the end of 2070, while the number of the advanced-aged population aged 80 and above is projected to exceed 265 million in the mid-2030s. The "China Development Report 2020: Development Trends and Policies of Chinese Population Aging" released by the China Development Research Foundation, the period from 2035 to 2050 is China's aging. By 2050, the number of people aged 65 and above in China is projected to reach 380 million, accounting for nearly 30% of the country's total population. The size of the population aged 60 and above will approach 500 million, making up more than one-third of the total population (Development Report, 2020).

China's elderly population has a rapid growth rate, and under the surface of the rapid growth of the elderly population. According to the data of China's seventh national population census, the number of people aged 60 and above in China has reached 280 million, accounting for 19.8% of the country's total population. Among this group, the size of the population aged 65 and above stands at 209 million, with

a proportion as high as 14.9%, which shows that the current situation of Chinese population aging is not optimistic (National Bureau of Statistics, 2022).

China's Xi'an has a population of 1.02 million elderly people over the age of 60. The international community is deeply aware that global aging will have an important impact on the development of the world, so the United Nations at the 45th session of the General Assembly will be October 1st as the "International Day of the Elderly" every year, and in 1992, the conference determined 1999 as the International Year of the Elderly, in order to remind countries to pay great attention to the elderly and the issue of the elderly. At the same time, the international community has also put forward the concepts of "healthy aging" and "active aging", reflecting the keen concern for aging. It is urgent to pay attention to the issue of aging, and it is the responsibility of the country and even every citizen (Xi'an Bureau of Statistics, 2024).

The elderly group is a special social group, they are rich in life experience and wisdom ability, but the objective factors of the development of the times lead to them after entering the old age life seems to be at a loss and out of place, and detachment from social production has a huge impact on their social role positioning. Under the influence of the dual factors of declining physical function and declining social function, the elderly group has a sense of loss of being marginalized. Information technology plays an important role in modern society and is a product of certain time and space conditions. reshape the social role of the elderly group, and provide help for the elderly group to achieve "old people have fun" and "old people have something to do" (Development Report, 2020).

After retirement, the income level, consumption power, and savings level of the elderly have been reduced to a large extent, resulting in the lack of effective protection of physical health, various chronic diseases, and the quality of life in later life cannot be guaranteed. What is even more terrifying is that the rapid changes in people's lifestyles in the information society, the unfamiliarity with various electronic products and information technology make it difficult for the elderly. Therefore, an

effective way to solve the survival dilemma of the elderly group is to improve the information literacy level of the elderly group (Yu ping et al, 2015).

On the one hand, for the elderly, good information literacy can help the elderly actively integrate into the life of the information society. On the other hand, for the society, allowing the elderly to have good information literacy can further develop the resources of the elderly, and it can alleviate the contradiction between the low level of social productivity and the high requirements of medical and health security in the aging population, which is of great significance to promoting China's economic development and social harmony. In a word, having good information literacy can alleviate the problem of population aging, alleviate social contradictions, and promote the harmonious development of society while improving the quality of life of the elderly group (Guan Fengchu, 2023).

The Education Development Plan for the Elderly (2016-2020) clearly points out that the development elderly education can not only help the elderly enrich their spiritual and cultural life and enhance their sense of social participation, but also effectively alleviate the social pressure brought by population aging, laying a solid foundation for building a more inclusive and harmonious social environment (The Education Development Plan for the Elderly, 2020). The report of the 20th National Congress of the Communist Party of China proposed to build a smart society, and now information technology and artificial intelligence have penetrated into all aspects of daily life. The whole society generally enjoys the convenience brought by information network technology to life, and the problem of information poverty among the elderly should also receive more attention (Report of the Chinese Government, 2022).

Information literacy is that humans should have in an information society. In the information society, people of all ages cannot ignore the topic of information literacy. The interests and quality of life of the elderly are also affected by their own information quality. Good information literacy is an important means for the elderly to integrate into the information age. It can not only help them access a wide range

of information resources, such as news, health knowledge, and cultural activities, but also enable them to communicate and interact more effectively with family, friends, and society. With good information literacy, the elderly can use various digital devices and applications, like smartphones, tablets, and social media platforms.

In 1983, China established the first university for the elderly, in 1988, the Association of Universities for the Elderly was established, and in 2017, the State Council promulgated the "13th Five-Year Plan for the Development of National Aging Undertakings and the Construction of the Pension System", which pointed out that China should form a new pattern of education for the elderly in 2020 (Pan Zheng & Lu Yuhui, 2025).

Since then, China has begun to formally incorporate the issue of the elderly into its national development plan. The 21st century is the era of the dominance of the information network, profoundly changing the way people live and produce, the possession and application of information and knowledge has become the standard to measure the strength level of individuals, enterprises and even countries, and countries with more information will have more say in the world pattern. A computer has simple computing, writing, searching, and translation functions, including information, current affairs and news, and other rich and diverse resources, which can meet people's needs in all aspects of online learning, shopping, chatting, medical treatment, consultation, etc (Yue Ziqi, 2021).

At the same time, with the gradual implementation of the national delayed retirement policy, entering old age does not mean ending work, and the elderly group needs to master the corresponding information knowledge and skills to meet the needs of work. Under this development trend, if the elderly group wants to improve the meaning of life, they cannot stay out of the information society, otherwise they will become the victims of the information society. It can be seen that having good information literacy is the "passport" for the elderly to integrate into the trend of information society with a positive and confident mental outlook. China's "Law on the Protection of the Rights and Interests of the Elderly" stipulates

that the goal of the work for the elderly is to achieve “the elderly have support, medical care, work, fun, and learning” (Dong zhiying, 2008).

In China, the elderly face deficiencies in four dimensions of information literacy: information awareness, information knowledge, information competence, and information ethics. In terms of information awareness, the elderly know the value of being information-conscious, often preferring to rely on traditional channels such as television and newspapers instead. Regarding information knowledge, such as technologies and functionalities. When it comes to information skills, some older individuals experience challenges in using smart devices, including slow operation speed and low accuracy in performing tasks. As for information ethics, many lack sufficient awareness, leaving them vulnerable to privacy leakage in unsafe online environments (Jiang Xiamei, 2020).

In summary, with the advent of the digital era, enhancing the information literacy of the elderly is of significant importance. To further promote the sustainable development of their information literacy, achieve the sustainable development goals set by the United Nations, and ensure lifelong learning opportunities for older adults, this study focuses on the elderly. It analyzes the current status of their information literacy. Furthermore, the study proposes a series of sustainable and replicable strategic frameworks.

Research Questions

1. What is the current situation of information literacy among the elderly in Xi’an city?

2. What are the strategies for improving the information literacy among the elderly in Xi’an city?

3. How to evaluate whether the strategies of information literacy among the elderly in Xi’an city are feasible and adaptable?

Objectives

1. To study the current situation of information literacy among the elderly in Xi'an city.

2. To develop strategies for information literacy among the elderly in Xi'an city.

3. To evaluate the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

Scope of the Research

Population and the Sample Group

Population

The population of elderly people over 60 years old in Xi'an city is 1.02 million (Xi'an Bureau of Statistics, 2024). According to the government report, this study selected 1.02 million elderly people from five communities as the total population.

The Sample Group

The Sample of Questionnaire Group

Based on the sampling table compiled by Krejcie and Morgan in 1970, the sample group of this study consisted of 384 elderly individuals from five communities in Xi'an city, and used by systematic sampling. The five communities that have been selected comprise the following: Beilin community, Lianhu community, Yanta community, Weiyang community, and Baqiao community.

The Sample of Interview Group

The interview group was composed of 10 experts selected from China. The experts were selected using purposive sampling, and based on the following criteria: 1) More than 10 years of community work experience; 2) A background in education; 3) Willingness to participate in interviews; 4) Holding an associate professor or higher academic title. The selection process focused on identifying professionals with relevant knowledge and practical experience in the field, thereby enhancing the reliability and validity of the data collected during the interviews.

Strategies Evaluation Expert Group

There were 8 experts were invited to evaluate the strategies, 8 experts used a purposive sampling method, who met the following qualifications: 1) experts who have been engaged in information literacy education management for more than 20 years; 2) have the professional title and PhD. Degree, that specifically targeted individuals with relevant expertise and experience in the field.

The Variable

Independent Variable

According to the analysis of related theories and research, independent variables are as follows:

1. Information awareness
2. Information knowledge
3. Information competence
4. Information ethics

Dependent Variable

Development of Strategy to Promote Sustainable Information Literacy among the Elderly in Xi'an City.

Contents

1. Study the current situation of information literacy among the elderly in Xi'an city. A survey questionnaire was designed and distributed to five communities in Xi'an, with a total of 384 questionnaires issued. Based on the connotation of information literacy, the questionnaire is divided into four dimensions: information awareness, information knowledge, information competence, and information ethics (Report of the Chinese Government, 2022).

2. Develop strategies for information literacy among the elderly in Xi'an city. The strategies were formulated using methods such as SWOT-PEST and TOWS analysis, involving interview forms with 10 experts to refine the proposed measures (Li Jiaping, 2024).

3. Evaluate the feasibility and adaptability of the strategies for information literacy among the elderly in Xi'an city, invited 8 experts from five communities in China to evaluate the feasibility and adaptability of the strategy (Ding Hongling, 2022).

Time

The study was conducted mainly from September 2024 to February 2026 with the following time points:

1. Submit the first three chapters of the proposal in September 2024.
2. Study the current situation of information literacy among the elderly in Xi'an city in March 2025.
3. Develop strategies for information literacy among the elderly in Xi'an city in April 2025.
4. Evaluate the feasibility and adaptability of the strategies for information literacy among the elderly in Xi'an city by 8 experts in May 2025.
5. Summarize the research results, complete the paper in February 2026.

Advantages

1. To the elderly: Fully recognize the importance of information literacy, take the initiative to learn information technology and related knowledge, improve information skills, and master key security knowledge such as identifying various forms of online fraud and protecting personal sensitive information.

2. To community: Actively organize information literacy training activities. The training content covers a variety of basic digital skills, including the basic operation of smartphones, the use of mobile payment, online shopping processes, the application of commonly used social software, as well as knowledge of network security protection. Help these groups gradually overcome barriers to the use of digital technologies.

3. To Elderly care center: Information such as the daily activity schedules of nursing homes, the allocation of medical resources, notifications of health lectures, and appointments for personalized services can be conveniently inquired and obtained through smart terminal devices such as smartphones and tablet computers.

This reduces resource waste caused by information asymmetry and promotes the refined development of elderly care services.

4. To government: Formulate targeted policies and measures. Meanwhile, it is necessary to strengthen the construction of information infrastructure, continuously expand network coverage, improve the accessibility and convenience of digital services, and ensure that the elderly can easily access various digital resources.

Definition of Terms

Strategies Development refers to the planning and decision-making process in which an organization or individual analyzed and planed the external environment and internal resources in order to achieve their vision, competitive advantage, sustainable development. Through comprehensive analysis, formulate targeted and feasible decisions to ensure that all measures for the digital development of the elderly are implemented in an orderly manner, truly helping them bridge the digital divide and integrate into the digital era (Cheng Xianping & Yang Shujun, 2016).

Sustainable development of elderly education refers to adopting a diversified teaching model that integrates online and offline approaches, as well as classroom learning with practical experiences, tailored to the learning characteristics and needs of older adults. It involves leveraging digital technology to develop online courses and learning platforms specifically designed for the elderly (The Education Development Plan for the Elderly, 2020).

Elderly refers to individuals with a physiological age of 60 years old and above, as defined by demographic standards. Physiological age is determined based on an individual's physiological state, physiological functions, and the corresponding physiological indicators that reflect these conditions (Development Report, 2020).

Information literacy refers to a comprehensive evaluation composed of four dimensions: information awareness, information knowledge, information competence and information ethics. The elderly with high information literacy have the consciousness to actively capture information, the knowledge to understand and

distinguish information, the ability to process and apply information, and the morality to release and share information (SuJing, 2002).

1. Information awareness refers to the sensitivity of the elderly to information and their ability to judge the value of information, serving as a core component of information literacy. It reflects an individual's understanding, attitude, and value orientation toward information in an information-driven society, effectively acquire, discern, utilize, and create information.

2. Information knowledge refers to the cognitive understanding of concepts, principles, methods, and technologies related to information among the elderly. It emphasizes systematic knowledge accumulation across the processes of information production, transmission, processing, and application.

3. Information competence refers to the comprehensive practical skills of effectively acquiring, evaluating, integrating, applying, and creating information, with particular emphasis on the integration of technical operation, critical thinking, and innovative application among the elderly.

4. Information ethics refers to the elderly should follow the entire process of information activities, ensuring that the application of information technology and sustainable development. Information ethics focuses on mitigating data-related risks in the digital environment.

Research Framework

To formulate sustainable development strategies for the information literacy of the elderly in Xi'an city. First, the researcher conducted preliminary questionnaire surveys and interviews to gather data on the current situation of the elderly across four dimensions: information awareness, information knowledge, information competence, and information ethics. Second, based on theoretical research on community sustainable development and sustainable development of information literacy among the elderly, the researcher employed SWOT analysis, PEST analysis, and the TOWS strategy matrix, incorporating insights from expert interviews, to develop sustainable development strategies for the information literacy of the

elderly in Xi’an city. Third, the feasibility and applicability of these strategies were evaluated. As shown in Figure 1.1.

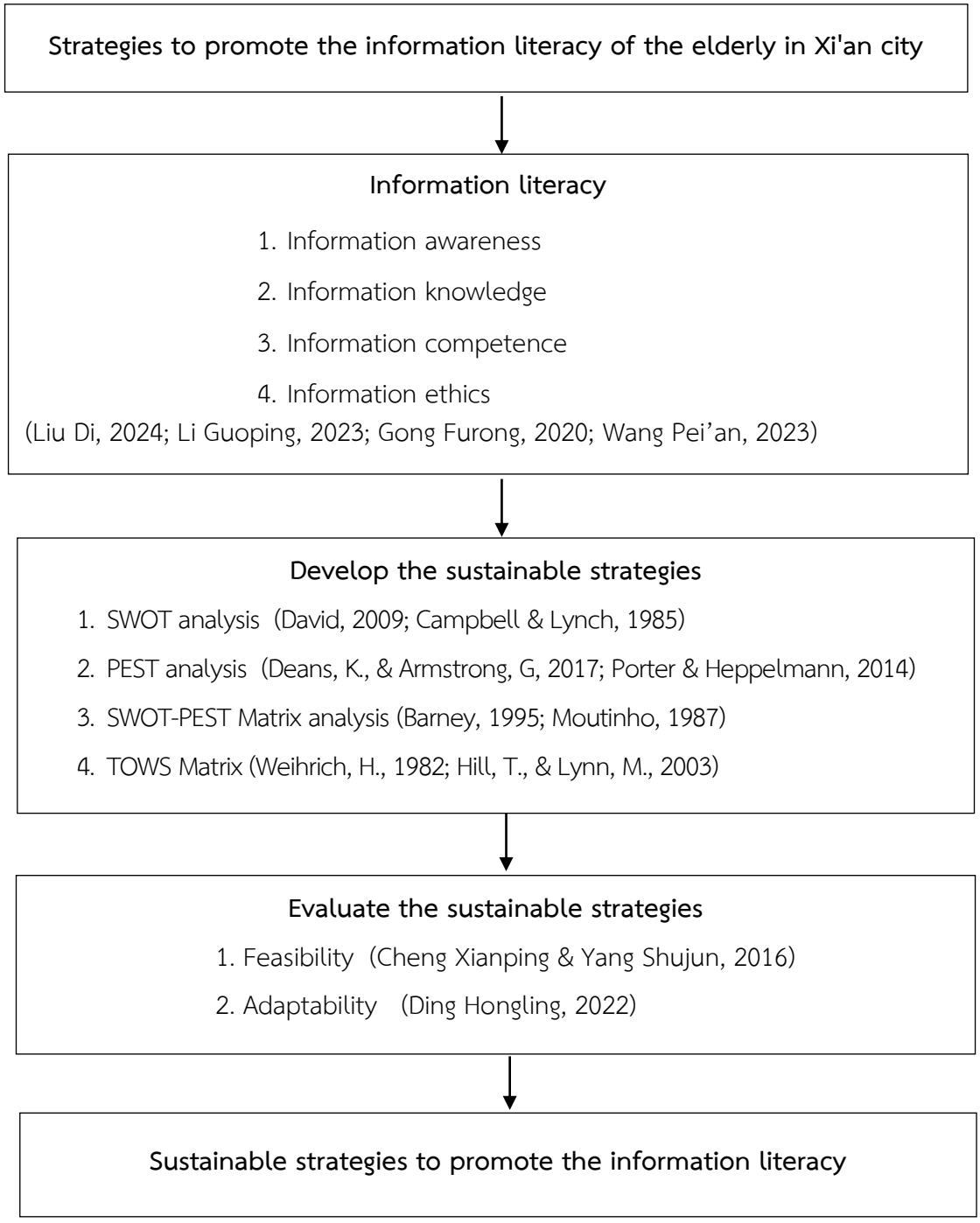

Figure 1.1 Research Framework

Chapter 2

Literature Review

This chapter will focus on the research objectives raised in Chapter 1 and will review the literature from five aspects: the concept of information literacy, context of the five communities in Xi'an city, education for sustainable development strategy and related research. In order to explore the theoretical basis of the information literacy of the elderly, this chapter sets out the theories as follow:

1. Concept and theory of information literacy
2. Context of the elderly in five communities of Xi'an city
3. Concept and theory of Sustainable development of elderly education
4. Strategy
5. Related Research

Concept and theory of information literacy

Concept of information literacy

The concept of information literacy was formally put forward in the 1970s. The literature retrieval skill training and user education activities that libraries had already carried out in the early days can actually be regarded as the early embryonic form of the information literacy concept. After long-term development and evolution, a systematic framework of information literacy has gradually taken shape. With technological advancements and exponential growth in social literature, readers' information needs have become increasingly diverse. The rapid development of information technology has driven libraries to widely adopt computerized management systems, which undoubtedly raises higher standards for users' search proficiency (Pijie zheng, 2003).

The concept of "information literacy", proposed by Zulkowski Paul, remains a pivotal research focus in library and information science. In his seminal work,

Zulkowski explicitly states: “Individuals who can effectively apply information resources to practical work scenarios are termed information literates” (p.6). This definition establishes a direct correlation between the ability to utilize information tools and resources and problem-solving competencies. Building upon this framework, Zulkowski identifies three core components: (1) Information resources must be practically applied in work contexts; (2) Users must acquire proficiency in operating information tools and source materials; (3) Information resources must be employed in the problem-solving process (Zulkowski, Paul, 1974).

The concept of information literacy has resurfaced. In 1976, during a paper presentation at the Seminar on the Future of Knowledge Organization hosted by Texas A&M University Library, Burchinal emphasized: Mastering information literacy requires a set of new skills, including how to efficiently and accurately locate and utilize information needed for problem-solving and decision-making. Burchinal defined information literacy as: (1) the ability to find and use information; (2) the application of information in problem-solving and decision-making; (3) efficient and precise information location and utilization (Burchinal, 1976).

In 1979, the Information Literacy Association (IIA) defined information literacy without including “application of information in the workplace” as a limiting condition, unlike Zulkowski: The IIA defines an ‘information literate person’ as someone who masters the use of information tools and can solve problems through them (Eugene Garfield, 1979). That same year, Robert Taylor first proposed the concept of information literacy in an article discussing the future of library professions, outlining its essential components: (1) Accessing appropriate facts and information to help solve most (not all) problems; (2) Understanding various information resources (sources and distribution) as a prerequisite for information literacy; (3) Continuous information acquisition being as important as occasional instant access; (4) Strategies for information acquisition (Robert Taylor, 1979).

Researchers note that information literacy gained widespread recognition in the late 1980s as an essential component of schools and academic libraries. In the information age, computer literacy—understanding computer hardware and software

functions—has become a vital part of information literacy. It enhances people's ability to navigate the knowledge explosion, involving understanding how computers help identify, access, and obtain data and documents needed for problem-solving and decision-making (Horton, F., 1983).

Martin Teissner proposed a practical definition of information literacy: "Information literacy refers to the ability to effectively acquire and evaluate information to meet specific needs" (Breivik, Patricia, 1985, p.723). Therefore, information literacy involves process skills applied for specific purposes.

The definition championed by Demo was established in 1986 for the Ollaria Library at the University of Colorado Denver, which serves both Denver Community College and Metropolitan State College (Demo,W.,1986).

Theories of information literacy characteristics

Several key aspects of this definition warrant emphasis: One characteristic of information literacy is the inclusion of a comprehensive set of skills. These skills are identified as research strategies and evaluation capabilities. Information literacy is not limited to information retrieval but also encompasses the understanding and assessment of information.

1. A comprehensive set of skills and knowledge: skills (research strategies, evaluation); knowledge of tools and resources.

2. Developed through attitude acquisition: persistence; attention to detail; cautious acceptance of printed words and single-source information.

In summary, the concept of information literacy, which emerged in the 1970s and 1980s, has evolved to form a well-defined framework. Initially emphasizing document retrieval skills, it has now shifted focus to the role of information in problem-solving and decision-making. Beyond developing search techniques, it actively incorporates advanced information technology particularly computers, which are now widely used in information acquisition and processing.

Information literacy is widely regarded as an essential skill for survival in the information age, a cornerstone of lifelong learning, and a key factor in the prosperity of democratic societies. Over the past three decades since the term was first coined, scholars have proposed various definitions of information literacy and engaged in extensive discussions. Most of these definitions share similar characteristics with the widely cited one below: To be an information literate person, one must be able to identify when information is needed and have the ability to effectively find, evaluate and use the information needed (American Library Association Information Literacy Chair Committee: 1989 Final Report).

Information literacy is defined as “the ability to access, evaluate, and use information from multiple sources”. Since 1990s, the research on information literacy abroad has paid more attention to the information literacy in the background of information society, emphasized the humanistic attribute of information literacy, and paid full attention to the ability of information criticism and evaluation (Doyle, C.S., 1992).

In September 2005, UNESCO (United Nations Educational, Scientific and Cultural Organization) convened its Information Literacy Conference in Prague, declaring information literacy as a fundamental human right for lifelong learning and a prerequisite for individual participation in the information society. It has been elevated to a key criterion in talent assessment, gaining widespread recognition globally, with its proficiency level now symbolizing the core competencies of modern society members. UNESCO defines information literacy as the means for individuals across all social strata to effectively learn, evaluate, utilize, and create information to achieve personal, societal, professional, and educational goals (UNESCO, 2005).

Information literacy is also defined as a learning approach. This interpretation links information literacy to the concept of lifelong learning (Bruce, ChristineS., 2008). Other perspectives on information literacy include: for instance, the ‘information literacy landscape’ concept proposed by Lloyd, and the view of information literacy as skills in information management and processing (Huvila, 2010).

In the late 1980s, the concept of information literacy was basically clear and gradually converged. In the 1990s, with the change of information environment and the emergence and rapid development of Internet, some research institutions and scholars made new expressions of the concept of information literacy in the process of information literacy research.

Ma Haiqun. (1997) defined information literacy as “the various information qualities possessed by individuals in the information society, including information intelligence (related to information knowledge and skills), information ethics, information awareness, information concepts, information potential, information psychology, etc.”

Xie Lihong. (2000) proposed in his article “Information Literacy Education and Literature Retrieval Course” that information literacy is the information awareness and various abilities or skills of information processing that people have in a society with cross-penetration of various information and highly developed technology, including the ability to collect, develop, identify, and comprehensively analyze, the ability to use information technology, as well as positive information psychology and good information ethics.

Sun Jianjun et al. (2001) argued that “information quality is a part of humanistic quality, which is a stable and basic personality psychological quality formed by the knowledge, information awareness, education, and environmental impact of the humanistic society, and it has obvious external expression.” Information literacy mainly includes two levels, one is information knowledge ability, which marks the level of information professional knowledge; The second is information awareness and awareness, which mainly includes the literacy of information collection, ordering, utilization and evaluation.

Pi Jiezheng. (2003) believed that “information literacy is the ability of information subjects to recognize and express information needs in information behavior, and to use appropriate information tools to find, obtain and use information from various information sources.”

Yang Lin & Li Bingyan. (2004) described that the requirements of people with higher education level for information literacy can be divided into the following four levels: (1) Basic level information literacy: have the information retrieval ability required by the undergraduate syllabus, and be able to use simple retrieval tools for information retrieval. (2) Research-oriented information literacy: long-term engaged in a professional research. (3) Professional information literacy: personnel engaged in information services, the purpose of which is to meet the needs of others for information. (4) Educational information literacy: professionals engaged in information education and information research. The requirements for information quality at the above four levels are gradually raised, and their extension is encompassing layer by layer. As shown in the Figure 2.1 below:

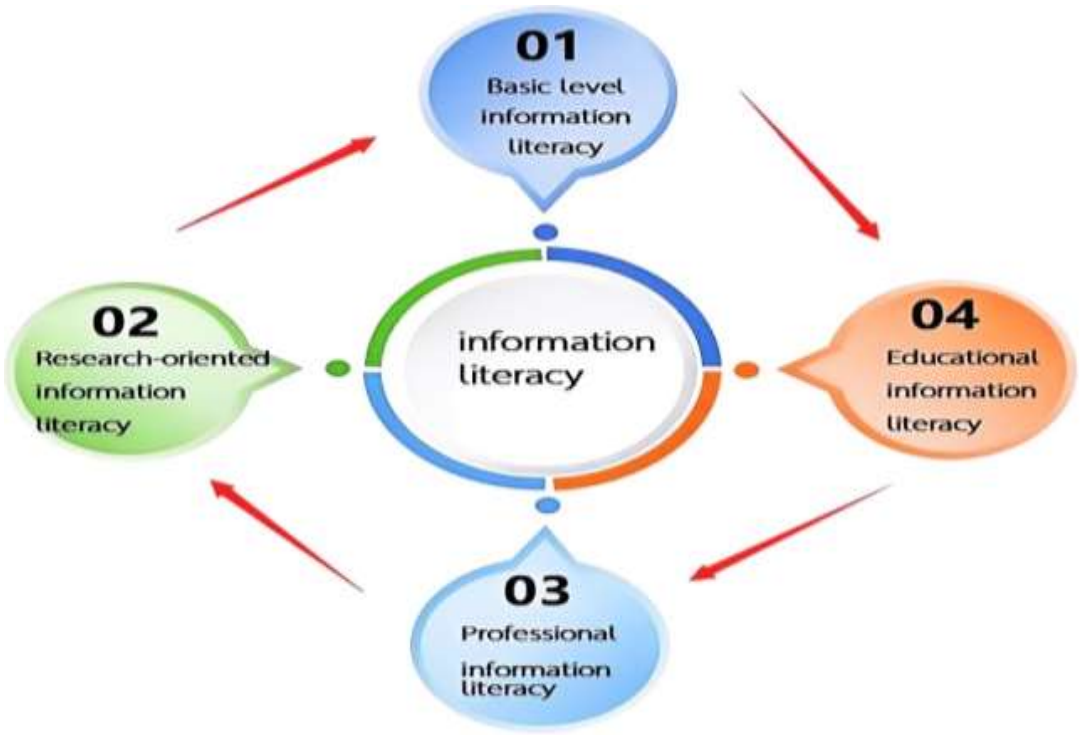

Figure 2.1 Four levels of higher education information literacy

(Source: Yang Lin & Li Bingyan. 2004)

Zeng Xiaomu & Sun Ping. (2005) focused on information literacy ability is a kind of comprehensive ability, which can be divided into three levels from basic to advanced (see Figure 2.2), the first level is basic information literacy ability, which is composed of basic library application knowledge and computer application ability. The second level is the ability to identify and evaluate information. The third level is the specialized information literacy ability applicable to the user's discipline.

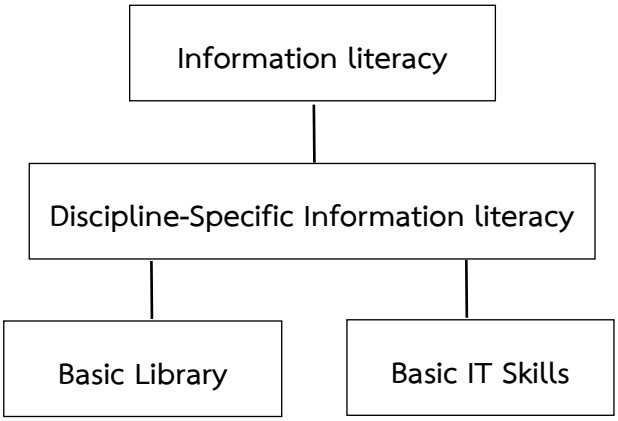

Figure 2.2 Three levels of information literacy competency

(Source: Zeng Xiaomu & Sun Ping. 2004)

In conclusion, it meant that when interpreting the concept of information literacy, scholars both at home and abroad base their studies on their respective national realities, leading to certain differences in its connotation. Information literacy is dynamically evolving, and its connotation will be continuously enriched with the advancement of social development. At present, Chinese scholars' research on the connotation of information literacy focuses on four aspects: information awareness, information knowledge, information competence, and information ethics.

Theories of information literacy evaluation

United States due to the early start of information literacy research, information literacy research and education at the primary and secondary schools,

universities and citizen levels are currently at the forefront of the world. Rich experience and results have been obtained. A series of authoritative and universally applicable information literacy evaluation standards have been published. Among them, the ACRL standard of United States and the ANZIIL standard of Australia and New Zealand are the most famous.

In 1998, American Library Association (ALA) developed standards for learner information literacy in their publication Information Competence: Creating Learning Partners. From the three aspects of information literacy, independent learning and social responsibility, the needs of information literacy in terms of skills, attitudes and morality are further enriched. (1) Information skills (processing). Criterion 1: Efficiently and quickly obtain and store information. Criterion 2: Evaluate information carefully and appropriately. Criterion 3: Accurate and creative use of information. (2) Independent learning. Criterion 1: Be able to keep track of the information you are interested in. Criterion 2: Understand and value information culture and its creative expressions. Criterion 3: Strive for excellence in information acquisition and knowledge formation. (3) Social responsibility. Criterion 1: Actively contribute to the learning community and recognize the importance of information for a democratic society. Criterion 2: Ethical behaviour in the handling of information and information technology. Criterion 3: Effectively participate in team activities for information development.

In January 2001, the United States Association for Higher Education Research (ACRL) reviewed and adopted the United States Information Competency Standards for Higher Education. This standard consists of five criteria and 22 indicators of implementation. Among them, the five major standards are: (1) Students with information literacy skills can decide the type and attitude of information they need; (2) be able to obtain the required information effectively and efficiently; (3) be able to critically evaluate information and its sources, and be able to integrate selected information with the original knowledge background and evaluation system; (4) can effectively use information to achieve a specific purpose; (5) Be able to understand the economic, legal and social issues arising from the use of information technology, and be able to comply with public ethics and laws in the acquisition and use of information.

Since then, the Australia and New Zealand Joint Working Group on Efficient Information Literacy (ANZIIL) has since issued the Australia and New Zealand Information Literacy Competency Standards in 2004, which consists of 6 Level 1 indicators, 19 Level 2 indicators and 67 Level 3 indicators. The six first-level indicators are: (1) Be able to confirm the need for information and decide the type and extent of information required; (2) Efficiently obtain the required information; (3) be able to critically evaluate information and search for information; (4) be able to manage the information collected or generated; (5) Be able to apply the initial information and new information to the construction of new concepts or innovative knowledge; (6) Be able to understand and comply with cultural, moral, economic, legal, and social issues related to the use of information when using information.

Table 2.1 Theories of information literacy evaluation (developed countries)

NO.	Author	Key concepts and theories	Time	Country
1	ALA	(1) Information skills (processing); (2) Independent learning; (3) Social responsibility.	1998	USA
2	ACRL	(1) The type and attitude of information; (2) Obtain the required information; (3) Critically evaluate information and its sources; (4) Effectively use information; (5) Comply with public ethics and laws.	2001	USA
3	ANZIIL	(1) The type and extent of information required; (2) Efficiently obtain the required information; (3) Critically evaluate information and search for information; (4) Manage the information collected or generated; (5) Apply the initial information and new information; (6) Comply with cultural, moral, economic, legal, and social issues.	2004	Australia & New Zealand

In conclusion, establishing foreign information literacy standards has become a priority for educational authorities. These standards not only provide a framework for evaluating information literacy but also serve as the core objective for its cultivation. Developed by reputable organizations in social or professional fields, the standards incorporate input from experts across various disciplines. As a result, they reflect national consensus, combine profound academic rigor with professional expertise, and hold significant reference value.

China's research on information literacy started more than a decade later than that of developed countries, and it was not until the 1990s that it was truly carried out. This is quite different from the information literacy education model in the United States. China's information literacy education initially originated from computer courses, while university-level information literacy education first appeared in library literature retrieval courses and computer education. Through literature retrieval on CNKI, it is found that there is already a large amount of research on information literacy at this stage, but most of it remains at the level of theoretical discussion or the interpretation of foreign information literacy standards and educational policies.

Chen Wenyong & Yang Xiaoguang. (2000) conducted a study on the information literacy competency standards, which is divided into 9 standards with a total of 40 items, including information needs, finding information sources, critically evaluating retrieved information, and understanding public policies and ethics that affect information search and use. This theory provides a comprehensive theoretical discussion on the information literacy standards, exploring various frameworks and conceptual models in depth. However, it does not offer detailed test methods or practical application examples, which limits its usefulness for real-world implementation and evaluation. As a result, the theoretical insights remain largely abstract and lack the necessary guidance for educators and practitioners seeking to apply these standards in teaching or assessment contexts.

Sang Xinmin. (2001) put forward standards for information literacy from the perspective of cultivating information literacy: the ability to efficiently obtain

information; the ability to skillfully and critically evaluate information; the ability to effectively absorb, store, and quickly extract information; the ability to express information in multimedia form and use information creatively; Transform the ability to control information into the ability to learn and communicate independently and efficiently; Learn, cultivate and improve the moral, emotional, legal awareness and social responsibility of citizens in the new environment of information culture.

Su Jing. (2002) started from the actual situation of information literacy education in different types of schools in China, scientifically referred to foreign evaluation standards, and made an overall evaluation of information literacy from the components of information demand, information acquisition, information evaluation, information utilization, as well as adherence to information ethics and compliance with relevant laws and regulations, which is specifically engineered and meticulously crafted to foster and encourage highly effective, responsible, and ethically sound approaches to the management of information and the guidance of decision-making processes.

Yang Lin & Li Bingyan. (2004) made a hierarchical evaluation standard for information quality of professional and technical personnel, and he believed that the hierarchical division of information quality evaluation standards should be divided by the purpose and ability of individuals to use information quality. It is divided into four levels, namely, basic application information quality, professional application information quality, basic service information quality, and advanced service information quality. This study makes a theoretical discussion on the formulation of information quality evaluation standards for professional and technical personnel in China from the structure and form, and proposes to formulate information quality evaluation standards and frameworks for professional and technical personnel at different levels.

Beijing Library Society. (2005) has formulated a standard system of information literacy competency at the general level in Beijing, which is composed of 7 dimensions, 19 second-level indicators and 63 third-level indicators. The standard draws on the information literacy standards of United States in many aspects, and is

currently a more comprehensive standard for education, and its basic framework is as follows: Dimension 1: Information literacy can understand information and the role, value and power of information literacy ability in modern society; Dimension 2: Information literacy are able to determine the nature and scope of the information required; Dimension 3: Information literacy are able to effectively obtain the information they need; Dimension 4: Information literacy are able to correctly evaluate information and its sources, and integrate the selected information into their own knowledge system to reconstruct a new knowledge system; Dimension 5: Information literacy are able to effectively manage, organize and communicate information; Dimension 6: Information literacy are able to effectively use information to accomplish a specific task as an individual or a member of a group; Dimension 7: Information literacy understand the legal, ethical, and socioeconomic issues related to information retrieval and use, and are able to retrieve and use information reasonably and legally.

The Institute of Scientific and Technical Information of China (2005), formally introduced a comprehensive evaluation index system designed to assess the overall level of information literacy. This framework is structured around three primary first-level indicators, which are further elaborated into a total of fifteen detailed second-level indicators. The core dimensions covered include information awareness, information ability, information perspective, and information ethics, collectively providing a holistic approach to measuring and understanding information literacy in various contexts.

Chen Yanshou. (2006) tried to design a set of standards suitable for evaluating the information literacy, developed a standardized framework for assessing information literacy, incorporating 5 core components and 20 specific items that evaluate awareness, retrieval, analysis, synthesis, and ethical application of information. This framework effectively bridges the gap between theoretical research and educational practice, offering a structured and adaptable approach to literacy instruction. By establishing clear and actionable benchmarks, it enables educators to systematically enhance both the quality and accessibility of literacy education.

Ultimately, this empowers learners by equipping them with practical, real-world competencies that are essential for academic success and lifelong learning.

Table 2.2 Theories of information literacy evaluation (China)

NO.	Author	Key concepts and theories	Time	Country
1	Chen Wenyong & Yang Xiaoguang	1. Information needs; 2. Information sources; 3. Understand policies and ethics.	2000	China
2	Sang Xinmin	1. Efficiently obtain information; 2. Skillfully evaluate information; 3. Effectively absorb information.	2001	China
3	Su Jing	1. Information demand; 2. Information acquisition.	2002	China
4	Yang Lin & Li Bingyan	1. Basic service information quality; 2. Advanced service information quality.	2004	China
5	Beijing Library Society	1. Effectively obtain the information; 2. Correctly evaluate information.	2005	China
6	The Institute of Scientific and Technical Information of China	1. Information awareness; 2. Information ability; 3. Information ethics.	2005	China
7	Chen Yanshou	1. Information awareness; 2. Information retrieval ability; 3. Information moral cultivation.	2006	China

In conclusion, the information literacy standards of European and United States countries have been relatively mature and formal, and the ACRL standards, ANZIIL standards, etc. are relatively complete and influential. The United States has embarked on the development of a series of information literacy evaluation index systems for different regions. China should establish an authoritative institution on information literacy as soon as possible, fundamentally attach importance to information literacy research, compare and learn from foreign information literacy competency index systems and formulation processes, integrate various research results, formulate information literacy standards applicable to China's national conditions, and promote the development of information literacy education.

Theories of information literacy among the elderly

The primary research directions on information literacy among the elderly include: pathways to digital inclusion, information competency assessment, design of age-friendly digital products and services, and the sustainable development of policy.

Kim et al. (2006) The study of the relationship between information literacy and life satisfaction of the elderly by using structural equation model method shows that the level of information literacy of the elderly is positively correlated with their life satisfaction. The conclusion indicates that in order to improve the life satisfaction of the elderly, the government must make corresponding policies to improve the level of information literacy of the elderly, so as to narrow the further social gap caused by the digital divide.

Kazemek,F.E., & Rigg,P. (2019) Current research on literacy needs and interests among the elderly remains insufficient. Consequently, many literacy training programs for seniors are based on inadequate and inaccurate information. The authors of this paper systematically reviewed recent literature on elderly literacy capabilities and proposed recommendations for future studies. Researchers emphasize the necessity of empirical studies to explore seniors self-perceived literacy behaviors. Specifically, this research should focus on two key tasks: (1) assessing elderly individuals' literacy needs and interests; (2) analyzing how societal expectations influence their literacy behaviors and interest preferences.

Dommes Aurelie et al. (2011) This study investigates the role of cognitive flexibility and lexical capacity in explaining age-related differences in search engine information retrieval. Nineteen elderly participants and twenty younger participants completed nine retrieval tasks and a series of cognitive tests. The elderly participants demonstrated poorer retrieval performance, fewer correct answers, and slower task completion rates. They exhibited reduced interaction with the system and specific difficulties in escaping retrieval deadlocks and reconstructing invalid queries. The findings suggest that declining cognitive flexibility with age plays a significant role in explaining observed age-related differences in information retrieval.

Lee, Misook et al. (2016) This study investigates the relationship between information literacy, life satisfaction, and well-being among the silver-haired population, aiming to provide actionable recommendations for enhancing their quality of life. The research focused on internet users aged 60 and above residing in Daegu/Gyeongbuk region, with 238 valid questionnaires collected. The analysis revealed that life satisfaction fully mediates the relationship between information literacy and well-being among this demographic.

Yu ping et al. (2015) To investigate the impact of information literacy education on elderly individuals' daily information-seeking behaviors under different elderly care models, this study employed a combination of stratified sampling and cluster sampling methods, surveying 3,568 seniors aged 60 and above in Zunyi (Chongqing), Shanghai, Wuxi, Wuhan, and Chenzhou. The results demonstrated that information literacy education significantly influences elderly individuals' daily information-seeking behaviors across various care models. Governments at all levels should increase investment in elderly care initiatives, leveraging higher education institutions, public libraries, and senior communities to vigorously promote elderly education programs. Implementing information literacy education for the elderly will effectively enhance their overall information literacy capabilities.

Berkowsky, R.W et al. (2018) A mixed-method study involving 52 elderly participants included: (1) viewing demonstrations detailing nine different technologies, (2) using customized questionnaires to evaluate these technologies,

and (3) participating in focus group discussions. Participants were divided into seven groups based on age (65-74 years, 75+years) and language (English, Spanish). The study measured technology adoption willingness, with predictors including self-assessment abilities (e.g., digital skills), computer/internet skills and knowledge, technology readiness, age, language, and technology scores (e.g., perceived value). Analytical methods included t-tests, and regression analysis. Supportive case studies were collected during focus group discussions. The results demonstrated that stakeholders in elderly technology adoption must fully consider the functionality and complexity of technologies, as well as the characteristics and capabilities of older adults.

Watsatree Diteeyont & Ku Heng-Yu. (2023) The digital literacy of the elderly is pivotal to their ability to fulfill diverse life needs through the internet and become competent digital citizens. This study systematically analyzed the digital literacy levels and influencing factors among 534 elderly individuals in Thailand. The data indicates that respondents generally demonstrate moderate digital literacy. Most seniors not only master digital tools proficiently but also employ strategies to access reliable online resources. They are capable of effective communication on digital platforms while maintaining robust personal information security.

Huang Deqiao & Lu Yao (2022). In advancing rural digitalization, bridging the “digital divide” between rapid technological progress and the growing elderly population in rural areas is crucial. This study examines the current state of rural digitalization in Chongqing’s Yuzhou District and mobile usage patterns among elderly villagers. These issues stem from insufficient digital literacy, technical anxiety, limited practical skills, inadequate smart device adaptability, and the absence of digital mentorship. To address this gap, comprehensive measures are needed: enhancing digital literacy among rural seniors, improving technological application capabilities, expanding age-friendly smart device supply, and establishing collaborative support mechanisms involving government, society, businesses, and families.

Jerad Moxley et al. (2022) This study employed 187 participants aged 65 to 92 years old were enrolled. Participants attended demonstrations of five technologies covering transportation, leisure, health, and new learning domains, and rated each technology based on multiple indicators hypothesized to influence technology adoption. Technology adoption willingness was primarily influenced by three variables: perceived value of technology (β=0.54), perceived ability to improve quality of life (β=0.24), and confidence in technology use (β=0.15). These variables were formed by the following factors: perceived effort required to learn technology, positive technology attitudes reflected in the optimistic component of the technology readiness scale, degree of technology underestimation, and perceived assistance needed to learn technology use.

Xiao Kang et al. (2023) In the context of digital transformation, society has raised higher demands for internet users information literacy. As a vulnerable group in this digital era, rural elderly populations remain deeply entrenched in the digital divide. This study conducted in-depth interviews with 160 rural seniors across eight cities. All interview texts were further analyzed through semantic network and sentiment analysis using RostcM6. The data analysis revealed that rural seniors generally hold positive attitudes toward information devices, yet their overall information literacy remains relatively low. Health, cultural factors, and economic conditions are identified as key variables influencing rural the elderly information literacy.

Yu Ping & Li Xiaoping. (2012) A large amount of data shows that China has entered an aging society and is facing the dual challenges of population aging and informatization. With the continuous improvement of material living standards, the quality of spiritual life has increasingly become an important indicator affecting the quality of life for the elderly. In the information society, the elderly have extensive information needs and pursue a rich and colorful spiritual life. However, the insufficient information literacy level of the elderly population in China, as well as their lack of ability to access information, has constrained the improvement of their spiritual life quality. Improving the information literacy level of the elderly will help

enhance their quality of life, which is a key measure to actively address population aging.

Ma Lili. (2024) By improving residents' information literacy, we can narrow the digital divide, stimulate community vitality, and lay a solid mass foundation and social environment for the full implementation of smart cities. By analyzing the current situation of standardized community construction and the key factors restricting the improvement of the elderly's information literacy, this paper proposes a "three-dimensional dynamic cultivation system" model, aiming to systematically enhance the information literacy level of elderly residents in Ningbo, constructing four pathways: "solidifying the foundation, focusing on key areas, and ensuring effectiveness," and formulating six security strategies: "basic guarantee, financial guarantee, organizational guarantee, legal guarantee, talent guarantee, and cultural guarantee."

Anu Siren & Sine Gonborg Knudsen. (2016) This study examines ICT usage and attitudes toward digital public services through survey data (n=3291) and qualitative interviews with 14 Danish seniors. While age, gender, and socioeconomic status were initially associated with ICT adoption, their explanatory power disappeared after controlling for attitudes and experience. Three distinct groups emerged in terms of ICT usage and digital service attitudes. Since low ICT adoption often stems from insufficient willingness rather than material or cognitive barriers, digital divide mitigation policies should prioritize skill development and confidence building over merely improving access or technical capabilities.

Carlos Vaz de et al. (2019) In today's society, proficiency in digital tools has become a fundamental skill. With the rapid growth of the elderly population, bridging the digital divide has become particularly crucial. Like the general population, seniors (the silver generation) need essential digital skills to stay connected and socially engaged in the digital world, thereby preventing social isolation and fostering social integration. To address this, Europe has launched a digital literacy initiative specifically for the silver generation. This article analyzes the

program's outcomes and finds that seniors generally hold positive views of their digital skill proficiency.

Li Jian et al. (2019) This study investigates the current curriculum landscape of ten senior universities. To enhance elderly learners digital literacy in mobile internet environments and mitigate risks from online misinformation, we have developed a curriculum framework with three tiers: foundational, advanced, and innovative courses. The system prioritizes competencies: information awareness, knowledge, skills, and ethics, while addressing the diverse learning needs of senior students. By systematically designing educational objectives, competency frameworks, and training models, this study provides actionable strategies and reform proposals for advancing information literacy education in senior universities.

Chen Ying & Tian Xinhua. (2020) Enhancing information literacy among the elderly not only reflects the humanistic care of a harmonious society but also benefits socio-economic development. The weak information literacy among the elderly primarily stems from their relatively backward information acquisition capabilities, most notably the widespread lack of skills in using online tools. The most effective solution is to foster a 'cultural immersion' at home, encouraging the elderly to proactively master smartphones and other digital tools. Therefore, the essential factor in rapidly enhancing their information literacy is fundamentally rooted in fostering collaborative efforts, which play a crucial role in boosting their enthusiasm and engagement with utilizing various online tools and resources.

Wang Lianlian & Shao Aiqun. (2021) In the information age, enhancing information literacy among the elderly is crucial. It based on the definition of elderly information literacy, thoroughly examines the role of community education in cultivating information awareness, imparting information knowledge, improving information skills, and shaping information ethics. To promote the improvement of elderly information literacy, a multi-dimensional approach is required: refining the digital training mechanisms of community education, fostering a digital educational environment and atmosphere; scientifically designing information literacy curricula;

adopting diversified teaching methods; and strengthening the development of information literacy educators.

Yang Ying. (2021) This approach not only enhances the quality of life for seniors but also helps them adapt to the rapid development of the information society, enabling them to conveniently access the conveniences of the information sharing era, enrich their spiritual and cultural lives, and alleviate the sense of loss brought by social transformation. From the perspective of social connection, internet use effectively addresses the isolation caused by insufficient social interaction among the elderly, ensuring their active social engagement. In terms of social support, seniors can obtain online companionship, information exchange, and effective emotional support through digital communication, which helps maintain a sense of collective social connection and ultimately improves their quality of life in later years.

Igor Kanižaj & Maria José Brites. (2022) This study presents preliminary findings from two research projects in Croatia and Europe focusing on digital literacy and the digital divide among older adults. The studies employed a combination of quantitative and qualitative methods, including public opinion surveys, case studies, and intergenerational workshops on digital and media literacy. Conducted in the latter half of 2020 and during the 2021 pandemic, both studies revealed both the unintended use and forced adoption of digital technologies by older adults, as well as their low engagement with digital environments, a phenomenon closely linked to inadequate digital skills and underdeveloped infrastructure.

Fan Zhiyu & Peng Huamao. (2022) A total of 189 elderly internet users completed the Internet Integration Perception Scale, Internet Control Belief Scale, Internet Usage Behavior Scale, and Information Literacy Scale. Results: (1) Internet integration significantly predicts the level of information literacy in the elderly. (2) The mediating effect of internet control belief was not significant. Internet integration influences information literacy through two pathways: first, the mediating role of internet usage behavior, where the promotion effect of social communication behavior was the weakest; second, indicating that a sense of internet integration can

positively influence internet control belief, promote internet usage behavior, and ultimately enhance information literacy levels. (3) Among the antecedent variables, management application dimension had the strongest impact on information literacy, while its promotion effect on comprehension and evaluation ability was the weakest.

Wang Jinhong. (2022) Based on the advantages of elderly information literacy education, this paper proposes a basic plan for constructing the information literacy curriculum system of senior universities and designs teaching and practical activities, providing new ideas for elderly information literacy education. The “main thread” revolves around curriculum development, covering traditional classroom teaching, broadcast teaching, online live courses, self-media live activities, and educational travel projects; the “three major resources” include upgrading paper textbooks, producing video materials, and compiling popular science manuals; the “four auxiliary measures” involve integrating classroom activities into communities, organizing thematic lectures, conducting practical experience courses, and combining educational travel projects.

Zhang Hongxia. (2022) The “Internet+” era signifies the organic integration of internet technology with traditional education. Under this framework, community-based elderly education has demonstrated systematic, large-scale, and efficient development trends, holding significant practical value. To address challenges such as inadequate policy support, uneven distribution of learning resources, and insufficient teaching staff, this paper proposes recommendations including refining elderly education policies, establishing diversified teaching systems, promoting teacher professionalization, and enhancing seniors’ self-directed learning capabilities. These measures aim to optimize community-based elderly education formats, expand educational resource supply, drive innovative development in elderly education, and ultimately foster social harmony.

Dorris Wang Lin et al. (2022) This research analyzes the current situation of the “digital divide” among the elderly population, classifies them through user profiling, and implements a series of online and offline integrated transformation measures to address the pain points and difficulties they encounter during smart

healthcare utilization. The aim is to establish a harmonious and humanized “Internet + elderly healthcare service ecosyste.” This transformation project aligns with the physiological, psychological, and medical-seeking habits of the elderly, is closely related to social welfare, and demonstrates strong accessibility and reference value for promotion.

Wang Miao. (2022) In the information age, community education plays a vital role in enhancing the information literacy of the elderly and empowering them as a driving force for social development. This paper first defines the concept of elderly information literacy through four dimensions: information awareness, knowledge, skills, and ethics. It then analyzes the significance of leveraging community education to improve elderly information literacy. Finally, it explores fundamental strategies for achieving this goal, including developing educational content tailored to the cognitive characteristics and needs of the elderly, creating an accessible information environment and learning atmosphere, and employing diverse teaching methods such as face-to-face instruction, interactive activities, and online-assisted learning to enhance both teaching effectiveness and elderly participation.

Qu Shaoping. (2022) To address the low information literacy among rural elderly, this study proposes a three-pronged approach involving government, societal, and media collaboration, along with individual empowerment. At the governmental level, efforts should focus on optimizing information dissemination channels and strategies. By leveraging rural opera cultural activities, traditional media, and community elders, we can meet the elderly’s information aesthetic needs while strengthening grassroots governance. From a societal and media perspective, rural communities should be empowered to build an integrated online-offline elderly education network. Media and internet companies must proactively adapt their apps for elderly users.

Guan Fengchu. (2023) To investigate the current state of information literacy among the elderly population in Zhengzhou, this study employed a field research methodology combining questionnaire surveys and in-depth interviews. The findings indicate that significant improvement in elderly information literacy is urgently

needed—a phenomenon that has gained widespread recognition. Analyzing the root causes from a two-factor theory perspective, the study proposes targeted strategies, including fostering a supportive social environment, enhancing family feedback, developing age-appropriate products, prioritizing education and training, strengthening social recognition, and cultivating self-directed learning awareness.

Liu Jinyi et al. (2023) The media literacy of the elderly is a key influencing factor in their ability to smoothly integrate into the digital society. Canada has accumulated a relatively profound theoretical research foundation in the education of elderly media literacy and has formed rich practical application experience. This paper uses Citespace6.1 software to conduct a visual analysis of the research history and institutions of elderly media literacy in Canada. The aim is to provide theoretical exploration and practical innovation references for the cultivation and development of information literacy among the elderly in China.

Wang Junqi & Liu Li. (2023) The seventh national census reveals that Shanxi Province has 6.607 million residents aged 60 and above, accounting for 18.92% of its total population—a figure 0.22 percentage points higher than the national average. Local elderly care institutions in Shanxi have achieved notable success by innovatively integrating educational resources with modern information technology. Specifically, numerous remote and underserved regions encounter significant difficulties in obtaining high-quality information literacy education resources, primarily due to insufficient funding allocations and limited technological infrastructure. The lack of adequate financial support restricts the acquisition of up-to-date educational materials and tools, while technological constraints, such as poor internet connectivity and scarce digital devices, further impede effective access to necessary learning resources. Moreover, the absence of standardized guidelines and unified frameworks across different regions severely obstructs the efficient integration and sharing of available educational assets.

Lai Jiarou. (2023) In the age of information explosion, it has become particularly urgent to strengthen media literacy training for digital vulnerable groups—seniors. Seniors generally lack experience and skills in media usage, resulting

in weaker voice power; their resistance to digital technologies leads to insufficient initiative in digital integration. Based on the concept of active aging, collaborative efforts to improve seniors' media literacy will help enhance their digital living quality. Specifically, governments should promote information openness and transparency, platforms need to innovate age-friendly media products, news media should establish positive images of seniors, while seniors themselves should improve their media usage skills and cultivate moral and emotional literacy. In addition to these measures, educational institutions can also play a significant role. They can design courses and training programs focused on information literacy.

Table 2.3 Theories of information literacy among the elderly

NO.	Author	Key concepts and theories	Time	Country
1	Kim et al.	The elderly information literacy level.	2006	USA
2	Kazemek, F. E., & Rigg, P	There is a need for empirical research into the perceptions of reading and writing held by the elderly themselves.	2010	USA
3	Dommes Aurelie et al.	The age-related decline in cognitive flexibility plays a role in the age-related differences.	2010	Britain
4	Misook Lee et al.	The silver generations' life satisfaction fully mediates the relationship.	2015	Japan
5	Yu ping et al.	Rely on universities, public libraries and communities for the elderly at all levels.	2015	China
6	Ronald W Berkowsky	Various stakeholders in technology adoption among older adults.	2018	Spain
7	Watsatree Diteeyont & Ku Heng-Yu	The levels and influential factors of Internet literacy among 534 elderly in Thailand.	2021	Thailand

Table 2.3 (Continued)

NO.	Author	Key concepts and theories	Time	Country
8	Huang Deqiao & Lu Yao	Establish collaborative support mechanisms involving government, society, enterprises, and families.	2022	China
9	Jerad Moxley	Assess the causal relationships among factors that influence willingness.	2022	Britain
10	Xiao Kang	The key variables affecting the information literacy of the elderly in rural areas.	2023	China
11	Yu Ping & Li Xiaoping	Improving the information literacy of the elderly will help improve their quality of life.	2012	China
12	Ma Lili	Improving the information literacy.	2014	China
13	Anu Siren et al.	Policy measures for bridging the digital divide should focus on skills and confidence rather than on access or ability.	2016	Denmark
14	Carlos Vaz de et al.	A European-wide digital literacy development initiative.	2019	Germany
15	Li Jian et al.	Divide the course into three levels: basic, promotion and innovative course.	2019	China
16	Chen Ying & Tian Xinhua	Strengthen the initiative of the elderly to use online tools through multi-party efforts is the key.	2020	China
17	Wang Lianlian & Shao Aiqun	Improve the informatization training mechanism of community education for the elderly, reasonably set up	2021	China

Table 2.3 (Continued)

NO.	Author	Key concepts and theories	Time	Country
		information literacy courses for community education.		
18	Yang Ying	Enjoy conveniently of the information.	2021	China
19	Igor Kanižaj & Maria José Brites	Through the involvement of journalism students, which contributed to the promotion an intergenerational guidance and support to older people.	2022	Croatia &Europe
20	Fan Zhiyu & Peng huamao	Internet integration could significantly and positively predict the information literacy level of the elderly.	2022	China
21	Wang Jinhong	The basic scheme for the construction of the information literacy curriculum system.	2022	China
22	Zhang Hongxia	Optimize the educational form and mode of community education for the elderly.	2022	China
23	Dorris Wang et al.	Implement a series of online + offline transformation for the elderly.	2022	China
24	Wang Miao	Create a good information environment and adopting diversified teaching forms.	2022	China
25	Qu Shaoping	Improve from government, society and media coordination.	2022	China
26	Guan Feng young	Develop age-appropriate products, attaching importance to education and training, increasing social identity.	2023	China

Table 2.3 (Continued)

NO.	Author	Key concepts and theories	Time	Country
27	Liu Jinyi et al.	Use Citespace6.1 software to visually analyze the institutions of media.	2023	Canada
28	Wang Junqi & Liu Li	To integrate educational resources for the elderly with modern information technology.	2023	China
29	Lai Jiarou	The news media should establish a positive media image of the elderly.	2023	China

In conclusion, in the research on information literacy of the elderly, foreign scholars mostly focus on the differences between the elderly and the young in information literacy, as well as the relationship between information literacy and life satisfaction, and the role of education and training in improving the information literacy of the elderly, but the research content is not comprehensive. In the face of the low overall information literacy level of the elderly group in China and the increasing aging population, the attention to the information literacy research of the elderly group is insufficient, and some studies on the information literacy of the elderly are mainly analyzed and explored from the perspectives of universities, communities or libraries for the elderly, ignoring the subjective role of motivating the elderly to improve their information literacy.

Context of the Elderly in five Communities of Xi'an city

Beilin Community

Beilin community is the core urban area of Xi'an city, located in the southeast of the city center, inside and outside the city wall, 8 streets under jurisdiction, a total area of 23.37 square kilometers. It is the smallest administrative region with the largest population density in Xi'an. The population over 60 years old in Beilin community is 246,000, accounting for 24.22% of the whole community

population. The degree of aging ranks the third in Xi'an city. The smaller area carries a great population density and a high proportion of the elderly population. The problem of home care for the elderly in Beilin community needs to be solved urgently. It has reached the level of moderate aging. Additionally, efforts are being made to promote and establish community-based elderly care service stations, which offer a range of support services such as daily assistance, health monitoring, and social activities. Furthermore, the community is actively carrying out aging-friendly transformation projects to ensure that public spaces, residential areas, and facilities are accessible and suitable for the elderly, thereby fostering a more inclusive and supportive living environment.

Lianhu Community

Lianhu community is located in the west and north of the center of Xi'an city, spanning the west and north walls of the Ming City wall, and is a sub-prefecture-level administrative region with a total area of 38.5 square kilometers. Lianhu community is the central city of Xi'an, Shaanxi Province, with 9 streets under its jurisdiction. Among them, 199,000 elderly people are over 60 years old, accounting for 19.53% of the total population. The degree of aging ranks the second place in Xi'an city. Lianhu community in recent years on the basis of the community, streets for institutions to build area, street, community level 3 endowment service system, through the tripartite linkage complementary, accurately provide all kinds of pension services, break the home, community, streets, institutional pension boundary, cracked the pain of pension service, let more and more old people can choose their own way of pension, realize the happiness of home endowment.

Yanta Community

Yanta community is located in the south section of Xi'an city, facing in the east, the south and west and the Second Ring Road, connecting Beilin community, Lianhu community and Weiyang community respectively. With a total area of 152 square kilometers, it has jurisdiction over 10 sub-district offices and 19 administrative villages. The elderly population aged 60 and above is about 303,000, accounting for 29.69% of the total population. Yanta community has a high degree of aging, and the

absolute number of the elderly population ranks the fourth in Xi'an city. The community has carried out a lot of investment and construction in the elderly care sector, including the construction of elderly care service centers, nursing homes health monitoring system, and the provision of intelligent elderly care services, to meet the challenges of the aging society.

Weiyang Community

Weiyang community is located in the north and west of Xi'an city. It is the location of the new administrative center of Xi'an city and the center of the "nine palace pattern" in the overall planning of Xi'an city. Because of the territory of the Han Weiyang Palace ruins named. Meaning "prosperity, not immortal". Area east to Xinjiamiao street new house village Chen Chen, west to the three bridge street guard village. The maximum distance from east to west is 21 kilometers, and the maximum distance from north to south is 15 kilometers. The whole land area is 264.41 square kilometers. At present, it has jurisdiction over 10 streets, and the number of people over 60 years old is 158 thousand and accounting for 15.36%. The degree of aging ranks first in Xi'an, and the aging trend is becoming increasingly severe. By adopting smart wearable devices and intelligent elderly care platforms, we have achieved real-time health monitoring for the elderly, rapid emergency response, and precise matching of personalized service needs.

Baqiao Community

Baqiao is located in the east of the main city of Xi'an city. It has been a major thoroughfare of Guanzhong and the east of Chang' an. During the Spring and Autumn Period, Duke Mu of Qin changed the name to Ba (Ba). The area covers a total area of 324.5 square kilometers, with 9 streets under its jurisdiction: Textile City Street, Shilipu Street, Hongqi Street, Xiwang Street, Xiwang Street, Hongqing Street, Dizhai Street, Baqiao Street, Xinzhu Street, Xinhe Street, and 76 administrative villages. The total population of Baqiao community is 666 thousand, and the number of people over 60 years old is 114 thousand, accounting for 20.19%. In addition, the elderly population over 80 years old was 10,000, accounting for 10.7% of the elderly population. These data show that Baqiao community has faced an obvious trend of

aging and aging, and the pension problem is relatively prominent. The degree of aging ranks the first in Xi'an city.

In short, the aging degree of Xi'an city is deepening and moving faster. Demand for elderly care services is diversified. With the improvement of material level and spiritual needs, the elderly's demand for old-age care services is no longer limited to basic life care, and the demand for cultural entertainment, medical care, spiritual comfort, information access and other aspects is increasing day by day. New pension models such as living and pension are also gradually welcomed by the elderly.

Concept and theory of Sustainable development of elderly education

Sustainable development of elderly education

Nigel Roome & Andrea Oates. (2002) believed that education for sustainable development includes three aspects. This perspective posits that sustainable development education encompasses three dimensions. First, it must be grounded in real-world contexts while transcending current "practice standards" in its description and interpretation. Second, educators and learners should jointly develop knowledge systems, skill sets, and value systems aligned with sustainable development education to collectively advance a more sustainable world. Third, the entire education sector requires repositioning, with fundamental reforms needed in educational objectives, curriculum content, teaching methodologies, and assessment systems. This definition comprehensively elucidates the core principles of sustainable development education at the conceptual level.

Sterling. (2002) proposed this definition, grounded in disciplinary perspectives, outlines five core dimensions of sustainable development education: pedagogical approaches, curriculum content, organizational frameworks, as well as sustainability values and personal/social values. Characterized by distinct disciplinary features, it advocates that sustainable development education should critically examine existing social, political, and economic systems along with their legal-cultural foundations, while reforming current political-economic models to

foster public acceptance of sustainable development principles and drive concrete actions in these domains. From an educational standpoint, the definition explicitly identifies the core mission of sustainable development education as transforming people's lifestyles and behavioral patterns.

Arjen E. J. Wals, in its report "Shaping the Future of Education: The Decade of Education for Sustainable Development 2012", UNESCO highlights that interpretations of the "education" component in sustainable development education vary across countries and regions, depending on their levels of participation, decision-making autonomy, and critical thinking capacity. These differences stem from distinct national contexts, leading to variations in implementation approaches and conceptualizations. When a country or region has limited capacity for participation, autonomous decision-making, and independent reflection, its sustainable development education tends to prioritize knowledge transmission, emphasizing theoretical instruction and information delivery. Conversely, in contexts with greater capacity for engagement, self-determination, and critical thinking, such education focuses on deep involvement, independent decision-making, collaborative knowledge creation, and innovative teaching methodologies, learning models, and stakeholder interaction strategies.

The Global Agenda 2030 holds the view that adult education helps to drive the achievement of the 17 sustainable development goals in the social, political, economic, ecological and cultural sectors. The United Nations Sustainable Development Goal 4 (SDG 4) proposes to "ensure inclusive and equitable access to quality education and lifelong learning opportunities." Adult learning and training and lifelong education can expand education opportunities, promote social equity, inclusiveness, and achieve sustainable development (United Nations, 2019).

In conclusion, sustainability is a global economic, social and environmental challenge. Adult education not only enhances learners' skills, knowledge and abilities, but also helps to promote sustainability at all levels. Social inclusion, positive citizenship, health, and personal well-being are also one of the goals of sustainable development. Adult education provides information, debate space, and

creativity to promote new lifestyles, and new programs, and new approaches necessary for sustainable development.

Information literacy for the elderly in the context of active aging

The theory of active aging proposes three important pillars: health, participation and security, which provides important conceptual support for solving the problem of aging, and embodies more humanistic care and life value than “healthy aging” and “successful aging”. The level of information literacy of the elderly determines the sense of integration, existence and happiness of the elderly in the information society, and has become an unavoidable issue in achieving “active aging”. The information literacy of the elderly from the perspective of active aging further highlights its important impact on the life health, social participation and social security of the elderly, and is also a positive response to the initiative of active aging in the new era, new environment and new background.

The proposed background of active aging

Since the early 21st century, the rapid development of the global economy has accelerated the aging population, making it a pressing global concern. Western developed nations were the first to enter an aging society. Two key factors contribute to this trend: First, fertility rates have steadily declined after the baby boom. Second, advancements in medical science and improved healthcare systems have significantly reduced mortality rates, as shown in Figure 2.3 (National Bureau of Statistics, 2022).

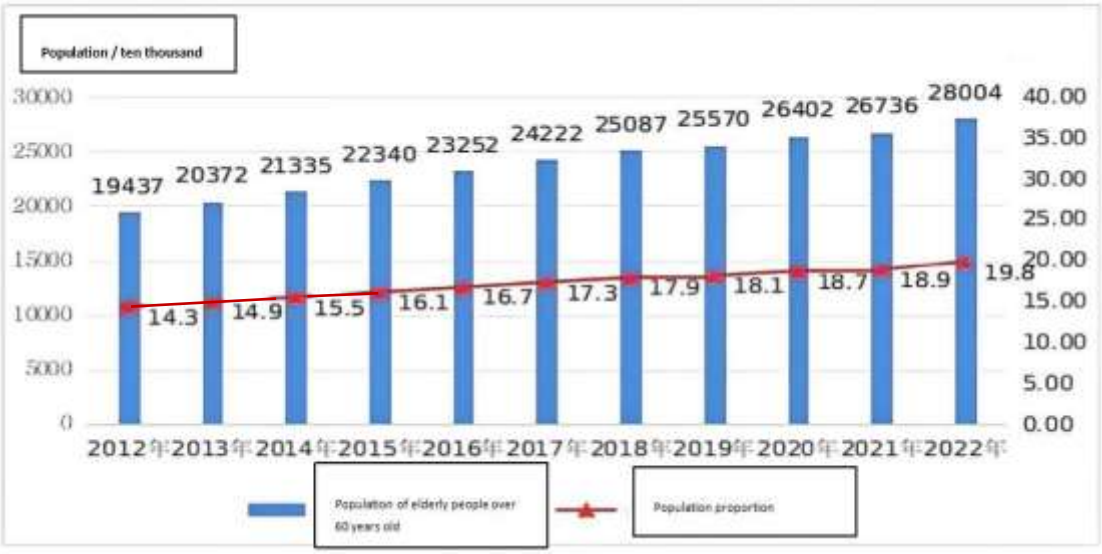

Figure 2.3 Proportion of the elderly aged over 60 in China from 2012 to 2022

The combined effect of low mortality and low fertility has led to a rising proportion of elderly individuals in total household populations, accelerating the gradual development of population aging. Since the 1960s, Germany became the first country to experience zero population growth. By the 1970s, Switzerland, Italy, and Norway followed suit, with some nations even recording negative population growth Thus, population aging has become an unavoidable issue for developed countries, and this trend shows no signs of reversal. It is precisely for this reason that the seven Western nations first proposed the concept of “active aging” at the 1997 Denver Conference (Song Quancheng & Cui Ruining, 2013).

According to the population survey, the number of Chinese people aged 60 and over will reach 248 million by 2020, accounting for 17 percent of the total population, while the number of elderly people (over 80 years old) will also exceed 30 million. Data forecast, according to the results after 2020, China’s aging population will enter the stage of rapid development, to 2050 aging population is likely to exceed 400 million, and the age over 80 years old total will be close to 95 million. Developed countries, led by the United States, are economically prosperous, and their pension service systems have fully entered an aging society. In contrast, China is

currently in the primary stage of socialism, with generally low levels of productivity and technological development, and the development of public resources is insufficient to support the rapid growth of an aging population (Chen Aihua, 2020).

It can be seen that the problem of population aging in China is quite serious. Under this background, country also follows the international development trend, draws lessons from the relevant aging theory, and carries out localization practice.

Connotation interpretation of active aging

What is active aging? In 1999, the World Health Organization proposed the "Active Aging" initiative, which defined active aging as: "the process of increasing health, participation and security opportunities as much as possible to improve the quality of life of people in old age." The Political Declaration issued at the Second World Conference on Aging in Madrid in 2002 stated, "to fully integrate and engage the elderly, to contribute more effectively to their community and social development; and to improve the care and support." China promulgated the Law of the Protection of the People's Republic of China on the Rights and Interests of the Elderly in 1996, which clearly stipulates that "the state should create conditions for the construction of socialist material civilization for the elderly (Peng Jieliu, 2025)."

As a result, most of the elderly will remain healthy and self-caring, with fewer requiring expensive medical and care services (World Health Organization, 2003). Therefore, it is the responsibility of the whole society to carry out health education for the elderly to cultivate a healthy life concept, and to vigorously develop public medical and health resources, and to provide more perfect and quality medical and health care services for the elderly. The essence of life is participation, and a life without participation is unimaginable. Conceptually, participation refers to the elderly people continue to participate in political, economic, cultural, social and other activities when the health status allows and the ability to meet the requirements, and continue to live in the mainstream of society by exporting labor services to the world.

Participation, to some extent, guarantees the subjectivity and independence of the elderly group, so that the elderly group, as members of the society, can continue to experience the enrichment and fun of work, which can stimulate their strong sense of social participation. At the same time, let the elderly feel that they can also play a positive role in the society, and enjoy a good quality of life through their own efforts and efforts. This can also alleviate the contradiction of insufficient productivity level faced by the aging population society, and maximize the great potential of the elderly under the background of rapid development. Because the elderly group has the prudence, wisdom and wisdom that the younger generation lacks, its active participation in social production and life will produce huge economic benefits, and can also realize the reasonable flow and allocation of human resources in the society. To some extent, security strengthens the responsibility and mission of the government in an aging population society.

It is more necessary for the government to introduce corresponding policies to ensure the quality of life in their later years. Secondly, we should ensure that the elderly group can enjoy the same rights as other groups from social discrimination. Every stage of life should be a wonderful flower of life, and also deserve the same attention and treatment. Let the rights of the elderly be fully guaranteed, and the whole society should respect the elderly, and not let discrimination flourish. To ensure that the elderly should receive due care and protection when they cannot protect their rights or live, so that the elderly can live with dignity and improve the quality of life and life of the elderly. Aging is the only way for everyone's life and the inevitable stage of life. We should abandon the wrong idea that "old is useless", and take positive measures to ensure the quality of life of the elderly, so that the elderly can spend the last stage of life with dignity, value and a sense of achievement.

Connotation and value of elderly information literacy from the perspective of active aging

The theory of active aging emphasizes that seniors should maintain physical and mental health while actively participating in social life and diverse activities to maximize their potential and enhance quality of life. Meanwhile, establishing a

robust social security system further improves the living standards and well-being of the elderly. Given that comprehensive information coverage has become an irreversible trend in modern society, possessing strong information literacy is undoubtedly a critical factor for seniors to truly achieve active aging. In the digital era, information literacy encompasses not only basic computer skills and internet usage abilities, but also the capacity to acquire, evaluate, and effectively utilize information, along with critical thinking and cybersecurity awareness when facing information overload. Furthermore, recognizing the elderly as individuals with equal rights, respecting their practical needs for emerging technologies and their willingness to proactively engage with new technologies, and believing that they can independently, healthily, and happily live in society through their own capabilities, are essential components in promoting equal treatment of the elderly learning abilities.

Information awareness: The elderly group actively integrates into the ideological guidance of the information age

The core of information awareness is “dare”and “think”. Generally speaking, it is to actively find answers, and know where and what methods to seek. Information awareness is the sum of various needs, thinking concepts and cognition of the elderly group in the process of participating in information activities (Zhang Qianwei, 2001).

Encouraging older adults to take part in information practices on their own will help to enhance their digital confidence and further stimulate their new needs and potential in the digital age. For instance, For example, various information practice activities suitable for the elderly can be organized, such as smartphone application training, online shopping experience activities, and social media use communication (Gu Lei & Xu Shengju, 2024).

Information awareness requires the elderly to have insight and sensitivity to face information. The elderly group should be able to accurately judge and master the useful information for solving problems in the complex information world, identify the authenticity and falsehood of various information, and be able to use

information correctly and skillfully by solving problems in practical work and life (Liu Di, 2024).

Information awareness indicates that the elderly group should have a positive and strong internal demand for information. Elderly people should take the initiative to embrace digital technology, realize the inevitable trend of social digital transformation, break stereotypes and resistance to digital products, actively accept, try and use digital products, and enhance the willingness to continue using digital products (Shi Qinggong et al., 2025).

Information knowledge: the basic conditions for the elderly group to actively integrate into the information age

The core of information knowledge is “knowledge and knowing”, which refers to whether they have all the knowledge, theories and methods related to information. Information literacy is the only way for the elderly to achieve active aging in the information age, and information knowledge is the basis and key to obtain good information literacy. Different groups of people require different information knowledge. In general, the general elderly group needs to have the following three aspects of information knowledge (Li Guoping, 2023).

As we know, the information age is not only constantly changing the way people think, but also the traditional way of reading, writing and writing. However, this does not mean that traditional cultural literacy has lost all its value, because traditional reading and writing is still and will always be the basis of information literacy, through online and offline learning platforms, covering the use of intelligent devices, network security knowledge, operation of common apps, etc., and provides stratified and classified training courses to meet the diversified learning needs of the elderly (Liu Xiaolin et al., 2025).

In order to delay or reduce the arrival of these changes as far as possible, we can only reduce or avoid factors that damage the physical and mental health of the elderly through the existing medical and health conditions, so as to protect the health of the elderly to a greater extent. The active aging policy framework argues that when risk factors for chronic diseases and functional decline decrease and

security factors increase, people will enjoy longer healthy times and a higher quality of life (Rong Tingwei et al, 2019).

In this era of information explosion, news updates, policy documents, health guides, and lifestyle services are disseminated through newspapers, magazines, online platforms, and mobile apps. For example, using a smartphone to browse the web, download and install apps, mastering fundamental modern information technology knowledge is essential. Strictly speaking, basic concepts like network principles, computer theory, and the evolution of information technology aren't indispensable (Li Jiaping, 2024).

Information competence: The elderly group actively integrates into the core elements of the information age

The core of information competence is "will not", that is, whether the elderly group can make effective use of information resources and equipment to obtain information, and screen, process and innovate information. All information literacy must be reflected in whether people can freely operate the information system. For the elderly group, it is enough to achieve the basic requirements of information ability in the general level of citizen information literacy (Gong Furong, 2020).

The basic information technology system mainly includes computer startup, installation and operation of application software, and operation and use of simple information system, the operation process should be simplified and diversified and personalized service channels such as voice service and manual service should be provided (Wang Pei'an, 2023).

The ability to use simple information tools refers to the ability of the elderly to operate simple email, browser, word processing tools and other technologies, pointed out that the organization volunteer team provides face-to-face digital skills training for the elderly, covering smartphone operation, online shopping, health information inquiry and so on (Qu Manqi et al., 2025).

This requires the elderly to search information purposefully, select suitable information, and when necessary, filter, integrate, analyze, and transform the

selected information. This is a crucial aspect of developing good information literacy for the elderly, as in this era of information explosion, selecting the necessary information from the vast sea of data is the foundation for successful information utilization (Cheng Wen, 2024).

Information ethics: an important guarantee for the elderly to actively integrate into the information age

The core of information ethics is “right or not”, which is the ability to judge whether an information conforms to social norms and norms. We often say that “information technology is a double-edged sword”, which has become especially prominent for the elderly group. On the one hand, information technology can provide great convenience for the lives of the elderly, so that they to devote themselves to life with a more positive and confident mental outlook and better integrate into the information age. On the other hand, with the rapid development of the information age, also inevitably appeared such as network information sharing and copyright, network security, computer hackers, computer viruses, information abuse goes against the phenomenon of ethics (Chen Baotong & You Wubing, 2025).

Yue Xiaoshuang. (2023) realized that new media channels such as WeChat official accounts and short video platforms, regular dissemination of short videos and animated content related to legal knowledge is conducted. These formats are vivid and intuitive, enabling elderly individuals to learn at their own pace and in any location, thereby effectively enhancing the accessibility and coverage of legal education.

Huang Jiahao & Ma Li. (2024) established a strict information supervision system to severely punish the illegal disclosure of elderly people’s information and ensure that the information rights and interests of the elderly are effectively protected. Based on this consideration, the concept of active aging provides theoretical support for the cultivation of information literacy of the elderly group. Through the above analysis, it can be seen that the four elements that constitute the information literacy of the elderly are complementary and indispensable, among

which the information ability and information knowledge are mutually reinforcing and interdependent.

Pan Zheng & Lu Yuhui. (2025) Formulate technical standards for intelligent elderly care products, and strengthen security measures such as data encryption and privacy protection. This is because information knowledge is the prerequisite for the elderly group to choose information and use information, and information knowledge is also the basis of improving information ability. In turn, information ability plays a restrictive role in the selection and mastery of information knowledge in the later stage.

Value of information literacy among the elderly from the perspective of active aging

In the 21st century, information explosion is the proper meaning of the information age. The information world gradually transcends the physical world into people's production and life. All kinds of information constitute a new information environment system and become an important part of our daily life. The information literacy derived from this has different meanings in individuals at different levels. The elderly group is in a special stage of life, and information literacy has a great impact on it. Combined with the role of information literacy, the learning rules of the elderly group, the physical characteristics and the target requirements of active aging, information literacy will mainly have the following three effects on the elderly group:

National level: Information literacy of the elderly group is conducive to improving their competitiveness

In the 2006-2020 National Informatization Development Strategy issued in 2006, it is pointed out that " In the 21st century, the information wave and the process of economic globalization are intertwined and deeply integrated, which not only promotes the continuous optimization of the global industrial division of labor system and the profound adjustment of the economic structure, but also reshapes the new pattern of global economic competition. (The General Office of the CPC Central Committee and The General Office of the State Council, 2006)."

Along with the transformation and development of economic and industrial development is the acceleration of the aging process of the world population, how to reshape the team of more and more large elderly groups has become one of the problems that all countries in the world must take seriously. The overall level of the state of informatization is determined by the informatization level of every citizen, which is also an important factor affecting the national competitiveness. Although the elderly group is not the backbone of national economic development, making the elderly group with good information literacy can not only enable the elderly to live a more fulfilling and happy life, but also enable the elderly who have their best to actively participate in social production, relieve social pressure and enhance national competitiveness. Therefore, the level of information literacy of the elderly group has to some extent affected the success of economic transformation and national competitiveness.

Social level: Information literacy of the elderly group is conducive to the construction of a learning society

One of the important contents of the sixteenth National Congress of the Communist Party of China in building a well-off society in an all-round way is to focus on building a learning society. In the report of the 17th National Congress of the Communist Party of China further emphasized the need to build a learning society with schools for all and lifelong learning. Among them, learning for all is the foundation of building a learning society, and lifelong learning is the goal of a learning society. In the information age, learning is no longer limited to the traditional teachers, and independent learning has more and more become a necessary learning way for people. In this case, good information literacy is an important guarantee for people to learn and acquire knowledge independently, and information literacy is an important ability for the elderly with inconvenient travel. When elderly individuals possess strong information literacy, they can independently search for and access required information based on their learning needs, thereby achieving effective self-directed learning. This capability helps mitigate the potential impact of external factors such as poor health conditions, geographical limitations, transportation

difficulties, or weather changes on learning continuity, making the learning process more flexible and stable.

Yue Ziqi. (2024) believes that it is necessary to regularly communicate network security knowledge with the elderly, share typical cases and improve vigilance. Let the elderly group continue to maintain their enthusiasm for learning is an important part of building a learning society, because the traditional concept holds that their social role is gradually marginalized after entering old age, and their social function is gradually weakened, which affects their correct understanding of themselves and leads them to their giving up learning. However, for the elderly with good information literacy, information technology tools greatly extend the sensory functions of human beings and provide convenience for the elderly group to continue to learn.

Personal level: The information literacy of the elderly group is conducive to improving the value of life

Information increasingly penetrates into people's work and life, which has a positive effect and inevitably has adverse effects. The information asymmetry caused by the digital divide phenomenon is in a sense aggravating the gap between the rich and the poor. Those who know where information is stored and can access information have an advantage in the competition for survival, while those who know little or no knowledge of information are at a disadvantage (Li Guoping, 2023).

It can be seen that information literacy has gradually become an important factor for individuals to have knowledge, wealth and life happiness, which also shows that information literacy is crucial for the elderly group to achieve active aging. In such a changing society, have a certain information literacy elderly group can actively obtain and process information, it can help them in the new stage of life development in accordance with the personal ability and interest timely planning life development direction, to achieve a happy life and improve the value of life is of great help. More importantly, having a certain information literacy can promote the elderly group to develop a good habit of independent learning and constantly

improve the ability of independent learning, which can enable the elderly to obtain a powerful weapon to adapt to the rapid changes of the times.

Strategy

Community education governance strategy

Communities have implemented strategies to enhance information literacy. For example, they regularly conduct digital skills training classes, distribute clear instruction manuals, and organize workshops on the use of smart devices.

Chen Longgen & Hu Yangbo. (2022) proposed to help build the multi-center governance model under the three-dimensional framework of the government, the market and the society by strengthening the construction of the coordination mechanism. In terms of the research on the participation mechanism of social organizations.

Ding Hongling. (2022) proposed to promote the socialized management of community education through the diversification of school subjects, group education, government purchase of services, and the cultivation and development of community education NGOs.

Li Jiaping. (2024) based on the analysis of the problems in our community education management to promote community education multicenter governance pattern, specifically refers to the community education governance to the needs of people and social needs, legal policy, management system and resource conditions for the practice and security way, with government, non-governmental organizations, community college, Zhu Qu unit as the main driving force.

Liu Zongjin. (2017) established the conceptual framework of collaborative governance of community education, and verified the influence of resource mobilization, multiple governance and benefit distribution on the collaborative governance effect of community education. Resource mobilization refers to the promotion of the role of resource mobilization and multiple governance refers to the effective supply of community education by establishing vision, power and responsibility division, collaboration, information sharing, equal consultation,

supervision and evaluation, and the benefit distribution refers to the analysis of the interests of participants.

Wang Linyan. (2020) used the operation theory to analyze the operation mechanism of decision-making, execution, supervision, coordination and service in community education governance, and based on the framework of community education governance, integrated and verified the five factors influencing the community education governance mechanism, namely, concept goal, multiple governance, resource support, benefit allocation, monitoring and evaluation.

Guo Yaobang. (2006) analyzed the operation mechanism of community education from the perspective of the elements of community education system, and found that the operation mechanism of goal orientation, organizational network, effective input, reso urce integration and evaluation incentive were mainly used in community education management.

Hu Xiaotian. (2020) analyzed the operation mechanism of the two community education projects, and summarized the development mechanism of urban horticulture projects: the community schools play the role of education and guidance, the neighborhood committee to mobilize the residents to participate in the project, maintain the continuous operation of the project, the other non-profit organizations and higher education institutions play the support and service role; the mechanism of garbage classification and recycling projects is to establish the whole product recycling alliance, including “green housewife”, community schools, three environmental protection enterprises and two environmental protection non-profit organizations, each undertake the corresponding functions of garbage classification and recycling.

Cheng Xianping & Yang Shujun. (2016) analyzed the possible governance paths and implementation strategies of community education, and proposed to promote the governance of urban and rural community education by adopting strategies such as guiding citizens for lifelong learning, coordinating the top-level design of community education, and exploring the market mechanism.

In conclusion, optimize the operation mechanism and practice path of community education, promote the choice and use of community education governance mechanism in practice, so as to improve the level of community education governance and achieve good governance of community education.

Community Sustainable Development Education Governance Strategies

To promote the sustainable development of information literacy among the elderly, communities have established a multi-level support system. This includes structured digital skills training pathways, the provision of offline digital guidance.

Nina Kolleck et al. (2017) described the different levels of governance system in the implementation of community sustainable development education process, the study found in the field of the sustainable development of social network, its prominent feature is multi-level and participate in the subject of governance, but different levels of education management in various stages of policy innovation cycle has not been well integrated together.

Inka Bormann & Jutta Nikel. (2017) studied the sustainability education in Germany during the United Nations Decade for Sustainable Development Education (2005-2014) Implementation. The study of four sub-projects in a three-year related project provides a communication model that understands the concept of sustainable development education in a multi-level education system. They studied the process at both the federal government and community levels and found that in the governance mechanisms of the SDB agenda, the elements that influence the coordination of actions of participants include: (1) understanding of the normative concept of sustainable development as a negotiating content; (2) participant' perceived opportunities to gain and increase appreciation in sustainability education as an incentive and driver of participation; and (3) dynamic setting of action coordination principles and rules as the situation changes.

Mandy Singer-Brodowski et al. (2020) studied how the participants involved in the German SDB education program acted together with each other from the perspective of educational governance. Research spanning administrative, political, academic, civil society, and educational practice domains reveals that stakeholders

involved in expanding sustainable development education must critically examine how they interpret, maintain, and embed these boundaries. Such reflection is vital for fostering relational agency in multi-stakeholder governance networks, enabling effective cross-domain collaboration to advance the implementation and deepening of sustainable development education.

Zhou Yanjun & Li Yan. (2021) proposed strategies for sustainable development of elderly education in contemporary communities. It identifies current challenges in the community education system, including insufficient awareness, imperfect management mechanisms, and weak foundational capabilities. To achieve healthy and sustainable development, elderly education in modern communities should adopt the following approaches: clarifying strategic positioning and updating educational concepts; coordinating government efforts to achieve collaborative governance; improving the education system and integrating multi-stakeholder resources; and integrating social resources to stimulate community vitality.

Wang Ruoxu & Zhu Jihong. (2024) compared the existing community education service models, this study analyzes their characteristics and challenges, and proposes a new service model based on sustainable design principles. The research team implemented service design practices according to this model, establishing a “Everyone is a Teacher” sustainable community education service system that prioritizes residents' learning needs. The system aims to facilitate dual-role transitions between learners and instructors, complemented by a supporting website.

In short, the sustainable development of education governance research involving global, national, cities, about the sustainable development of community education practice guidance, put forward some sustainable development education practice development strategy, understanding and analysis of the sustainable development of community education and its governance is of great significance.

Sustainable management strategy

SWOT analysis

SWOT analysis refers to the situation analysis under the internal and external competitive environment and competitive conditions of the research object. The specific contents are: first list the internal advantages and disadvantages, external opportunities and threats associated with the research object and arrange them in the matrix; then match and analyze the factors with systematic analysis methods, so as to draw a series of conclusions with decision-making nature.

Since its initial proposal by Albert Humphrey of the University of San Francisco in 1988, SWOT analysis has become a widely adopted methodology in strategic planning and management. In his seminal work, Humphrey elaborated on the origins and applications of SWOT analysis, underscoring its vital role in organizational decision-making processes. By systematically evaluating an organization's internal strengths and weaknesses alongside external opportunities and threats, SWOT analysis serves as a powerful strategic planning tool that enables businesses to comprehensively assess their internal capabilities and external environment.

With the growing popularity of SWOT analysis, numerous scholars have conducted in-depth research on it. In their comprehensive marketing management textbook, they strongly emphasized that SWOT analysis—encompassing the evaluation of a company's internal Strengths and Weaknesses as well as external Opportunities and Threats—serves as an indispensable component of corporate strategic planning, providing a structured and systematic framework for businesses to assess their current position and make informed, forward-looking decisions in an increasingly competitive and dynamic market environment (David, 2009).

Campbell & Lynch. (1985) SWOT analysis also has certain limitations, it pointed out that SWOT analysis is overly simplistic, which may lead to misunderstandings of complex environments. They suggested combining it with other tools and methods such as the PEST analysis (Political, Economic, Social, Technological) and the Five Forces model to gain a more comprehensive

perspective. Additionally, the subjectivity of SWOT analysis remains an issue, as its results often depend on the analyst's judgment and interpretation.

In SWOT analysis, S represents advantages, W represents disadvantages, O represents opportunity, T represents threat, advantages and disadvantages are the internal environment of the community. The opportunities and threats are mainly analysis of the external environment of the enterprise, including current market demand, increase of number of competitors or strategic change, introduction of new national policies, change of economic situation, change of customer demand, etc.

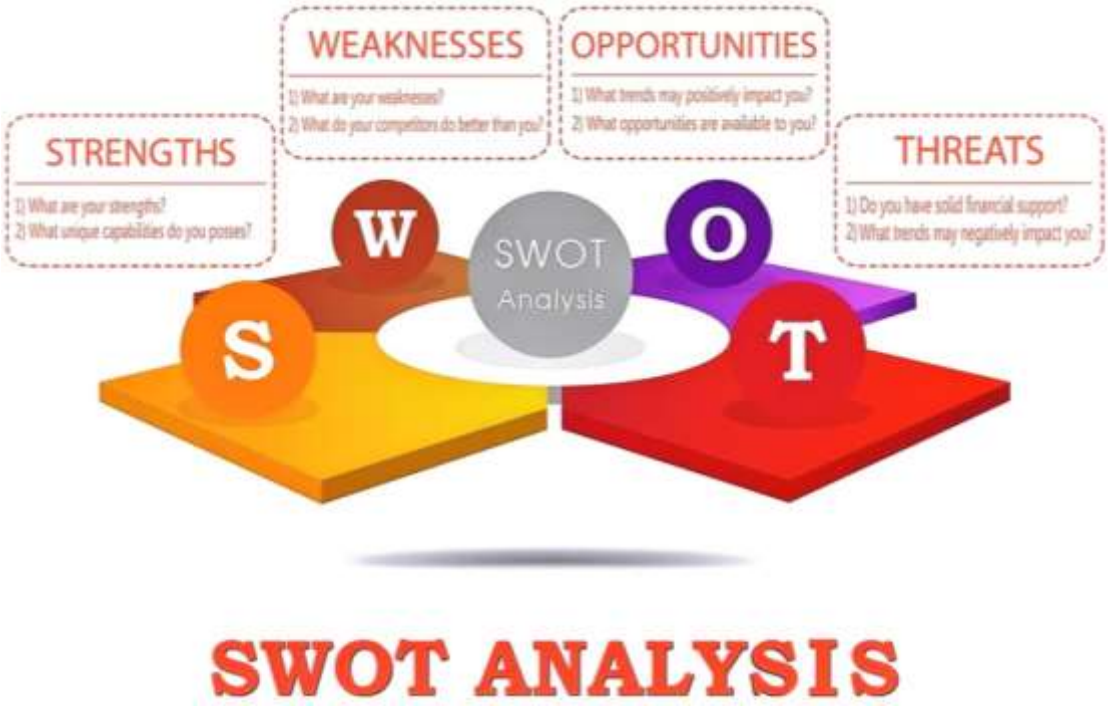

Figure 2.4 SWOT analysis Model

(Source: Campbell & Lynch. 1985)

In summary, this study employs the SWOT analysis method to systematically examine, integrate, and conduct in-depth analysis of four dimensions: internal strengths and weaknesses of the community, as well as external opportunities and

threats. This approach enables the community to gain a more intuitive understanding of its internal and external environmental characteristics.

TOWS matrix: A Strategic Framework for Organizational Assessment

Weihrich, H. (1982). First proposed in his seminal work *The TOWS Matrix: A Tool for Situational Analysis*, Weiherich demonstrated that the TOWS matrix enables managers to integrate external opportunities and threats with internal strengths and weaknesses, this framework generates four strategic approaches: SO (leveraging strengths to seize opportunities), ST (utilizing advantages to mitigate risks), WO (overcoming weaknesses to capitalize on prospects), and WT (combining both strengths and weaknesses to avoid pitfalls).

Figure 2.5 TOWS matrix Model

(Source: Weihrich, H. 1982)

Hill, T., & Lynn, M. (2003) In the book The TOWS Matrix: A Tool for Situational Analysis, the author provides a detailed explanation of how to apply the TOWS matrix and offers multiple practical cases demonstrating how TOWS analysis can be integrated into corporate strategic planning. The work emphasizes the importance of

TOWS analysis in dynamic environments, highlighting that businesses must continuously update both internal and external analyses to adapt to evolving market conditions.

Kotler & Keller. (2016) As highlighted in the book *Marketing Management*, TOWS analysis empowers businesses to better understand market dynamics and optimize resource allocation when developing marketing strategies. This analytical framework is also widely adopted by non-profit organizations and public sector entities for strategic planning, helping them identify and leverage resources to address external challenges. In practical applications, TOWS analysis has become a cornerstone of corporate strategy development, marketing campaigns, new product innovation, and various other business operations.

In short, The TOWS matrix provides organizations with a systematic evaluation framework to comprehensively assess their strategic positioning. By analyzing their strengths, weaknesses, opportunities, and threats, companies can develop strategies that leverage internal advantages while addressing external challenges. Research has emphasized the critical role of this analysis in strategic planning and management.

PEST analysis

Johnson, G., Scholes, K., & Whittington, R. (2014) PEST analysis refers to the analysis method mainly used in the external macro environment of enterprises in the process of strategic management. The macro environment, also known as general social environmental factors, does not directly impact business operations. Instead, it exerts its influence indirectly by altering the development trends of micro-environmental factors affecting corporate activities. The essence of PEST analysis lies in identifying opportunities and potential threats within the external macro environment. This process provides crucial references for formulating scientific, rational, and feasible strategic plans, thereby better guiding the long-term development and decision-making direction of enterprises.

Factors for PEST analysis

The PEST analysis consists of four factors

Kotler, P., Brown, L., Burton, S., Deans, K., & Armstrong, G. (2017) Social factors: it refers to the social structure, cultural inheritance, values, religious beliefs, income level, education level, customs and habits of the members of the community. These social elements all exist quietly in the social environment, and have an obvious impact on the daily business activities of the community. Political factors: refers to the political forces that can play a direct and indirect role in the daily operation activities of the community and the laws and regulations related to the daily operation of the community. When the community is usually suppressed by political forces, or the government has promulgated laws and regulations that are binding on the daily operation of the community, the community should adjust its business strategy in time to ensure that its own operation must comply with the provisions of political laws and regulations. Political factors mainly include: the relationship between community and government; the stability of government; the influence of laws and regulations on the community; the government recognition of community business activities.

Porter & Heppelmann. (2014) Technical factors: it refers to the community's research and development, breakthrough and innovation in science and technology, so as to form new technologies, new knowledge, new processes and new materials related to the production and operation of the community. These technological advancements can have a significant impact on the community's competitiveness. For example, new technologies may lead to more efficient production methods. It mainly includes: social science and technology level; social science and technology strength; international science and technology system; international science and technology policies and regulations. The scientific and extensive application of technical elements can promote the rapid development of the community.

Figure 2.6 PEST analysis Model

(Source: Johnson, G., Scholes, K., & Whittington, R.2014)

In short, The PEST analysis framework serves as a strategic tool designed to assist community managers in comprehensively assessing and interpreting the multifaceted influences of the external environment. By examining four core dimensions—Political, Economic, Social, and Technological—the analysis systematically evaluates the macro-environment, providing a scientific basis and clear direction for community decision-making.

From above information, PEST analysis was a strategic tool used to assess external factors influencing an organization. It categorizes these factors into Political, Economic, Social, and Technological domains. The framework has evolved to include Environmental and Legal aspects, reflecting their increasing importance in strategy formulation. Effective use of PEST analysis involves continuously monitoring these factors to anticipate changes and adapt strategies accordingly. It is particularly useful for understanding market dynamics, addressing global and local variations, and integrating these insights into broader strategic management practices.

SWOT-PEST Matrix analysis

David. (2016) PEST analysis is typically combined with SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) to provide a more comprehensive assessment of the external environment. With its flexibility, PEST analysis can be applied to organizations of all sizes and types, from startups to multinational corporations, enabling effective external environment analysis. By integrating political, economic, social, and technological factors, PEST analysis helps organizations systematically identify and understand key elements in their external environment that may impact their development, thereby providing robust support for strategic.

Barney. (1995) The SWOT-PEST analysis method is a comprehensive strategic tool that combines SWOT and PEST frameworks. It enables enterprises to holistically evaluate internal strengths and weaknesses alongside external opportunities and threats, while incorporating macro-environmental factors such as political, economic, social, and technological elements. For instance, in practical applications, companies can identify their core technological advantages through SWOT analysis. By leveraging PEST analysis, they gain deeper insights into current and future technological trends, regulatory support, and market dynamics.

Moutinho. (1987) In practical applications, the SWOT-PEST analysis strategy has proven to be widely applicable across various fields. It can be used to evaluate the comprehensive competitiveness of specific destinations, helping stakeholders understand their strengths, weaknesses, opportunities, and potential threats. At the corporate strategy planning level, it also assists in identifying key internal and external factors influencing business development, providing robust support for formulating scientifically sound strategic decisions.

The literature review on the SWOT-PEST integrated analysis strategy clearly demonstrates that this hybrid methodology offers organizations a robust and multi-dimensional analytical framework. By systematically combining internal and external environmental factors, it enables companies to conduct thorough and structured evaluations even within highly complex and rapidly changing market conditions.

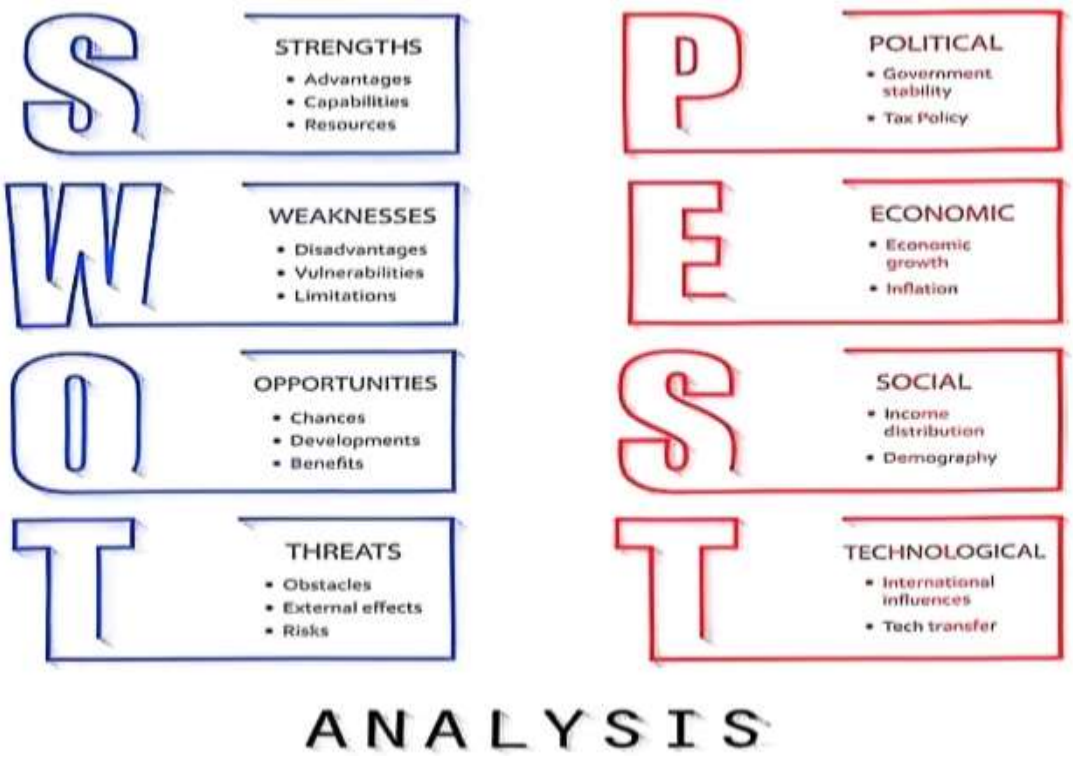

Figure 2.7 SWOT-PEST analysis Model

(Source: Moutinho.1987)

In conclusion, this study using SWOT-PEST analysis, mainly from the advantages and disadvantages, opportunities and challenges of the internal and external environment, and then from the political, economic, social and technology, by combining SWOT analysis and PEST analysis, build the SWOT-PEST matrix analysis model, relying on the form of the chart more intuitively present each influencing factors, and then put forward development countermeasures. The SWOT-PEST matrix analysis model reveals three key dimensions: Internal Strengths include the organization's extensive experience in elderly digital services, professional teams, and mature technical solutions. Weaknesses may involve limited funding, slow technological updates, and imbalanced talent distribution. External Opportunities encompass enhanced policy support for elderly digital inclusion, growing societal awareness of digital integration, and breakthroughs from continuous technological innovation.

Table 2.4 The SWOT-PEST matrix analysis model

SWOT-PEST		P	E	S	T
Internal environment	S	SP	SE	SS	ST
S/W	W	WP	WE	WS	WT
External environment	O	OP	OE	OS	OT
O/T	T	TP	TE	TS	TT

In short, SWOT-PEST analysis reveals that in the context of active aging, the advantages of bridging the digital divide stem from heightened societal attention to the elderly population and rapid technological advancements, which create favorable social and technical conditions for addressing the digital divide. Conversely, limitations include limited technological acceptance among some seniors and insufficient service provision. Externally, increasing policy support and active participation of social capital present new opportunities for digital divide governance. Challenges, however, involve balancing the needs of different stakeholders and ensuring effective implementation of governance measures.

Related Research

The development strategy for information literacy among the elderly relies on the foundation of family and community, driven by government guidance and multi-stakeholder collaboration, supported by policies and integrated resources, thereby providing a reference for research.

Huang Zhen & Liu Ying. (2020) A survey was conducted among 65 elderly individuals in Xi'an (male aged 60 and above, female aged 55 and above). The majority of the elderly remain dissatisfied with existing new media platforms, and their usage needs have not been adequately met. Apart from learning and communication platforms, the most anticipated new media services (or platforms) for the elderly are those closely related to personal health, such as remote medical consultations and intelligent "family doctors." Although some health care

apps are available in the market, their adoption rate among the elderly remains low. Most elderly individuals are unaware of the existence of these apps or the methods for downloading them.

Ma Zhao. (2021) The Xi'an Municipal Bureau of Statistics conducted an online survey targeting permanent residents aged 50 and above in Xi'an. Among the challenges faced by seniors, financial pressure, lack of companionship, and caregiving support are identified as major difficulties. Additionally, significant demand exists for rehabilitation care and catering services, indicating substantial potential for community-based home care services. Specifically, 48.1% of respondents indicated a need for medical rehabilitation services, while 46.7% required elderly meal services. Furthermore, 42.5% expressed a notable demand for cultural and sports activities, and 39.6% highlighted a significant need for emotional support.

Song Yeqin & Gu Limei. (2023) pointed out that current governance of the digital divide for the elderly population still faces significant practical challenges in value orientation, institutional safeguards, tool application, structural design, and operational mechanisms. To address these, future efforts must adopt a multi-dimensional collaborative approach: maintaining demand-driven core values, strengthening legal frameworks and supporting policies, maximizing technology's enabling role, optimizing multi-stakeholder collaboration networks, and refining coordination mechanisms. To strengthen institutional safeguards, we must accelerate the establishment of a comprehensive legal framework covering digital access, usage, and security.

Li Jingbo & Li Yi. (2024) Based on data from the China General Social Survey (CGSS) from 2010 to 2018, this study employs an age-period-cohort model to investigate the health status of empty-nest elders and analyzes the impact of internet use on their health. The results show that changes in the mental health of empty-nest elders are influenced by period and cohort but are unrelated to age; changes in physical health are affected by age and period but are unrelated to cohort. Further findings indicate that internet use has a significant positive effect on the physical and mental health of empty-nest elders, primarily through social and

learning channels. Particularly, for rural empty-nest elders aged 75 and above, the positive impact of internet use on their health is more pronounced.

Guo Weina. (2024) pointed out that the field of elderly education still faces challenges such as cognitive biases in service delivery, limited resource utilization, mismatched supply-demand content. Hangzhou's community education for the elderly has implemented multiple measures, including designing service pathways, improving policy support mechanisms, establishing smart service platforms, creating demonstration bases, developing region-specific courses, and implementing targeted training programs. These initiatives aim to update values, innovate educational models, and create new scenarios for elderly community education. Additionally, they seek to collaborate with cross-regional, cross-level, and cross-departmental business networks to bridge invisible connections.

Jiang Yilu & Wen Taoying. (2024) pointed out that Japan is confronting the challenge of an aging population. The government prioritizes enhancing digital literacy and skills among the elderly. Through collaboration between the Ministry of Internal Affairs and Communications, local governments, and various sectors of society, multiple initiatives have been implemented to help seniors better adapt to the digital era. In education, Japan has actively explored effective approaches to improve digital literacy for older adults. These efforts include offering diverse courses and activities, creating comfortable learning environments, establishing integrated teaching platforms, providing high-quality educational services, and promoting interdisciplinary collaboration, aimed at comprehensively upgrading digital skills among the elderly.

Cao Shule & Wang Xinru. (2024) focused on silver-haired internet celebrities deeply involved in platform content creation, exploring their integration into digital communities and their journey toward active aging. Research reveals that a multi-layered, embedded, and creative platform participation framework centered on seniors is gradually taking shape. Through engaging with this multidimensional platform, these silver-haired influencers experience a vibrant lifestyle and find renewed meaning in their later years. In digital communities, seniors not only share life wisdom and cultural heritage but also actively engage with younger

generations, fostering intergenerational understanding and integration. This cross-generational interaction enriches the spiritual world of silver-haired influencers while empowering them to play more active and influential roles in society.

Cheng Wen. (2024) discussed this study examines the current state of media usage and media literacy among the elderly, highlighting that media development and aging are two major trends in contemporary society. It recommends that stakeholders eliminate age discrimination and adopt a people-centered approach; promote intergenerational harmony through technology feedback; enhance lifelong learning capabilities to share the benefits of the digital era; and advance intelligent media development to help the elderly enjoy a happy and fulfilling later life. These measures aim to achieve the healthy development of elderly affairs and the continuous improvement of media literacy, collectively building a senior-friendly society.

Ji Wannian & Lu Cailan. (2024) proposed that it is necessary to change the concept of the elderly and cultivate their internal needs for digital technology; pay attention to the assistance of various forces, consolidate the bond of family support; encourage enterprises to fulfill their social responsibilities, provide more digital products suitable for the elderly; strengthen the top-level design and policy guidance, and build a harmonious digital ecological environment to help the elderly group adapt to the digital society more quickly. For collaborative support, families should play a foundational role by offering more patience and guidance to help seniors overcome learning challenges. Communities can organize training sessions and networking events to create platforms for seniors to learn and connect.

To sum up, the sustainable development of information literacy of the elderly needs the joint efforts of the government, society, family and other aspects. By building a perfect policy system, strengthening education supply, optimizing the education environment, establishing a long-term mechanism and other measures, the information literacy level of the elderly can be continuously improved, laying a solid foundation for the construction of a smart aging society. The government should

take the lead by formulating and implementing policies to enhance information literacy among the elderly, while providing them with more learning resources and opportunities. All sectors of society should actively participate and work together to promote the development of information literacy education for the elderly. Families, in turn, should assume the responsibility of foundational education by encouraging and supporting older adults in learning digital technologies.

Chapter 3
Research Methodology

In alignment with the three specific research objectives that focused on and enhanced information literacy among the elderly in Xi'an city, this study was divided into three phases.

Phase 1 : To study the current situation of information literacy among the elderly in Xi'an city.

Phase 2 : To develop strategies for information literacy among the elderly in Xi'an city.

Phase 3 : To evaluate the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

In order to achieve the above research phase, the researchers adopted the following research procedures:

1. The Population and the sample group
2. Research Instrument
3. Data Collection
4. Data Analysis

The objectives of this research were: 1) to study the current situation of information literacy among the elderly in Xi'an city; 2) to develop strategies for information literacy among the elderly in Xi'an city; 3) to evaluate the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city. This study employed a mixed-methods research design. This study adopted systematic sampling method and selected 384 elderly people from 5 communities in Xi'an city as the sample group, and 10 interview experts and 8 evaluation experts, using purposive sampling method.

Phase 1: To study the current situation of information literacy among the elderly in Xi'an city.

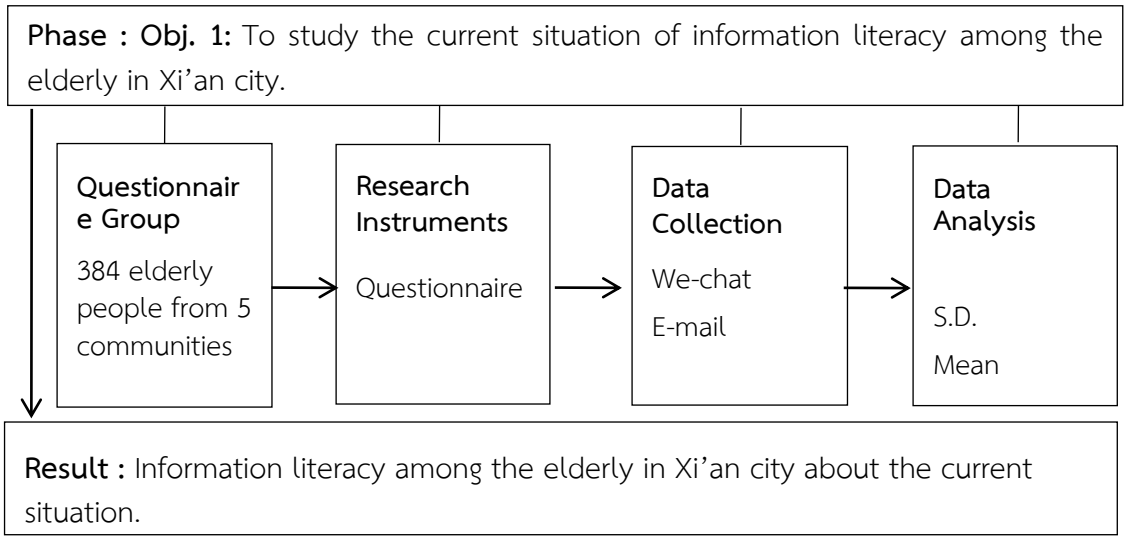

Figure 3.1 Phase diagram for Objective 1

The Population and the sample Group

Population

According to the statistical data released by the Xi'an Bureau of Statistics in 2024, the number of elderly people aged 60 and above in the city has reached 1.02 million. To comprehensively and systematically assess the information literacy level of the elderly population in China's Xi'an city, this study selected elderly individuals from five representative communities as research samples. The aim is to obtain accurate data through systematic sampling methods, providing theoretical basis and practical references for improving the information literacy of the elderly.

China Xi'an city has five communities, the number and percentage of elderly people aged 60 and above in the communities are: Beilin community (246,000, 24.22%), Lianhu community (199,000, 19.53%), Yanta community (303,000, 29.69%), Weiyang community (158,000, 15.36%), and Baqiao community (114,000, 11.20%). (Xi'an Bureau of Statistics, 2024).

Sample group

Questionnaire Group

According to the Krejcie and Morgan sampling table (1970 edition), this study adopted systematic sampling method and selected 384 elderly people from 5 communities in Xi'an city as the sample group.

The 5 communities selected include: Beilin community, Lianhu community, Yanta community, Weiyang community, Baqiao community.

Table 3.1 Sample size of questionnaire survey

NO.	Community	Population	The Sample Group	Percentage(%)
1	Beilin	246,000	93	24.22
2	Lianhu	199,000	75	19.53
3	Yanta	303,000	114	29.69
4	Weiyang	158,000	59	15.36
5	Baqiao	114,000	43	11.20
	Total	**1,020,000**	**384**	**100.0**

To ensure the representatives of the sample group, this study will endeavour to descriptive analysis methods to systematically examine the sample characteristics from six aspects: gender, age, educational background, health condition, monthly income, and type of work prior to retirement.

Research Instrument

Questionnaire

To explore the current status of information literacy among the elderly in Xi'an city, this study collected data through questionnaire surveys. The questionnaire conducted in this study was mainly divided into two parts:

Part 1: Basic information survey of respondents. It was used to understand the relevant background of the respondents, including: gender, age, educational background, health condition, monthly income, type of work prior to retirement.

Part 2: According to the connotation of information literacy, the questionnaire is divided into four dimensions: information awareness, information knowledge, information competence and information ethics.

The questionnaire survey was conducted using a five-point Likert scale, where higher scores indicate higher levels of information literacy. The details are as follows:

4.50 - 5.00 highest level

3.50 - 4.49 high level

2.50 - 3.49 moderate level

1.50 - 2.49 low level

1.00 - 1.49 lowest level

Constructing questionnaire process

The construction process of questionnaire was as follows:

Step 1: Descriptive statistical analysis mainly sorts out the basic information of the survey from six aspects: gender, age, educational background, health condition, monthly income, type of work prior to retirement.

Step 2: Questionnaire Design. Based on the four dimensions of information literacy, a total of 32 questions were designed, including 8 questions related to information awareness, 8 questions related to information knowledge, 8 questions related to information competence, and 8 questions related to information ethics.

Step 3: Inviting experts to revise the questionnaire content. The questionnaire was sent to five experts for evaluation.

Step 4: After soliciting expert opinions, 30 elderly individuals were selected as pilot samples to conduct a small-scale field test before the formal survey. Statistical analysis revealed an objective consistency index (IOC) is 1, and ensure the reliability of the questionnaire.

Data Collection

The method of data collection for Objective 1: To study the current situation of information literacy among the elderly in Xi'an city.

The researcher provided an explanation and requested a letter from the Graduate School of Bansomdejchaopraya Rajabhat University. The researcher distributed online questionnaires to 384 elderly people in 5 communities in Xi'an city.

The following are the input and output diagrams, as shown in Figure 3.2.

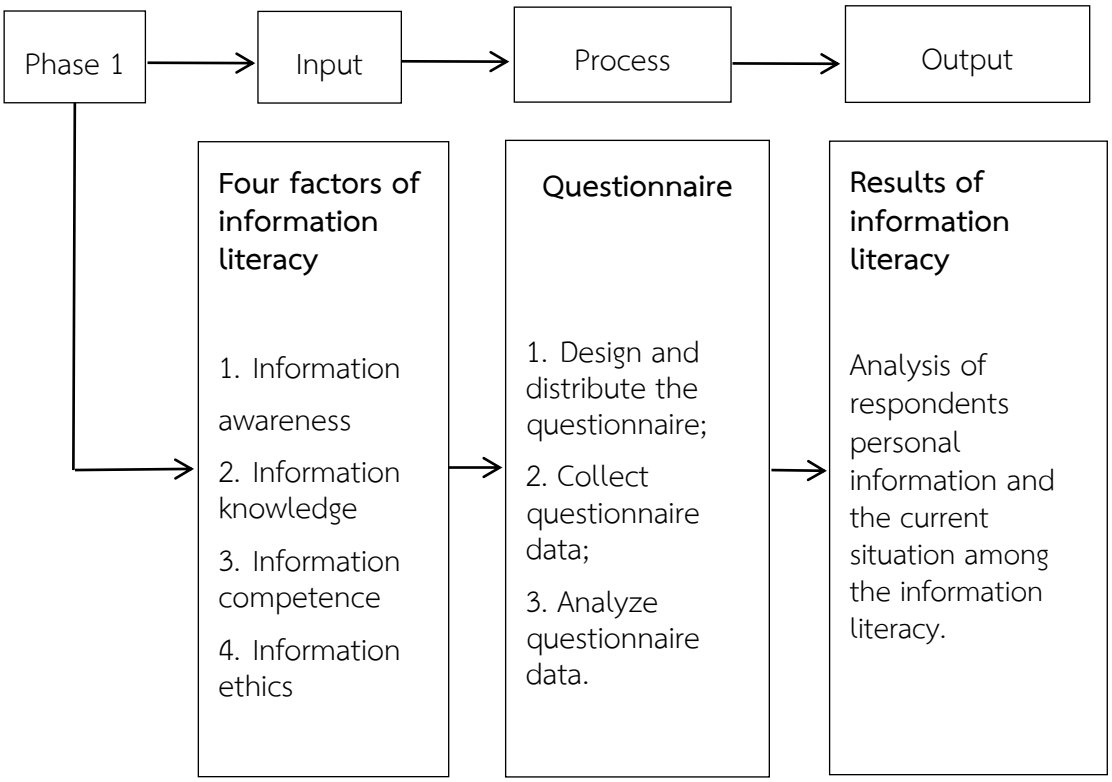

Figure 3.2 Research process of Phase 1

Data Analysis

Step 1: The personal information of the questionnaire respondents were analyzed in terms of percentage, categorized by gender, age, educational background, health condition, monthly income, type of work prior to retirement.

Step 2: Using descriptive statistics, the questionnaire statistics were processed and the current situation of information literacy among the elderly in Xi'an city was analyzed through the mean and standard deviation.

Phase 2: To develop strategies for information literacy among the elderly in Xi'an city.

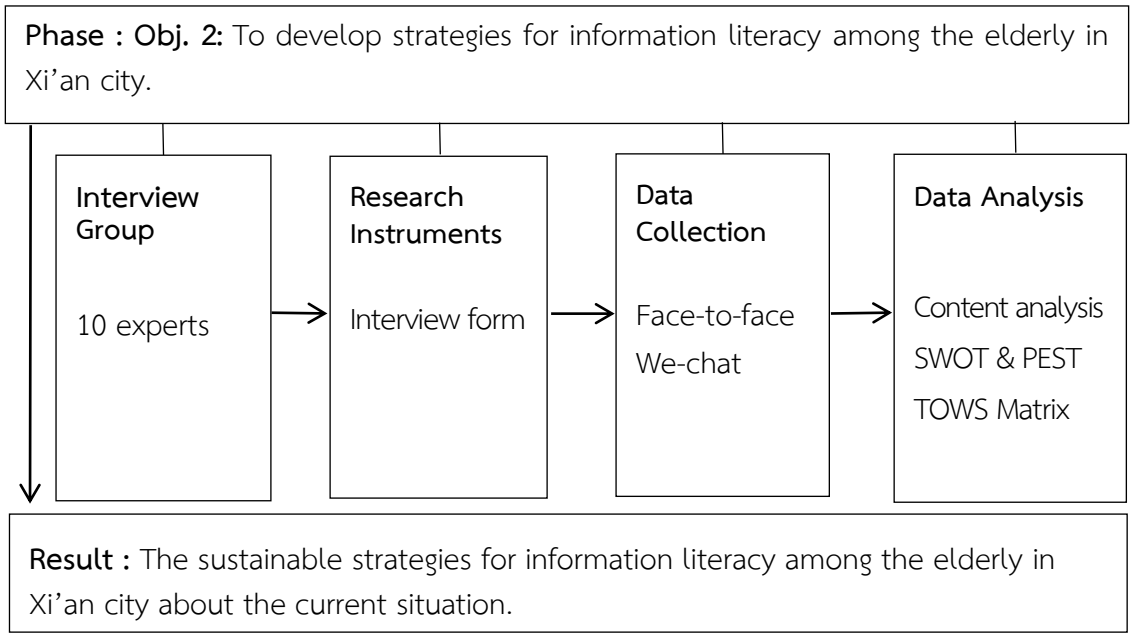

Figure 3.3 Phase diagram for Objective 2

Sample group

Interview Group

The interview group was composed of 10 experts selected from China. The experts were selected using purposive sampling, the following criteria: 1) have been working in community for more than 10 years; 2) who expertise in educational; 3) holding a professional title of associate professor or higher.

Table 3.2 List of Interviewer

Interviewee	Workplace	Education background	Time
Interviewee 1	Political Science and Law Data Institute	Professional title:Professor Work experience:25 years	March10, 2025
Interviewee 2	China Internet Network Information Center	Professional title:Professor Work experience:22 years	March10, 2025
Interviewee 3	Information Technology Center	Professional title:Professor Work experience:20 years	March11, 2025
Interviewee 4	Nankai University	Professional title:Professor Work experience:21 years	March11, 2025
Interviewee 5	Renmin University of China	Professional title:Professor Work experience:38 years	March12, 2025
Interviewee 6	Xi'an Association on Aging Information	Professional title:Professor Work experience:26 years	March13, 2025
Interviewee 7	China Research Center on Aging	Professional title:Professor Work experience:30 years	March13, 2025
Interviewee 8	Xi'an Elderly Care Service Center	Professional title:Professor Work experience:31 years	March14, 2025
Interviewee 9	Ministry of Industry and Information Technology	Professional title:Professor Work experience:28 years	March14, 2025
Interviewee 10	Xi'an Cybersecurity Center	Professional title:Professor Work experience:27 years	March15, 2025

Table 3.3 List of experts for strategy draft

NO.	Community	Interview Group
1	Beilin	2
2	Lianhu	2
3	Yanta	2
4	Weiyang	2
5	Baqiao	2
	Total	**10**

Research Instrument

Interview Form

Interview form will be conducted was divided into 4 aspects: 1) Information awareness; 2) Information knowledge; 3) Information competence; 4) Information ethics.

Constructing an Interview Form Process

The construction process of interview form was as follows:

Step 1: Based on the results of the questionnaire survey and the analysis of the current situation of information literacy, a corresponding interview form was developed from 4 aspects.

Step 2: SWOT-PEST analysis and TWOS matrix

Through SWOT and PEST analysis, the strengths, weaknesses, opportunities, and threats of information literacy among the elderly in Xi'an city were analyzed. Subsequently, based on the results of the TWOS strategic matrix analysis, a draft strategy was formulated, and a discussion outline was designed.

The draft strategy were collected, information literacy among the elderly in Xi'an city were put forward. That can be summarized as Table 3.4.

Table 3.4 SWOT-PEST analysis of information literacy strategy for the elderly

SWOT	PEST
External environment Opportunities	Political factors (P) National policy support, information support policy, and government system guarantee Economic factors (E) Local finance supports the state and local governments to vigorously and continuously invest funds in information education to ensure the supply Social factors (S) the diversification of community service methods and contents, the needs of the construction of a learning society, and the needs of lifelong learning for the elderly Technical factors (T) The expansion and development of network technology, artificial intelligence and big data
External environment Threat	Political factors (P) The community policy construction planning standards are not unified Economic factors (E) The financing channels for information literacy construction are limited, and the development of information literacy education for the elderly is not sufficient and unbalanced Social factors (S) the space and willingness to participate in the elderly Technical factors (T) Technology risk of information fraud, the leakage risk of personal privacy

Table 3.4 (Continued)

SWOT	PEST
Internal environment Strengths	Provide a more convenient life experience, entertainment and cultural experience, and enhance the social circle and interactivity
Internal environment Weaknesses	Information awareness has begun to take shape but the level is not high, information knowledge is lacking and the structure is unbalanced, information ability is insufficient and social integration is poor

Data Collection

The method of data collection for Objective 2: To develop strategies for information literacy among the elderly in Xi'an city, the steps are as follows:

Step1: The researcher asked the Graduate School of Bansomdejchaopraya Rajabhat University to send a letter to collect discussion data. The researcher sent invitation letters to the interviewees who participated in proposing strategies. The invitation letter elaborates on the research objectives, significance, and specific participation methods, while expressing sincere expectations for respondents to contribute constructive suggestions to enhance the information literacy of elderly individuals in Xi'an city.

Step2: Examination of research using interview methods. With interview group to confirm strategies to improve the information literacy of the elderly.

The following are the input and output diagrams, as shown in Figure 3.4.

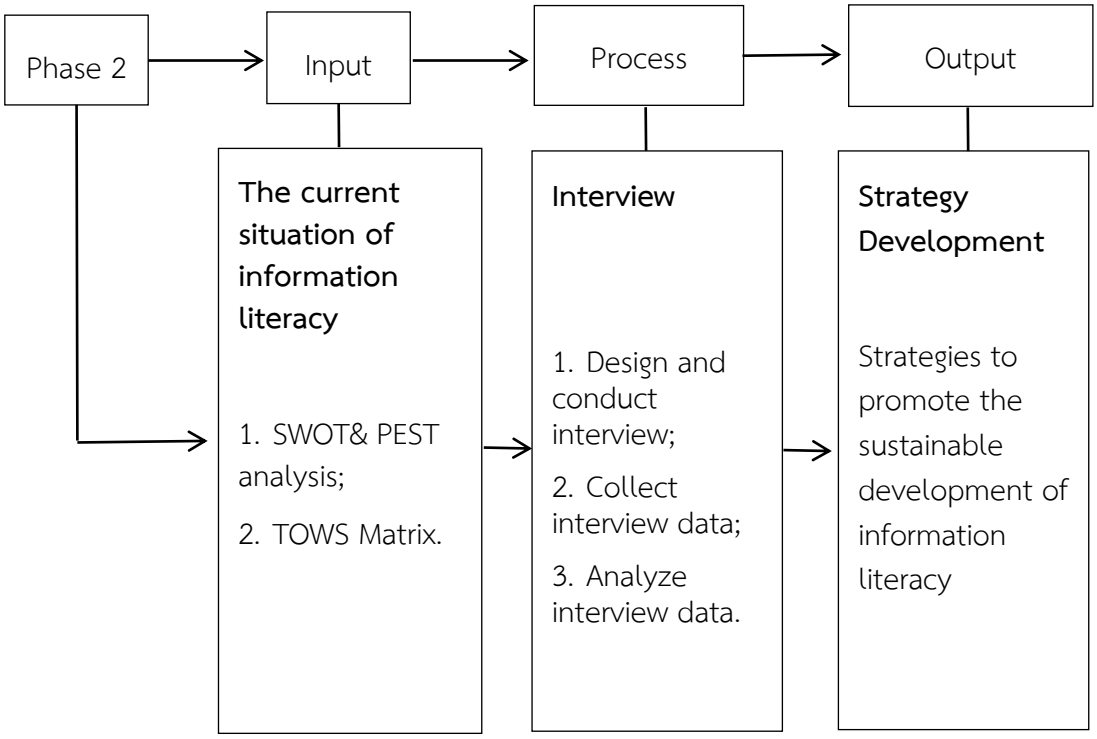

Figure 3.4 Research process of Phase 2

Data Analysis

Step 1: Based on the four aspects of information literacy, 10 experts are invited to conduct interviews and summarize the interview results.

Step 2: Use SWOT, PEST and TOWS matrix to analyze the opinions of 10 experts and come up with strategies.

Phase 3: To evaluate the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

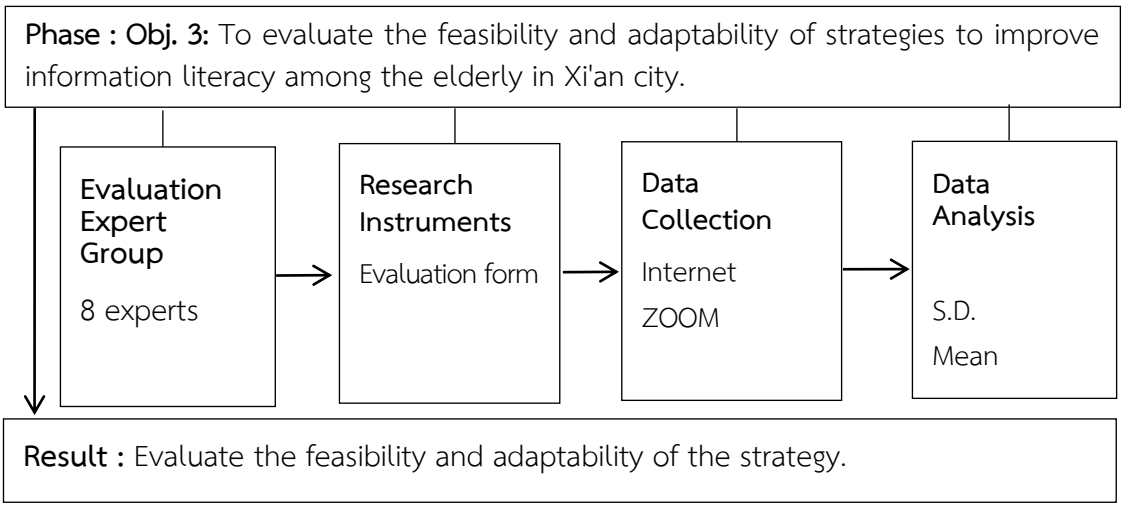

Figure 3.5 Phase diagram for Objective 3

Sample group

Evaluation Expert Group

The 8 experts were invited to evaluate the strategies, who met the following qualifications: 1) experts who have been engaged in information literacy education management for more than 20 years; 2) have the professional title and PhD. Degree; 3) a purposive sampling method was used.

Table 3.5 List of experts in the evaluation

NO.	Community	Evaluation Expert Group
1	Beilin	2
2	Lianhu	2
3	Yanta	2
4	Weiyang	1
5	Baqiao	1
	Total	**8**

Research Instrument

Evaluation form

This instrument collects data for Objective 3. Invited 8 experts from five communities in Xi'an city to evaluate the feasibility and adaptability of the strategy. According to the sample size, two experts were invited from Beilin, Lianhu, and Yanta, and one expert each from Weiyang and Baqiao.

Constructing evaluation form process

Step 1: Based on the specific strategies for improving the information literacy of the elderly in the city are formulated.

Step 2: The researcher designed an evaluation form and invited 8 experts to evaluate the feasibility and adaptability of the strategies. The evaluation form used the form of Likert's five-level scale

Data Collection

The data collection for Objective 3: To evaluate the feasibility of strategies to improve information literacy among the elderly in Xi'an city.

Step1: The researcher requested a letter from the Graduate School of Bansomdejchaopraya Rajabhat University to collect evaluation data.

Step2: The researcher Invited experts to fill out the evaluation form. The evaluation form covers all aspects of the strategy to improve the information literacy of the elderly in Xi'an city.

Step3: The researcher summarized and analyzed the results of the evaluation form. Through analysis, the data from the evaluation forms completed by experts was processed to derive the scores of each strategy.

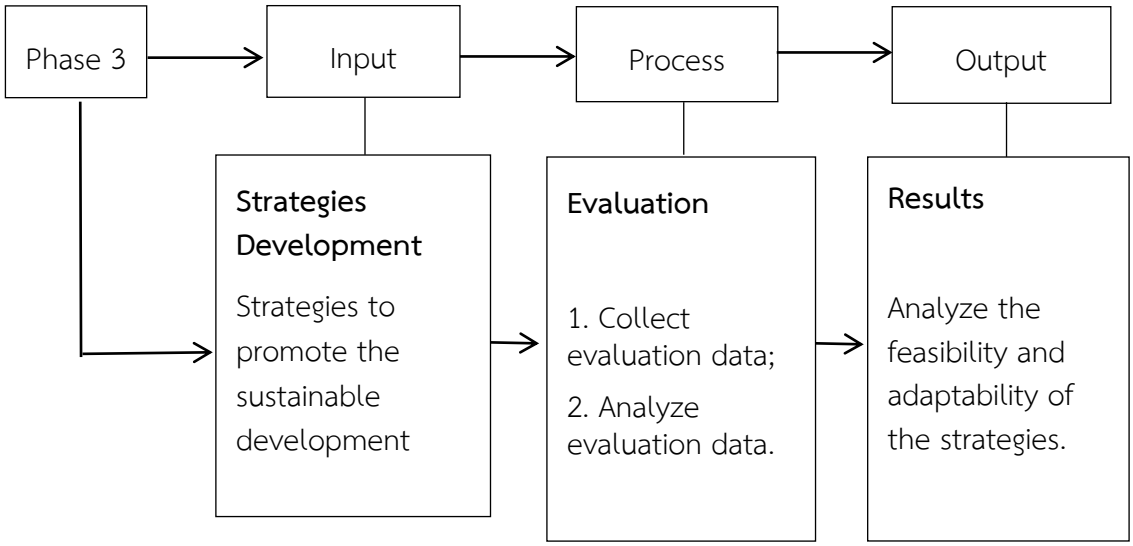

Figure 3.6 Research process of Phase 3

Data Analysis

Analyze the feasibility and adaptability of the strategies, in this study were evaluated by mean and standard deviation.

Summary

The research process is divided into three phases, the details are as follows:

The first phase serves as the evidence base for the first objective. The second phase serves as the evidence for the second objective. The third phase serves as the evidence for the third objective. The conclusion of research methodology were as below, a summary of the research phases were shown by Figure 3.7.

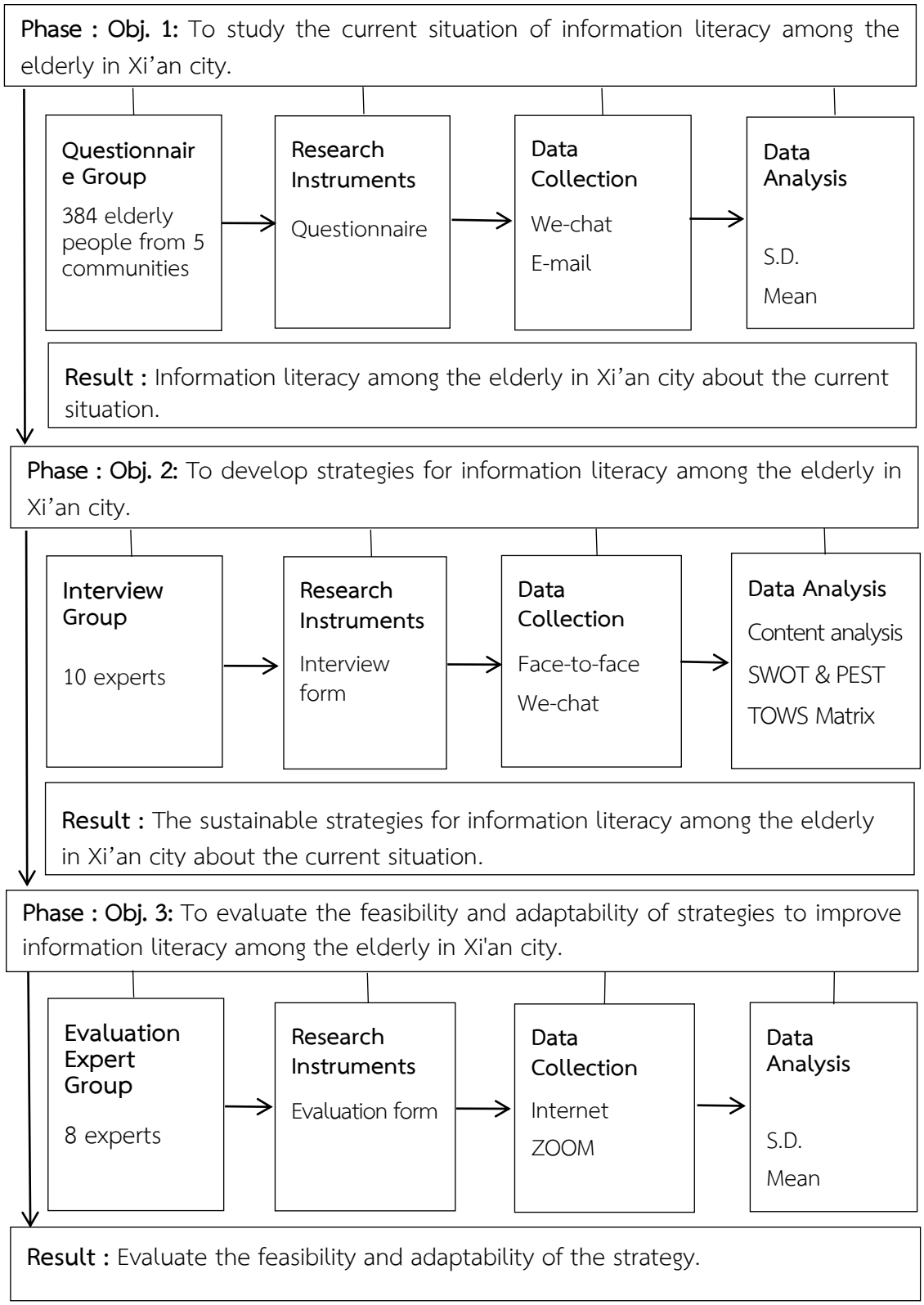

Figure 3.7 Research Process

Chapter 4

Results of Analysis

The objectives were: 1) to study the current situation of information literacy among the elderly in Xi'an city; 2) to develop strategies for information literacy among the elderly in Xi'an city; 3) to evaluate the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

The data analysis result can be presented as follows:

1. Symbol and abbreviations
2. Presentation of data analysis
3. Results of data analysis

Symbol and abbreviations

To ensure that the data results can be clearly, the researchers have provided detailed and explanations for all symbols.

N	Refers to sample group
$\overline{X}$	Refers to mean
S.D.	Refers to standard deviation
S	Refers to Strength
W	Refers to Weakness
O	Refers to Opportunity
T	Refers to Threat
P	Refers to Policy
E	Refers to Economy
S	Refers to Society
T	Refers to Technology

Presentation of Data Analysis

Phase 1 : To study the current situation of information literacy among the elderly in Xi'an city.

The research consists of two steps, focusing on the respondents' personal information and the current situation of the information literacy among the elderly in Xi'an city.

Step 1 : Analysis of Respondents' Personal Information

The analysis results are categorized by gender, age, educational background, health condition, monthly income, and type of work prior to retirement. Data is presented in terms of frequency and percentage.

Step 2 : Analysis of the current situation among the information literacy

It analyzes the information literacy level of elderly people in Xi'an city from four aspects: information awareness, information knowledge, information competence, and information ethics, using mean and standard deviation.

Phase 2 : To develop strategies for information literacy among the elderly in Xi'an city.

With experts regarding the development of strategies to promote sustainable information literacy among the elderly in Xi'an city. The analysis is divided into two steps:

Step 1 : Interview Content Analysis

Invite 10 experts to propose strategies for improving information literacy among the elderly in Xi'an city.

Step 2 : SWOT-PEST analysis and TWOS matrix

Use SWOT, PEST and TOWS matrix to analyze the opinions of 10 experts and come up with strategies.

Phase 3 : To evaluate the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

Evaluate the feasibility and adaptability of the strategies. Invited 8 experts to evaluate the feasibility and adaptability of the proposed information literacy strategies. The evaluation was conducted using structured forms and presented through mean and standard deviation.

Results of Data Analysis

To ensure the scientificity and reliability of the research results, the researchers conducted a systematic and comprehensive analysis of the collected data.

Phase 1 : To study the current situation of information literacy among the elderly in Xi'an city.

Step 1 : Analysis of Respondents' Personal Information

The analysis results are categorized by gender, age, educational background, health condition, monthly income, and type of work prior to retirement. Data is presented in terms of percentage.

Table 4.1 Respondents' Personal Information and Corresponding Percentage

(n=384)

Item	Personal information	Frequency	Percentage(%)
Gender	Male	201	52.34
	Female	183	47.66
	Total	**384**	**100**
Age	60-70	182	47.39
	71-80	124	32.29
	81-90	56	14.58
	>90	22	5.74
	Total	**384**	**100**

Table 4.1 (Continued)

(n=384)

Item	Personal information	Frequency	Percentage(%)
Educational background	Primary school below	77	20.05
	Primary school	174	45.31
	Junior middle school	85	22.14
	Senior middle school	24	6.25
	Bachelor degree	17	4.43
	Graduate degree	7	1.82
	Total	**384**	**100**
Health condition	Healthy	249	64.84
	Unhealthy	135	35.16
	Total	**384**	**100**
Monthly income	<3,000RMB	139	36.20
	3,001-5,000RMB	167	43.49
	5,001-7,000RMB	53	13.80
	>7,000RMB	25	6.51
	Total	**384**	**100**
Type of work prior to retirement	Manager	23	5.99
	Worker	70	18.23
	Farmer	54	14.06
	Salesperson	79	20.57
	Teaching staff	48	12.50
	Medical staff	36	9.38
	Governmental staff	31	8.07
	Out of work	43	11.20
	Total	**384**	**100**

According to Table 4.1, 201 male (52.34%) and 183 female (47.66%) respondents. Regarding age, the 60–70 age had the most respondents, 182 in total (47.39%), followed closely by the 71–80 age with 124 (32.29%). Among 81–90, 56

people participated (14.58%), and the number of those aged 90 and above was relatively small, with only 22 participants (5.74%).

The results showed that the younger the age, the more people use electronic devices. Overall, the proportion of male respondents was slightly higher than that of female respondents.

The educational background, 7 held graduate degrees (1.82%, lowest proportion), 17 had bachelor's degrees (4.43%), 24 were senior high school (6.25%), 85 had junior high school education (22.14%), 174 were primary school (45.31%), 77 had below primary school (20.05%).

The findings showed that with culture, you can use the basic functions of your mobile phone.

For health condition, 249 elderly people were in good health, accounting for 64.84%, while some suffered from illnesses. Among this group, 135 had disabilities, representing 35.16%.

The results indicated physical health contributes to the elderly's acquisition of fundamental mobile phone knowledge.

In terms of monthly income, 139 elderly (36.20%) had less than 3,000 RMB. The largest group, 167 respondents (43.49%), had 3,001 - 5,000 RMB. Additionally, 53 respondents (13.80%) had 5,001 - 7,000 RMB, and 25 respondents (6.51%) had over 7,000 RMB.

The results showed that from 3,001 to 5,000 RMB had the largest number. Older people with good incomes can afford to buy electronic devices.

Before retirement, 23 elderly were managers (5.99%), 70 were workers (18.23%), 54 were farmers (14.06%), 79 were in sales (20.57%, the largest group), 48 were teachers (12.50%), 36 were medical staff (9.38%), 31 were government staff (8.07%), and 43 were unemployed (11.20%).

The findings revealed that the majority of elderly individuals engaged in sales prior to retirement.

Step 2 : Analysis of the current situation among the information literacy

This study focuses on the four core components of information literacy: information awareness, information knowledge, information competence, and information ethics. Statistical methods such as the mean and standard deviation were adopted to present the relevant data, aiming to comprehensively understand the current situation of the elderly's information literacy and the characteristics of each of its components.

Table 4.2 Mean and standard deviation of the current situation of information literacy

(n=384)

NO.	Information literacy among the elderly	$\overline{X}$	S.D.	Level	Rank
1	Information awareness	3.91	0.83	High	1
2	Information knowledge	3.90	0.87	High	2
3	Information competence	3.84	0.81	High	3
4	Information ethics	3.76	0.83	High	4
	Total	**3.85**	**0.84**	**High**	

According to Table 4.2, found that the current situation of information literacy among the elderly in Xi'an city in four aspects was at high level ($\overline{X}$=3.85, S.D.=0.84). Considering the results of this research, aspects ranged from the highest to lowest level were as follows: the highest level was information awareness ($\overline{X}$=3.91, S.D.=0.83), followed by information knowledge ($\overline{X}$=3.90, S.D.=0.87), information competence ($\overline{X}$=3.84, S.D.=0.81), and information ethics was the lowest level ($\overline{X}$= 3.76, S.D.=0.83).

Table 4.3 Mean and standard deviation of the current situation of information awareness

(n=384)

NO.	Information awareness	$\overline{X}$	S.D.	Level	Rank
1	The frequency of using a computer or a mobile phone	3.87	0.89	high	6
2	Think that learning information technology will be very helpful to life	3.99	0.84	high	1
3	To improve information awareness through learning methods such as lectures / training	3.97	0.86	high	2
4	To encounter difficulties or problems in life, want to seek solutions through the Internet	3.81	0.82	high	8
5	Follow the latest news updates on the internet	3.91	0.79	high	4
6	Has a good awareness of information needs and feedback when conducting information activities	3.85	0.82	high	7
7	After information literacy training, your sensitivity to information has improved	3.89	0.80	high	5
8	Will actively accept and learn information that is beneficial to personal development	3.95	0.79	high	3
	Total	**3.91**	**0.83**	**high**	

According to Table 4.3, the current situation of information literacy in information awareness was at a high level ($\overline{X}$=3.91, S.D.=0.83). Considering the results of this research, aspects ranged from the highest to lowest level as follows: the highest level was “Think that learning information technology will be very helpful to life” ($\overline{X}$=3.99, S.D.=0.84), followed by “To improve information awareness

through learning methods such as lectures/training" ($\overline{X}$=3.97, S.D.=0.86), "Will actively accept and learn information that is beneficial to personal development" ($\overline{X}$= 3.95, S.D.=0.79), "Follow the latest news updates on the internet" ($\overline{X}$=3.91, S.D.=0.79), "After information literacy training, your sensitivity to information has improved" ($\overline{X}$=3.89, S.D.=0.80), "The frequency of using a computer or a mobile phone" ($\overline{X}$=3.87, S.D.=0.89), "Has a good awareness of information needs and feedback when conducting information activities" ($\overline{X}$=3.85, S.D.=0.82), and "To encounter difficulties or problems in life, want to seek solutions through the Internet" was the lowest level ($\overline{X}$= 3.81, S.D.=0.82).

Table 4.4 Mean and standard deviation of the current situation of information knowledge

(n=384)

NO.	Information knowledge	$\overline{X}$	S.D.	Level	Rank
1	Engage in regular study to update information knowledge	3.88	0.90	high	6
2	Willing to participate in information literacy teaching courses or activities	3.87	0.87	high	7
3	Understand information related laws and regulations and ethical knowledge, such as intellectual property, privacy, copyright	3.91	0.88	high	3
4	Understand information related information crime, information pollution and other information security knowledge	3.94	0.91	high	1
5	Understand the current development process and trends of information literacy	3.89	0.85	high	5
6	Utilize online resources to enhance information knowledge	3.90	0.83	high	4

Table 4.4 (Continued)

(n=384)

NO.	Information knowledge	$\overline{X}$	S.D.	Level	Rank
7	Participate in related online information knowledge competitions	3.92	0.87	high	2
8	Periodically assess one's level of information knowledge	3.83	0.86	high	8
	Total	**3.90**	**0.87**	**high**	

According to Table 4.4, the current situation of information knowledge among the elderly in Xi'an city was at a high level ($\overline{X}$=3.90, S.D.=0.87). Considering the results of this research, aspects ranged from the highest to lowest level as follows: the highest level was "Understand information related information crime, information pollution and other information security knowledge" ($\overline{X}$=3.94, S.D.=0.91), followed by "Participate in related online information knowledge competitions" ($\overline{X}$=3.92, S.D.=0.87), "Understand information related laws and regulations and ethical knowledge, such as intellectual property, privacy, copyright" ($\overline{X}$=3.91, S.D.=0.88), "Utilize online resources to enhance information knowledge" ($\overline{X}$=3.90, S.D.=0.83), "Understand the current development process and trends of information literacy" ($\overline{X}$=3.89, S.D.=0.85), "Engage in regular study to update information knowledge" ($\overline{X}$=3.88, S.D.=0.90), "Willing to participate in information literacy teaching courses or activities" ($\overline{X}$=3.87, S.D.=0.87), and "Periodically assess one's level of information knowledge" was the lowest level ($\overline{X}$= 3.83, S.D.=0.86).

Table 4.5 Mean and standard deviation of the current situation of information competence

(n=384)

NO.	Information competence	$\overline{X}$	S.D.	Level	Rank
1	Use mobile phone or computer device for online shopping	3.86	0.78	high	3
2	Retrieve, obtain, and filter out a large amount of information using devices such as mobile phones or computers	3.87	0.80	high	2
3	When reading information, pay attention to identify the usefulness and credibility of information	3.85	0.86	high	4
4	Use the Internet for information exchange and sharing activities	3.80	0.76	high	7
5	Edit text, audio, video, pictures and so on	3.90	0.81	high	1
6	Able to accurately filter out target information from a large amount of retrieved information	3.79	0.79	high	8
7	Able to install and download internet software	3.83	0.81	high	5
8	Conduct periodic evaluations of one's information competence	3.82	0.83	high	6
	Total	**3.84**	**0.81**	**high**	

According to Table 4.5, the current situation of information competence among the elderly in Xi'an city was at a high level ($\overline{X}$=3.84, S.D.=0.81). Considering the results of this research, aspects ranged from the highest to lowest level as follows: the highest level was "Edit text, audio, video, pictures and so on" ($\overline{X}$=3.90, S.D.=0.81), followed by "Retrieve, obtain, and filter out a large amount of information using devices such as mobile phones or computer" ($\overline{X}$=3.87, S.D.=0.87), "Use mobile

phone or computer device for online shopping" ($\overline{X}$=3.86, S.D.=0.78), "When reading information, pay attention to identify the usefulness and credibility of information" ($\overline{X}$=3.85, S.D.=0.86), "Able to install and download internet software" ($\overline{X}$=3.83, S.D.=0.81), "Conduct periodic evaluations of one's information competence" ($\overline{X}$=3.82, S.D.=0.83), "Use the Internet for information exchange and sharing activities" ($\overline{X}$=3.80, S.D.=0.76), and "Able to accurately filter out target information from a large amount of retrieved information" was the lowest level ($\overline{X}$=3.79, S.D.=0.79).

Table 4.6 Mean and standard deviation of the current situation of information ethics

(n=384)

NO.	Information ethics	$\overline{X}$	S.D.	Level	Rank
1	Ability to understand digital copyright and disseminate information legally and responsibly	3.83	0.86	high	2
2	Know that there are multiple risks in a digital environment	3.70	0.83	high	8
3	Capability to protect digital devices by installing and activating protection software such as firewalls	3.72	0.82	high	6
4	Capable of ensuring the protection of personal and others' privacy information in the process	3.77	0.82	high	3
5	Ability to identify dangerous websites and internet fraud in the digital environment	3.71	0.84	high	7
6	Report and stop the dissemination of harmful and false information to others	3.86	0.86	high	1

Table 4.6 (Continued)

(n=384)

NO.	Information ethics	$\overline{X}$	S.D.	Level	Rank
7	The community should strengthen the emphasis on information ethics education	3.75	0.83	high	4
8	Strengthening information law education helps improve individual legal literacy	3.74	0.80	high	5
	Total	**3.76**	**0.83**	**high**	

According to Table 4.6, the current situation of information ethics among the elderly in Xi'an city was at a high level ($\overline{X}$=3.76, S.D.=0.83). Considering the results of this research, aspects ranged from the highest to lowest level as follows: the highest level was "Report and stop the dissemination of harmful and false information to others" ($\overline{X}$=3.86, S.D.=0.86), followed by "Ability to understand digital copyright and disseminate information legally and responsibly" ($\overline{X}$=3.83, S.D.=0.86), "Capable of ensuring the protection of personal and others' privacy information in the process" ($\overline{X}$=3.77, S.D.=0.82), "The community should strengthen the emphasis on information ethics education" ($\overline{X}$=3.75, S.D.=0.83), "Strengthening information law education helps improve individual legal literacy" ($\overline{X}$=3.74, S.D.=0.80), "Capability to protect digital devices by installing and activating protection software such as firewalls" ($\overline{X}$=3.72, S.D.=0.82), "Ability to identify dangerous websites and internet fraud in the digital environment" ($\overline{X}$=3.71, S.D.=0.84), and "Know that there are multiple risks in a digital environment" was the lowest level ($\overline{X}$=3.70, S.D.=0.83).

According to the data interpretation for average values based on Rensis Likert's (1932) scale, the following ranges apply: 4.50-5.00 indicates the highest level, 3.50-4.49 indicates a high level, 2.50-3.49 indicates a medium level, 1.50-2.49 indicates a low level, and 1.00-1.49 indicates the lowest level. A questionnaire survey of information literacy among the elderly in Xi'an city found that the average value of the total scale of sustainable information literacy among the elderly in Xi'an city

was at a high level ($\overline{X}$=3.85, S.D.=0.84). The average value of information awareness among the elderly in Xi'an city was at a high level ($\overline{X}$=3.91, S.D.=0.83). The average value of information knowledge among the elderly in Xi'an city was at a high level ($\overline{X}$=3.90, S.D.=0.87), information competence among the elderly in Xi'an city was at a high level ($\overline{X}$=3.84, S.D.=0.81), and information ethics among the elderly in Xi'an city was at a high level ($\overline{X}$=3.76, S.D.=0.83).

The average order of the four first-order dimensions is: information awareness ($\overline{X}$=3.91, S.D.=0.83) > information knowledge ($\overline{X}$=3.90, S.D.=0.87) > information competence ($\overline{X}$=3.84, S.D.=0.81) > information ethics ($\overline{X}$=3.76, S.D.=0.83). The level of information awareness is the highest, while the average level of information ethics is the lowest. Therefore, this to some extent indicates that information knowledge, information competence, and information ethics need to be further improved.

In summary, the overall level of information literacy among the elderly in Xi'an city is high, yet there is an imbalance in the development across its specific dimensions, among the multiple components of information literacy, the level of information awareness of this group is particularly prominent.

Phase 2 : To develop strategies for information literacy among the elderly in Xi'an city.

Step 1: Interview Content Analysis

To gain an in-depth understanding of the current situation of information literacy among the elderly and the main problems they face, this paper adopts a purposive sampling method, selects 10 community education management responsible persons as research subjects, and conducts interviews with them. By systematically analyzing the interview data and combining the actual research situation, this paper puts forward a series of targeted and effective countermeasures and suggestions for improving the information literacy of the elderly.

The interviewees for this study were 10 community education administrators who met the following criteria: 1) Over 10 years of community service experience; 2) Possession of an educational background; 3) Willingness to participate in structured interviews; 4) Availability to review interview transcripts for verification.

A total of 10 interviewers were conducted in this study. Each interview was conducted one-on-one in a more private place, where others could not eavesdrop on the conversation, ensuring that the interviewee would not be disturbed by other factors.

Topic 1:

The current situation of information awareness among the elderly in Xi'an city is as follows.

Survey data on elderly information literacy in Xi'an city reveals that seniors often lack confidence or even resist smart devices due to unfamiliarity. To address this, it's crucial to shift their traditional mindset and help them build confidence in using smart devices and the internet, enabling more elderly individuals to embrace these technologies with ease and initiative.

To promote and sustainable information awareness among the elderly in Xi'an city, a multifaceted strategy is essential.

1) Increase the frequency of elderly users of mobile software tools and gradually improve their operational skills.

2) Cultivate the elderly's awareness of providing feedback on information needs, help them develop the habit of continuously browsing and acquiring information, and enhance their sensitivity to information.

3) The elderly should strengthen their confidence, shift from passive acceptance to active embrace, and actively understand, participate in, and use mobile phones.

4) The elderly should learn information technology skills, accept new information, acquire new knowledge, and be good at seizing opportunities.

5) At the content delivery level, efforts should be made to help the elderly fully recognize their own capabilities, improve their negative self-evaluation, and dispel their doubts about themselves and information literacy services.

6) The information service content is spread through TV, radio and other traditional media, and the influence is enhanced by interactive live broadcast.

7) Government departments should rely on community activity venues (such as residential areas and nursing homes), carry out publicity campaigns, and leverage group effects and word-of-mouth communication to raise the elderly's awareness of information awareness services.

8) Communities need to organize a series of engaging information literacy education activities, foster a strong atmosphere of informatization, and encourage the elderly to take the initiative to improve their own information literacy.

9) Rewards such as the title of "Lifelong Learner" or commemorative badges can be granted based on cumulative learning hours, daily check-ins and sharing activities, facilitating the elderly's sharing and display on media platforms.

Topic 2:

The current situation of information knowledge among the elderly in Xi'an city is as follows.

Most elderly individuals lack a systematic understanding of the concept and theory of information literacy, having not undergone systematic learning. The survey reveals that their previous exposure to information literacy was sporadic. Additionally, it is found that the government and community offer limited channels for the elderly to learn about information literacy, with no specific courses designed to help them understand these concepts, leading to a significant lack of information literacy among the elderly.

To promote and sustain information knowledge among the elderly in Xi'an city, a multifaceted approach is essential.

1) Information literacy training courses are conducted, where volunteers teach the elderly how to access information.

2) Establish information sharing and learning groups, encourage the elderly to carry out group learning activities, and set up mutual-aid learning teams.

3) Vigorously carry out publicity and education to guide the elderly to understand the sustainability of information knowledge and stimulate their interest in learning. Organize a series of publicity events to vividly demonstrate the application scenarios of information knowledge in daily life.

4) Provide operational guidance and Q&A services to help the elderly master the basic functions of new media as an information channel. Demonstrate the usage of new media through traditional media such as outdoor screens, thereby improving their efficiency in information acquisition.

5) Organize basic new media information competitions covering contents such as device button operations, basic software download functions and typing operations, aiming to create a relaxed learning atmosphere for the elderly.

6) Promote literacy in information skills, covering aspects such as prevention of common diseases, balanced diet, scientific exercise, and mental health maintenance, to enhance the quality of life for the elderly; as well as strengthening awareness of anti-fraud.

7) Organize regular writing workshops, painting classes, photography clubs and video production training courses to provide a platform for the elderly to showcase themselves and exchange experiences.

8) Provide diversified learning resources covering a variety of formats such as carefully selected textual materials, clear and intuitive images, as well as vivid and interesting audio and video content, so as to meet the learning needs of different elderly groups.

9) Provide online courses or organize webinars, deliver knowledge in the form of live streaming or recorded broadcasts, and promote interaction and communication among participants. Online courses can be designed with different learning modules and schedules to meet the needs of diverse learners; webinars, on the other hand, can focus on specific themes and invite industry experts to give in-depth explanations and share their insights.

10) Collect subjective perceptions and feedback from elderly individuals regarding learning content and methods, and identify difficulties and needs encountered during the learning process. For instance, recommend relevant learning materials for weak areas, adjust learning progress, and optimize learning methods.

Topic 3:

The current situation of information competence among the elderly in Xi'an city is as follows.

In this age of information overload, older adults often struggle with independent thinking and judgment, facing significant challenges in information retrieval. Complicated smartphone operations, combined with limited education or outdated hardware, make it difficult for them to use digital devices effectively.

To promote and sustainable information competence of the elderly in Xi'an city, several strategies can be effectively implemented.

1) In light of the characteristics and actual needs of the elderly, communities can offer information literacy training courses to help them master basic digital skills such as web browsing, information retrieval, and social media usage.

2) Set up dedicated activity rooms for elderly learning, equipped with devices such as computers, tablet computers and smartphones, to provide a convenient platform for the elderly to learn and practice.

3) Teach basic computer operation skills, such as system startup and shutdown, file management, and simple applications of common office software.

4) The basic information retrieval methods and the skills of using network security knowledge are systematically taught to the elderly.

5) The image retrieval feature helps you find relevant information by uploading images, and you can search with voice commands.

6) Help older adults master skills such as WeChat chat, video calls, mobile payments and other common functions.

7) Establish and improve the monitoring and feedback mechanism for training effectiveness, utilizing regular assessments, classroom observations, and

participant evaluations to promptly understand training outcomes and collect improvement suggestions, thereby continuously optimizing the training program.

8) Focus on integrating the practical life scenarios of the elderly, using simple and undertandable language along with vivid case studies to enhance their comprehension and mastery.

9) Provide convenient digital services for the elderly, such as launching online social security applications and medical expense reimbursement services. Through these online platforms, the time spent waiting in queues at physical service counters can be effectively reduced.

Topic 4:

The current situation of information ethics among the elderly in Xi'an city is as follows.

The elderly are willing and actively adhering to the dual requirements of moral and legal norms in the digital world, cautiously handling the forwarding and posting of online information while strictly regulating their own online speech and conduct. However, they lack certain information ethics capabilities.

Subjectively, they believe they comply with relevant online norms, yet often find outcomes contrary to their intentions. To avoid mistakes, many older adults have reduced their use of smart devices to post or forward information.

To promote and sustainable information ethics among the elderly in Xi'an city, a structured and proactive approach is essential.

1) Establish a content review mechanism, combining technical means with manual review, to ensure the information on online platforms is healthy, positive, and lawful.

2) Teach the basic operations of smartphones, the use of common social software, the process of online shopping, as well as safety knowledge such as how to identify online fraud and protect personal privacy.

3) The knowledge of fraud prevention is widely disseminated through various channels such as publicity boards, residents' meetings, TV public service

advertisements and official websites, to ensure that it can accurately reach the elderly group.

4) The community organizes special training activities on information ethics and morality, inviting professionals to provide education for the elderly group on cybersecurity protection knowledge and personal information protection.

5) Strengthen and improve the regulatory mechanism, and increase the punishment for the infringement of the personal information rights of the elderly.

6) Establish a rapid response mechanism to build a solid anti-fraud defense against suspicious situations reported by the elderly.

7) Update your phone's lock screen password, payment password, and app login password in a timely manner.

8) Regularly install anti-virus software, firewalls and various security protection tools.

9) Adopt displays with large fonts and high contrast, add voice-assisted functions, and so on, to reduce the difficulty and cost for elderly users when implementing information security measures.

10) Set up a consultation and service hotline to address various problems that elderly users may encounter when operating technological products such as smartphones, smart home appliances and web applications.

11) Develop content covering health preservation knowledge, interpretation of policies and regulations, guidelines for daily services, and emergency assistance channels.

12) China needs to deeply participate in the discussion and formulation of various international Internet governance rules and technical standards, and build a fair, reasonable, open, inclusive, globally recognized and universally binding international cyberspace governance rule system.

13) Strengthen cybersecurity cooperation with countries around the world, and jointly build a sound cross-border collaboration mechanism covering multiple key links such as information sharing, joint response and security alerts.

14) A global cooperation mechanism for cyberspace governance is established, aiming to promote in-depth exchanges and pragmatic collaboration among countries around the world in this field. By strengthening the signing of bilateral and multilateral cooperation agreements with other countries, we can advance the mutual learning of cyberspace governance experience and in-depth technical cooperation.

The researchers classified, summarized, and sorted the suggestions of 10 interviewers on 4 topics. They agreed on many suggestions, and some were different, so we need to further analyze these suggestions. The interview suggestions are summarized in Table 4.7.

Table 4.7 Summary of interview suggestions

Topics	Suggestions	Interviewer1	Interviewer2	Interviewer3	Interviewer4	Interviewer5	Interviewer6	Interviewer7	Interviewer8	Interviewer9	Interviewer10	Frequency	Percentage (%)
T1	**Information awareness**												
	1) Increase the frequency of elderly users of mobile software tools and gradually improve their operational skills.	√	√	-	√	-	√	√	√	√	√	8	80
	2) Cultivate the elderly's awareness of providing feedback on information needs, help them develop the habit of continuously browsing and acquiring information, and enhance their sensitivity to information.	√	√	√	√	√	√	-	√	√	√	9	90
	3) The elderly should strengthen their confidence, shift from passive acceptance to active embrace, and actively understand, participate in, and use mobile phones.	√	√	√	√	√	-	√	√	√	-	8	80
	4) The elderly should learn information technology skills, accept new information, acquire new knowledge, and be good at seizing opportunities.	√	√	-	√	√	√	√	√	√	√	-	90
	5) At the content delivery level, efforts should be made to help the elderly fully recognize their own capabilities, improve their negative self-evaluation, and dispel their doubts about themselves and information literacy services.	√	-	√	√	√	-	√	√	-	√	7	70

Table 4.7 (Continued)

Topics	Suggestions	Interviewer1	Interviewer2	Interviewer3	Interviewer4	Interviewer5	Interviewer6	Interviewer7	Interviewer8	Interviewer9	Interviewer10	Frequency	Percentage (%)
	6) The information service content is spread through TV, radio and other traditional media, and the influence is enhanced by interactive live broadcast.	√	√	√	—	√	—	√	—	√	√	7	70
	7) Government departments should rely on community activity venues (such as residential areas and nursing homes), carry out publicity campaigns, and leverage group effects and word-of-mouth communication to raise the elderly's awareness of information awareness services.	√	√	√	—	√	√	√	√	√	√	9	90
	8) Communities need to organize a series of engaging information literacy education activities, foster a strong atmosphere of informatization, and encourage the elderly to take the initiative to improve their own information literacy.	√	√	√	—	√	√	√	√	√	√	9	90
	9) Rewards such as the title of "Lifelong Learner" or commemorative badges can be granted based on cumulative learning hours, daily check-ins and sharing activities, facilitating the elderly's sharing and display on media platforms.	√	—	√	√	—	√	√	—	√	√	7	70

Table 4.7 (Continued)

Topics	Suggestions	Interviewer1	Interviewer2	Interviewer3	Interviewer4	Interviewer5	Interviewer6	Interviewer7	Interviewer8	Interviewer9	Interviewer10	Frequency	Percentage (%)
T2	**Information knowledge**												
	1) Information literacy training courses are conducted, where volunteers teach the elderly how to access information.	√	√	√	√	—	√	√	√	√	√	9	90
	2) Establish information sharing and learning groups, encourage the elderly to carry out group learning activities, and set up mutual-aid learning teams.	√	√	√	—	√	√	—	√	√	√	8	80
	3) Vigorously carry out publicity and education to guide the elderly to understand the sustainability of information knowledge and stimulate their interest in learning. Organize a series of publicity events to vividly demonstrate the application scenarios of information knowledge in daily life.	√	√	√	√	√	—	√	√	√	√	9	90
	4) Provide operational guidance and Q&A services to help the elderly master the basic functions of new media as an information channel. Demonstrate the usage of new media through traditional media such as outdoor screens, thereby improving their efficiency in information acquisition.	√	—	√	√	√	√	—	√	√	√	9	90

Table 4.7 (Continued)

Topics	Suggestions	Interviewer1	Interviewer2	Interviewer3	Interviewer4	Interviewer5	Interviewer6	Interviewer7	Interviewer8	Interviewer9	Interviewer10	Frequency	Percentage (%)
	5) Organize basic new media information competitions covering contents such as device button operations, basic software download functions and typing operations, aiming to create a relaxed learning atmosphere for the elderly.	√	√	√	—	—	√	√	√	√	—	7	70
	6) Promote literacy in information skills, covering aspects such as prevention of common diseases, balanced diet, maintenance, to enhance the quality of life for the elderly; as well as strengthening awareness of anti-fraud.	√	√	—	√	√	√	√	√	√	√	9	90
	7) Organize regular writing workshops, painting classes, photography clubs and video production training courses to provide a platform for the elderly to showcase themselves and exchange experiences.	√	—	√	—	√	√	√	√	—	√	7	70
	8) Provide diversified learning resources covering a variety of formats such as carefully selected textual materials, clear and intuitive images, as well as vivid and interesting audio and video content, so as to meet the learning needs of different elderly groups.	√	√	—	√	√	—	√	√	√	√	8	80

Table 4.7 (Continued)

Topics	Suggestions	Interviewer1	Interviewer2	Interviewer3	Interviewer4	Interviewer5	Interviewer6	Interviewer7	Interviewer8	Interviewer9	Interviewer10	Frequency	Percentage (%)
	9) Promote interaction and communication among participants. Online courses can be designed with different learning modules and schedules to meet the needs of diverse learners.	√	√	√	√	—	—	√	√	√	√	8	80
	10) Collect subjective perceptions and feedback from elderly individuals regarding learning content and methods.	√	—	√	—	√	√	√	√	√	√	8	80
T3	**Information competence**												
	1) In light of the characteristics and actual needs of the elderly, communities can offer information literacy training courses to help them master basic digital skills such as web browsing, information retrieval, and social media usage.	√	√	√	√	√	—	√	√	√	√	9	90
	2) Set up dedicated activity rooms for elderly learning, equipped with devices such as computers, tablet computers and smartphones, to provide a convenient platform for the elderly to learn and practice.	√	√	√	—	√	—	√	√	√	√	8	80
	3) Teach basic computer operation skills, such as system startup and shutdown, file management, and simple applications of common office software.	√	√	√	√	√	√	√	—	√	√	9	90

Table 4.7 (Continued)

Topics	Suggestions	Interviewer1	Interviewer2	Interviewer3	Interviewer4	Interviewer5	Interviewer6	Interviewer7	Interviewer8	Interviewer9	Interviewer10	Frequency	Percentage (%)
	4) The basic information retrieval methods and the skills of using network security knowledge are systematically taught to the elderly.	√	√	√	—	—	√	√	√	√	√	8	80
	5) The image retrieval feature helps you find relevant information by uploading images, and you can search with voice commands.	√	√	√	√	√	√	√	—	√	√	9	90
	6) Help older adults master skills such as WeChat chat, video calls, mobile payments and other common functions.	√	√	√	√	—	√	√	√	√	√	9	90
	7) Establish and improve the monitoring and feedback mechanism for training effectiveness, utilizing regular assessments, classroom observations, and participant evaluations to promptly understand training outcomes and collect improvement suggestions, continuously optimizing the training program.	√	√	—	√	√	—	√	√	—	√	7	70
	8) Focus on integrating the practical life scenarios of the elderly, using simple and understandable language along with vivid case studies to enhance their comprehension and mastery.	√	√	√	—	√	√	√	√	√	√	9	90

Table 4.7 (Continued)

Topics	Suggestions	Interviewer1	Interviewer2	Interviewer3	Interviewer4	Interviewer5	Interviewer6	Interviewer7	Interviewer8	Interviewer9	Interviewer10	Frequency	Percentage (%)
	9) Provide convenient digital services for the elderly, such as launching online social security applications and medical expense reimbursement services. Through these online platforms, the time spent waiting in queues at physical service counters can be effectively reduced.	√	—	√	√	—	√	—	√	√	√	7	70
T4	**Information ethics**												
	1) Establish a content review mechanism, combining technical means with manual review, to ensure the information on online platforms is healthy, positive, and lawful.	√	√	√	√	—	√	√	√	√	√	9	90
	2) Teach the basic operations of smartphones, the use of common social software, the process of online shopping, as well as safety knowledge such as how to identify online fraud and protect personal privacy.	√	—	√	—	—	√	√	√	√	√	7	70
	3) The knowledge of fraud prevention is disseminated through various channels such as publicity boards, residents' meetings, TV public service advertisements, to ensure that it can accurately reach the elderly.	√	√	—	√	√	√	√	√	√	√	9	90

Table 4.7 (Continued)

Topics	Suggestions	Interviewer1	Interviewer2	Interviewer3	Interviewer4	Interviewer5	Interviewer6	Interviewer7	Interviewer8	Interviewer9	Interviewer10	Frequency	Percentage (%)
	4) The community organizes special training activities on information ethics and morality, inviting professionals to provide education for the elderly group on cybersecurity protection knowledge and personal information protection.	—	√	√	√	√	√	√	√	√	√	9	90
	5) Strengthen and improve the regulatory mechanism, and increase the punishment for the infringement of the information rights of the elderly.	√	√	√	—	—	√	√	√	√	√	8	80
	6) Establish a rapid response mechanism to build a solid anti-fraud defense against suspicious situations reported by the elderly.	—	√	√	√	—	—	√	√	√	√	7	70
	7) Update your phone’s lock screen password, payment password, and app login password in a timely manner.	√	√	√	√	√	√	√	√	√	—	9	90
	8) Regularly install anti-virus software, firewalls and various security protection tools.	√	√	√	√	√	√	—	—	√	√	8	80
	9) Adopt displays with large fonts and high contrast, add voice-assisted functions, and so on, to reduce the difficulty and cost for elderly users when implementing information security measures.	√	√	√	√	√	—	√	√	√	√	9	90

Table 4.7 (Continued)

Topics	Suggestions	Interviewer1	Interviewer2	Interviewer3	Interviewer4	Interviewer5	Interviewer6	Interviewer7	Interviewer8	Interviewer9	Interviewer10	Frequency	Percentage (%)
	10) Set up a consultation and service hotline to address various problems that elderly users may encounter when operating technological products such as smartphones, smart home appliances and web applications.	√	√	√	√	√	√	√	√	—	√	9	90
	11)Develop content covering health preservation knowledge, interpretation of policies and regulations, guidelines for daily services, and emergency assistance channels.	√	√	√	√	√	√	√	√	√	—	9	90
	12) China needs to deeply participate in the discussion and formulation of various international Internet governance rules and technical standards, and build a fair, reasonable, open, inclusive, globally recognized and universally binding international cyberspace governance rule system.	√	—	—	√	—	√	√	√	√	√	7	70
	13) Strengthen cybersecurity cooperation with countries around the world, and jointly build a sound cross-border collaboration mechanism covering multiple key links such as information sharing, joint response and security alerts.	—	√	√	√	√	√	—	—	√	√	7	70

Table 4.7 (Continued)

Topics	Suggestions	Interviewer1	Interviewer2	Interviewer3	Interviewer4	Interviewer5	Interviewer6	Interviewer7	Interviewer8	Interviewer9	Interviewer10	Frequency	Percentage (%)
	14) A global cooperation mechanism for cyberspace governance is established, aiming to promote in-depth exchanges and pragmatic collaboration among countries around the world in this field. By strengthening the signing of bilateral and multilateral cooperation agreements with other countries, we can advance the mutual learning of cyberspace governance experience and in-depth technical cooperation.	√	√	√	—	√	√	√	√	√	—	8	80

Based on the comprehensive analysis of the current situation of information literacy among the elderly in Xi'an city, a total of 42 targeted information literacy enhancement strategies were systematically developed and formulated, with the goal of effectively addressing their needs and challenges in the digital age.

Table 4.8 The percentage of strategies propose in information awareness

Item	Percentage90%	Percentage80%	Percentage70%
Information awareness	Strategy2) Strategy4) Strategy7) Strategy8)	Strategy1) Strategy3)	Strategy5) Strategy6) Strategy9)

From the Table 4.8, the frequency of four strategies mentioned by experts is 90%. The frequency of two strategies mentioned by experts is 80%. The frequency of three strategies mentioned by experts is 70%.

Table 4.9 The percentage of strategies proposed in information knowledge

Item	Percentage90%	Percentage80%	Percentage70%
Information knowledge	Strategy1) Strategy3) Strategy4) Strategy6)	Strategy2) Strategy8) Strategy9) Strategy10)	Strategy5) Strategy7)

From the Table 4.9, the frequency of four strategies mentioned by experts is 90%. The frequency of four strategies mentioned by experts is 80%. The frequency of two strategies mentioned by experts is 70%.

Table 4.10 The percentage of strategies proposed in information competence

Item	Percentage90%	Percentage80%	Percentage70%
Information competence	Strategy1) Strategy3) Strategy5) Strategy6) Strategy8)	Strategy2) Strategy4)	Strategy7) Strategy9)

From the Table 4.10, the frequency of five strategies mentioned by experts is 90%. The frequency of two strategies mentioned by experts is 80%. The frequency of two strategies mentioned by experts is 70%.

Table 4.11 The percentage of strategies proposed in information ethics

Item	Percentage90%	Percentage80%	Percentage70%
Information ethics	Strategy1) Strategy3 Strategy4) Strategy7) Strategy9) Strategy10) Strategy11)	Strategy5) Strategy8) Strategy14)	Strategy2) Strategy6) Strategy12) Strategy13)

From the Table 4.11, the frequency of seven strategies mentioned by experts is 90%. The frequency of three strategies mentioned by experts is 80%. The frequency of four strategies mentioned by experts is 70%.

Step 2: SWOT-PEST analysis and TWOS matrix

Based on the SWOT analysis method, this study first systematically sorts out the internal and external factors affecting the development of sustainable information literacy among the elderly in Xi'an city. On this basis, it further applies the TOWS analysis method to conduct a matching analysis of internal strengths and weaknesses against external opportunities and threats. Through this process, targeted strategic recommendations are finally formulated. The SWOT analysis method provides a framework for identifying key influencing factors by evaluating four dimensions: Strengths, Weaknesses, Opportunities and Threats; while the TOWS analysis method, on this basis, aims to effectively integrate internal conditions with the external environment through the strategic combination of these elements, so as to formulate more feasible and adaptable development strategies.

In this study, the PEST analysis method serves as an effective tool that can assist community managers in accurately and comprehensively identifying and evaluating various opportunities and potential threats brought by the external environment. This method mainly analyzes the overall and systematic external macro-environment of the community from four core dimensions: Political, Economic, Social and Technological, thereby providing a clear picture of the external environment for decision-making. The TOWS analysis method further offers strong support for formulating operable strategies to improve the sustainable information literacy of community members. By applying TOWS analysis, it can be ensured that the formulated strategies can give full play to their own strengths, effectively make up for existing deficiencies, actively seize favorable development opportunities, and properly respond to various possible challenges, thus making the strategies more feasible and adaptable.

Table 4.12 SWOT- PEST analysis of information literacy

PEST / SWOT	Politics (P)	Economy (E)	Society (S)	Technology (T)
Strengths (S)	**SP1** The government attaches great importance to the improvement of information literacy and has issued a number of policy documents to promote its related development	**SE1** Enterprises have set up special funds and formulated subsidy policies to support the R&D and application of relevant technologies	**SS1** Establish an Alliance for Information Accessibility and Digital Aging Adaptation	**ST1** Enrich the digital skills training for the elderly by relying on senior universities, elderly care institutions, community education institutions and other relevant organizations
	SP2 China's Ministry of Industry and Information Technology has launched a nationwide initiative to promote the aging-friendly transformation of internet applications	**SE2** The government has increased financial subsidies and regularly provides free information technology training at fixed venues	**SS2** Community organizations organize information technology training activities and lectures	**ST2** Establish and improve the information data backup and recovery mechanism to prevent information data from being lost or damaged

Table 4.12 (Continued)

PEST / SWOT	**Politics (P)**	**Economy (E)**	**Society (S)**	**Technology (T)**
Strengths (S)	SP3 The government has built an intelligent information platform that integrates data collection, sharing, integration, transmission and voice communication	SE3 Economic measures such as government support and tax relief are adopted to attract enterprises and social organizations to participate in the information sector	SS3 The community provides sufficient human resources to strengthen the talent guarantee for informatization services	ST3 Design product interfaces and operation processes that are in line with the usage habits of the elderly, simplify operation steps, and improve the ease of use and user-friendliness of the products
Weaknesses (W)	WP1 Poor policy implementation effectiveness, narrow coverage and insufficient publicity efforts have made it difficult for the elderly to access and	WE1 Some elderly people have relatively low income levels, while smart devices and services on the market are priced high, resulting in insufficient purchasing power among the elderly	WS1 Lack of social organizations or professionals that provide basic knowledge and practical operation training for the elderly	WT1 There is still a gap between products for the elderly and the needs of the elderly, the needs of the elderly vary greatly, and the problems of product interface design are prominent

Table 4.12 (Continued)

PEST / SWOT	Politics (P)	Economy (E)	Society (S)	Technology (T)
	master new technologies			
Weaknesses (W)	WP2 A lack of a sustainable development information education policy system suitable for aging populations	WE2 The relationship between product supply and demand is not smooth. The elderly have limited channels to obtain information and their purchasing channels are not unobstructed	WS2 A sense of social integration is weakened. Unable to effectively use digital devices and services, they feel disconnected from society	WT2 The number of anti-aging products suitable for the elderly is limited and their types are monotonous, which cannot fully cover all kinds of application scenarios for the elderly's daily use
	WP3 Lack of a long-term mechanism for building a digital rule of law, and there is insufficient interaction among	WE3 Some elderly people have outdated consumption concepts and lack awareness of internet usage	WS3 The media's publicity efforts regarding the elderly's digital life are insufficient, and the attention paid to improving	WT3 The complexity of social platforms: social media platforms have a variety of functions, and their interface design may be overly

Table 4.12 (Continued)

PEST / SWOT	Politics (P)	Economy (E)	Society (S)	Technology (T)
Weaknesses (W)	government supervision, platform self-regulation and industry self-regulation		the elderly's digital skills is inadequate	complicated
Opportunities (O)	OP1 With the advent of the digital information age, China has stepped into a digital information society	OE1 Improve the elderly's income is a necessary condition for the development of their information literacy	OS1 Public attention has been growing steadily, the media coverage rate of this issue has increased significantly	OT1 Enhance the digital literacy and skills of the elderly not only meets the development requirements of the digital age, but also serves as a task for advancing the lifelong learning of the whole nation
	OP2 The rapid development of media	OE2 Sustained economic growth provides material	OS2 Communities, elderly care institutions and public	OT2 The government launches the "Special Action

Table 4.12 (Continued)

PEST / SWOT	Politics (P)	Economy (E)	Society (S)	Technology (T)
	technology, a new round of technological revolution characterized by networking and intelligence	support for the development of information literacy	welfare organizations provide the elderly with services including lectures, study seminars, skill training and family education	for Internet Application Adaptation for the Elderly and Barrier-Free Renovation" to promote the sustainable of the digital adaptation for the elderly
Opportunities (O)	OP3 The internet penetration rate has been rising year by year, which has lowered the threshold for the elderly to enter the information society	OE3 Enhance consumers' purchasing power, boost economic growth, and strengthen the consumption capacity of the elderly group	OS3 The popularization of the internet has boosted the annual growth of the number of elderly netizens	OT3 The development of artificial intelligence technologies such as speech recognition and image recognition is increasingly demanding informatization

Table 4.12 (Continued)

PEST / SWOT	Politics (P)	Economy (E)	Society (S)	Technology (T)
Threats (T)	TP1 The policies and regulations concerning the disclosure, utilization and supervision of information have not yet been refined	TE1 The investment cost of information infrastructure and internet construction is relatively high	TS1 Family and community education institutions have failed to provide effective learning support, thus plunging information literacy services into difficulties	TT1 Disconnection Between the Ubiquitous Digital Environment and the Elderly's Learning Capabilities
	TP2 The supply of public digital information resources is relatively lagging behind	TE2 Elderly consumers hold conservative consumption concepts and have limited income	TS2 The elderly group has a relatively low educational level and weak willingness to learn independently, and tends to resist digital devices	TT2 The information platform management system is yet to be refined, and its information recognition capability needs to be improved

Table 4.12 (Continued)

PEST / SWOT	Politics (P)	Economy (E)	Society (S)	Technology (T)
Threats (T)	TP3 The distribution of public digital information resources is uneven	TE3 Enterprises that develop products suitable for the elderly population face relatively high production costs and long R&D cycles	TS3 Digitalization, informatization and intellectualization are reshaping traditional modes of production and lifestyles with unprecedented influence	TT3 In the information application phase, the elderly lack awareness and understanding of the security risks associated with data utilization

In summary, based on the SWOT-PEST analysis of the results regarding the current situation of information literacy among the elderly in Xi'an city, a draft strategy for promoting the sustainable development of information literacy among the elderly in the city has been proposed.

A draft strategy for the sustainable development of information literacy among the elderly in Xi'an city was formulated by applying the TOWS matrix analysis method.

Table 4.13 TOWS matrix analysis

	Internal Strengths	**Internal Weaknesses**
External Opportunities	**SO (Leverage Strengths to Seize Opportunities) Strategy** Enhance the information awareness of the elderly 2. Change perceptions, overcome fear of digital technology, and encourage broad participation 3. Cultivate self-awareness, promote sustained participation, and advance lifelong learning	**WO (Overcome Weaknesses to Seize Opportunities) Strategy** Guide the elderly to learn information knowledge 2. Actively develop the elderly capabilities in media information dissemination 3. Establish knowledge education platforms and carry out online information literacy
External Threats	**ST (Leverage Strengths to Counteract Threats) Strategy** Create a supportive social atmosphere and offer more learning encouragement	**WT (Minimize Weaknesses to Avoid Threats) Strategy** Strengthen the supervision of the information environment and ensure safe participation

Table 4.13 (Continued)

	Internal Strengths	Internal Weaknesses
	Give full play to the role of family education and carry out intergenerational interaction	2. Enterprises fulfill their social responsibilities and improve the performance of products
	Strengthen the teaching staff for information literacy	3. Enhance cybersecurity and build a clean cyberspace
	Improve infrastructure and service development	4. Deepen international cooperation and governance

Table 4.14 Strategies of TOWS matrix analysis

Item	Aspects	Strategies
SO	Enhance the information awareness of the elderly	(1) Government departments should accelerate the introduction of relevant industry standards. (2) Formulate corresponding educational policies to promote digital education. (3) Learn digital skills independently through watching online instructional videos. (4) To learn basic operations of smart devices such as smartphones and computers.
	Change perceptions, overcome fear of digital technology, and encourage broad participation	(1) Embrace change proactively and adopt an open, proactive mindset towards digital technologies. (2) Overcome fear and resistance towards new technologies, believing in one's own ability to master digital skills.

Table 4.14 (Continued)

Item	Aspects	Strategies
		(3) Experience firsthand the convenience brought by digital technology. (4) Formulate a reasonable study plan based on your own needs and interests.
SO	Cultivate self-awareness, promote sustained participation, and advance lifelong learning	(1) Bridge digital integration channels and foster a positive digital awareness. (2) Maintain interest in emerging digital products and services, be courageous to try and explore, and continuously accumulate digital knowledge and experience. (3) Acquire knowledge on digital usage through self-directed online learning platforms, online tutorials, and other resources.
WO	Guide the elderly to learn information knowledge	(1) Actively participate in training courses on smartphone usage and computer operation organized by communities. (2) By using voice commands, the voice assistant can help query information such as weather, news, and recipes, play music and radio. (3) Select search engines such as Baidu, Sogou, or 360 Search, and enter keywords. (4) Leveraging WeChat public accounts to release distance learning content such as “Aerial Classroom” and “Online Courses.”

Table 4.14 (Continued)

Item	Aspects	Strategies
WO	Actively develop the elderly capabilities in media information dissemination	(1) Through television, radio, newspapers, the internet, and other media channels, promote the importance and usage methods of digital technology to enhance the digital literacy and safety awareness of elderly individuals. (2) Encourage elderly individuals to actively participate in information content creation activities to enhance their personal information creation and expression abilities.
	Establish knowledge education platforms and carry out online information literacy	(1) Relevant cultural departments can provide diverse learning resources on the platform, including content in the form of text, images, audio, and video, to meet the learning needs of different elderly individuals. (2) Offer online courses or organize webinars to deliver knowledge and facilitate interactive exchanges through live streaming, recorded broadcasts, and other methods. (3) Establish dedicated customer service for the elderly, providing telephone guidance services.
ST	Create a supportive social atmosphere and offer more learning encouragement	(1) Communities establish “Silver-Haired Digital Classrooms” and adopt a “veterans mentoring newcomers” mutual assistance model. (2) The community collaborate with universities to recruit volunteers on campus. (3) Establish dedicated information literacy education channels or columns for the elderly, expanding access to informational knowledge.

Table 4.14 (Continued)

Item	Aspects	Strategies
ST	Give full play to the role of family education and carry out intergenerational interaction	(1) By providing financial support, such as purchasing smart devices like mobile phones. (2) Select smart devices that are easy to operate and functionally practical, smartphones or tablets with large screens, large fonts, and big buttons. (3) Utilizing the internet, actively assisting them in learning and using media. (4) Organize young family members to form study groups with elderly members to learn digital skills.
	Strengthen the teaching staff for information literacy	(1) Develop and implement fundamental and universal digital skills training courses. (2) Digital community centers have been established, helping them learn digital skills and utilize e-government services.
	Improve infrastructure and service development	(1) Provide network coverage and strengthen the construction of network infrastructure. (2) Establish digital learning centers in communities to provide venues for learning and training for the elderly. (3) Provide digital services, strengthen the digital construction of government services. (4) Develop digital education software and applications specifically targeted at the elderly.

Table 4.14 (Continued)

Item	Aspects	Strategies
	Strengthen the supervision of the information environment and ensure safe participation	(1) Formulate legal provisions related to the protection of digital rights for the elderly, safeguarding their relevant rights when participating in digital life, and enhancing their trust in digital products and services. (2) The government leverage technological empowerment to safeguard network security. (3) Enhance the ability of elderly individuals to identify security risks in information applications and online payments, while strengthening their awareness of fraud prevention.
WT	Enterprises fulfill their social responsibilities and improve the performance of products	(1) Develop an AI virtual assistant specifically designed for the elderly, capable of conversing with them, receiving their questions or instructions, providing activity suggestions. (2) Design a pure mode for the elderly, reduce advertising exposure to elderly users, and add dialect recognition functionality. (3) Design age-friendly functional content and develop a voice assistant, such as making phone calls, sending text messages. (4) Ensure appropriate information display size is a fundamental requirement for elderly-friendly reading. Develop large-font version apps, increase font and icon sizes.

Table 4.14 (Continued)

Item	Aspects	Strategies
	Enhance cybersecurity and build a clean cyberspace	(1) Cultivate digital security awareness and protect personal digital security. (2) Maintain appropriate balance to avoid digital addiction and dependence.
WT	Deepen international cooperation and governance	(1) China should actively participate in the formulation of relevant rules and standards for international internet governance, and engage in the establishment of international cyberspace governance rules. (2) Jointly combat transnational cybercrime, prevent security threats such as cyberattacks and data breaches, and enhance the global cybersecurity. (3) Actively advocate for the establishment of a cooperative mechanism for global cyberspace governance, and promote exchanges and cooperation among countries.

This research proposed strategies for promoting sustainable development information literacy of the elderly in Xi'an city, which mainly includes four aspects, with a total of 42 strategies, as listed in Table 4.15.

Table 4.15 List of strategies

NO.	Aspects of Strategies	Numbers of Measures
1	Information awareness	9
2	Information knowledge	10
3	Information competence	9
4	Information ethics	14
Total	**4**	**42**

In conclusion, the four aspects of information literacy for the elderly in Xi'an city have been formulated through 42 strategies, including 9 on information awareness, 10 on information knowledge, 9 on information competence, and 14 on information ethics.

Table 4.16 Strategies to promote sustainable information awareness

Aspect	Strategies
Information awareness	Increase the frequency of elderly users of mobile software tools and gradually improve their operational skills. Cultivate the elderly's awareness of providing feedback on information needs, help them develop the habit of continuously browsing and acquiring information, and enhance their sensitivity to information. The elderly should strengthen their confidence, shift from passive acceptance to active embrace, and actively understand, participate in, and use mobile phones. The elderly should learn information technology skills, accept new information, acquire new knowledge, and seize opportunities.

Table 4.16 (Continued)

Aspect	Strategies
Information awareness	At the content delivery level, efforts should be made to help the elderly fully recognize their own capabilities, improve their negative self-evaluation, and dispel their doubts about themselves and information literacy services. The information service content is spread through TV, radio and other traditional media, and the influence is enhanced by interactive live broadcast. Government departments should rely on community activity venues, carry out publicity campaigns, leverage group effects and word-of-mouth communication to raise the elderly's awareness of information awareness services. Communities need to organize a series of engaging information literacy education activities, foster a strong atmosphere of informatization, and encourage the elderly to take the initiative to improve their own information literacy. Rewards such as the title of "Lifelong Learner" or commemorative badges can be granted based on cumulative learning hours, daily check-ins and sharing activities, facilitating the elderly's sharing and display on media platforms.

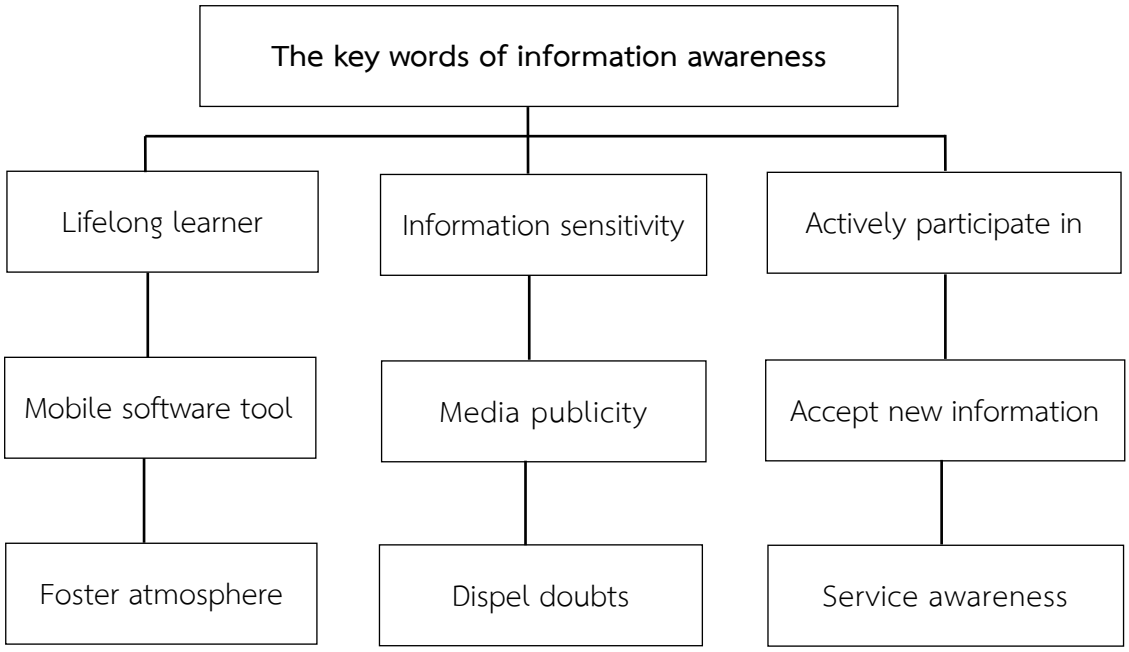

Figure 4.1 The key words of information awareness strategy

Information awareness includes nine strategies, and the key words of these strategies are extracted, as shown in Figure 4.1

Table 4.17 Strategies to promote sustainable information knowledge

Aspect	Strategies
Information knowledge	Information literacy training courses are conducted, where volunteers teach the elderly how to access information. Establish information sharing and learning groups, encourage to carry out group learning activities, set up mutual-aid learning teams. Vigorously carry out publicity and education to guide the elderly to understand of information knowledge and stimulate their interest in learning. Organize a series of publicity events to vividly demonstrate the application scenarios of information knowledge in daily life.

Table 4.17 (Continued)

Aspect	Strategies
Information knowledge	Provide operational guidance and Q&A services to help the elderly master the basic functions of new media as an information channel. Demonstrate the usage of new media through traditional media such as outdoor screens, improving their efficiency in information acquisition. Organize basic new media information competitions covering contents such as device button operations, basic software download functions and typing operations, aiming to create a relaxed learning atmosphere for the elderly. Promote literacy in information skills, covering aspects such as prevention of common diseases, balanced diet, scientific exercise, and mental health maintenance, to enhance the quality of life for the elderly; as well as strengthening awareness of anti-fraud. Organize regular writing workshops, painting classes, photography clubs and video production training courses to provide a platform for the elderly to showcase themselves and exchange experiences. Provide diversified learning resources covering a variety of formats such as carefully selected textual materials, clear and intuitive images, as well as vivid and interesting audio and video content, so as to meet the learning needs of different elderly groups. Promote interaction and communication among participants. Online courses can be designed with different learning modules and schedules to meet the needs of diverse learners. Collect subjective perceptions and feedback from elderly individuals regarding learning content and methods.

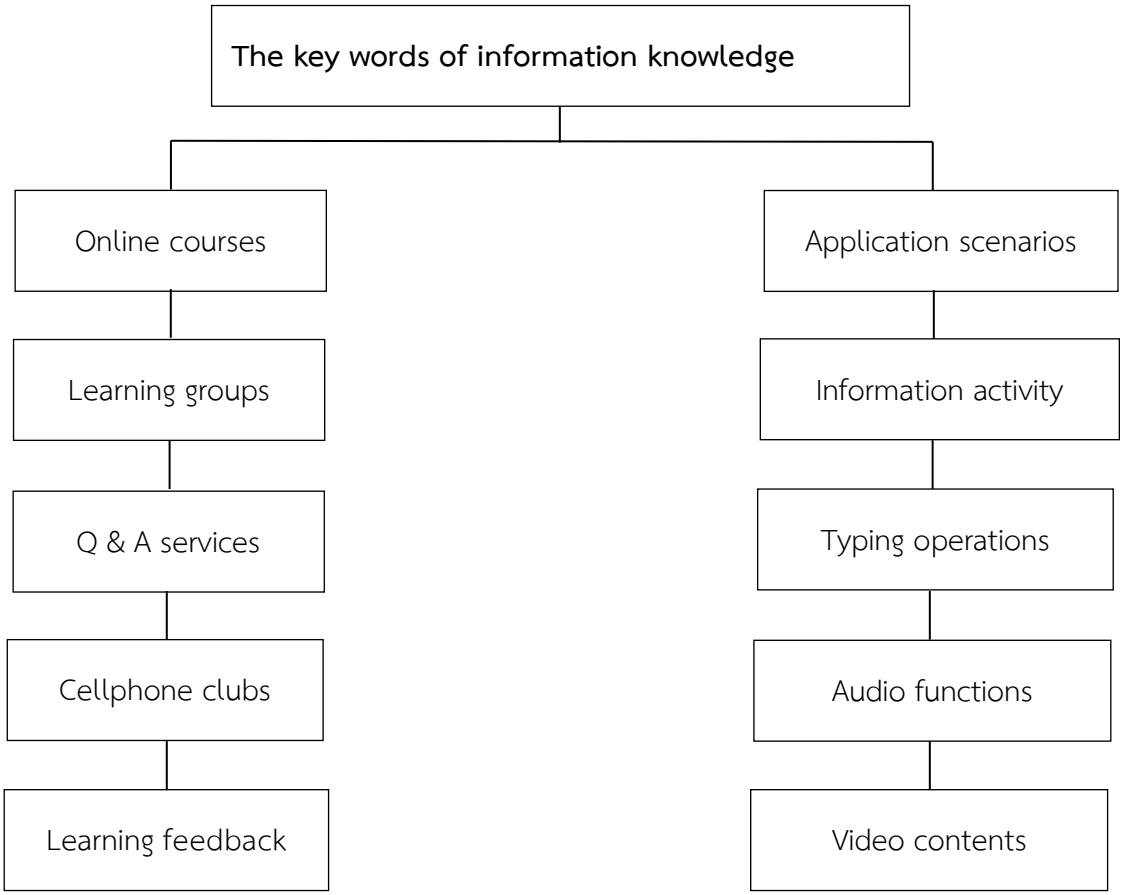

Figure 4.2 The key words of information knowledge strategy

Information knowledge includes ten strategies, and the key words of these strategies are extracted, as shown in Figure 4.2.

Table 4.18 Strategies to promote sustainable information competence

Aspect	Strategies
Information competence	In light of the characteristics and actual needs of the elderly, communities can offer information literacy training courses to help them master basic digital skills such as web browsing, information retrieval, and social media usage. Set up dedicated activity rooms for elderly learning, equipped with devices such as computers, tablet computers and smartphones, to provide a convenient platform for the elderly to learn and practice. Teach basic computer skills, system startup and shutdown, file management, and simple applications of common office software. The basic information retrieval methods and the skills of using network security knowledge are systematically taught to the elderly. The image retrieval feature helps you find relevant information by uploading images, and you can search with voice commands. Help older adults master skills such as WeChat chat, video calls, mobile payments and other common functions. Establish and improve the monitoring and feedback mechanism for training effectiveness, utilizing regular assessments, classroom observations, and participant evaluations to promptly understand training outcomes and collect improvement suggestions, thereby continuously optimizing the training program. Focus on integrating the practical life scenarios of the elderly, using simple and understandable language along with vivid case studies to enhance their comprehension and mastery. Provide convenient digital services for the elderly, such as launching online social security applications and medical expense reimbursement services. Through these online platforms, the time spent waiting in queues at physical service counters can be reduced.

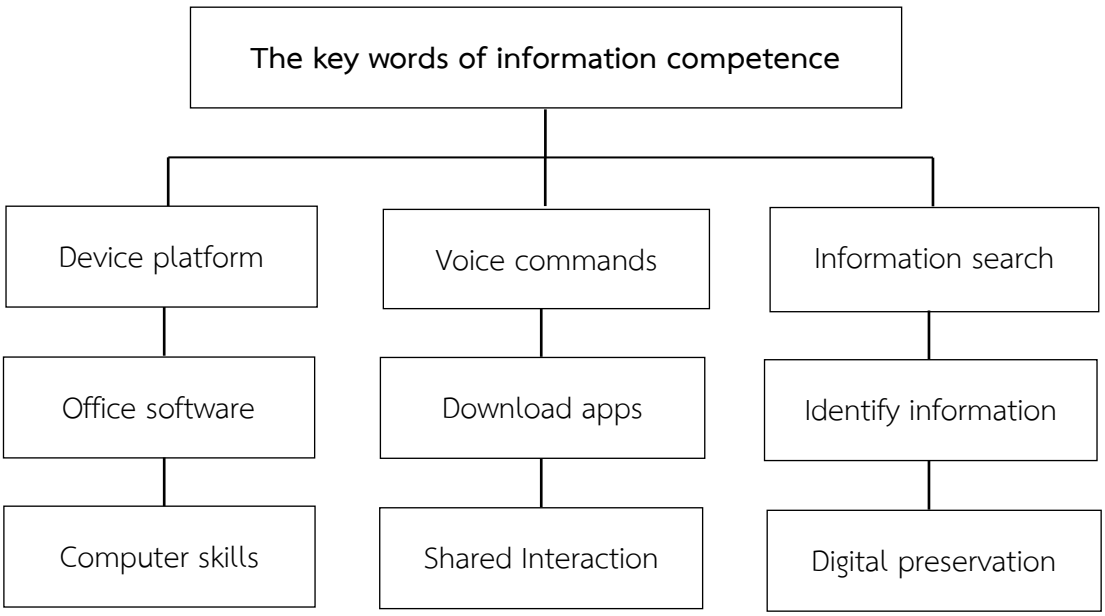

Figure 4.3 The key words of information competence strategy

Information competence includes nine strategies, and the key words of these strategies are extracted, as shown in Figure 4.3

Table 4.19 Strategies to promote sustainable information ethics

Aspect	Strategies
Information ethics	Establish a content review mechanism, combining technical means with manual review, to ensure the information on online platforms is healthy, positive, and lawful. Teach the basic operations of smartphones, the use of common social software, the process of online shopping, as well as safety knowledge such as how to identify online fraud and protect personal privacy. The knowledge of fraud prevention is widely disseminated through various channels such as publicity boards, residents' meetings, TV public service advertisements and official

Table 4.19 (Continued)

Aspect	Strategies
	websites, to ensure that it can accurately reach the elderly group. The community organizes special training activities on information ethics and morality, inviting professionals to provide education for the elderly group on cybersecurity protection knowledge and personal information protection. Strengthen and improve the regulatory mechanism, and increase the punishment for the infringement of the personal information rights of the elderly. Establish a rapid response mechanism to build a solid anti-fraud defense against suspicious situations reported by the elderly. Update your phone's lock screen password, payment password, and app login password in a timely manner. Regularly install anti-virus software, firewalls and various security protection tools. Adopt displays with large fonts and high contrast, add voice-assisted functions, and so on, to reduce the difficulty and cost for elderly users when implementing information security measures. Set up a consultation and service hotline to address various problems that elderly users may encounter when operating technological products such as smartphones, smart home appliances and web applications. Develop content covering health preservation knowledge, interpretation of policies and regulations, guidelines for daily services, and emergency assistance channels.
Information ethics	

Table 4.19 (Continued)

Aspect	Strategies
Information ethics	China needs to deeply participate in the discussion and formulation of various international Internet governance rules and technical standards, and build a fair, reasonable, open, inclusive, globally recognized and universally binding international cyberspace governance rule system. Strengthen cybersecurity cooperation with countries around the world, and jointly build a sound cross-border collaboration mechanism covering multiple key links such as information sharing, joint response and security alerts. A global cooperation mechanism for cyberspace governance is established, aiming to promote in-depth exchanges and pragmatic collaboration among countries around the world in this field. By strengthening the signing of bilateral and multilateral cooperation agreements with other countries, we can advance the mutual learning of cyberspace governance experience and in-depth technical cooperation.

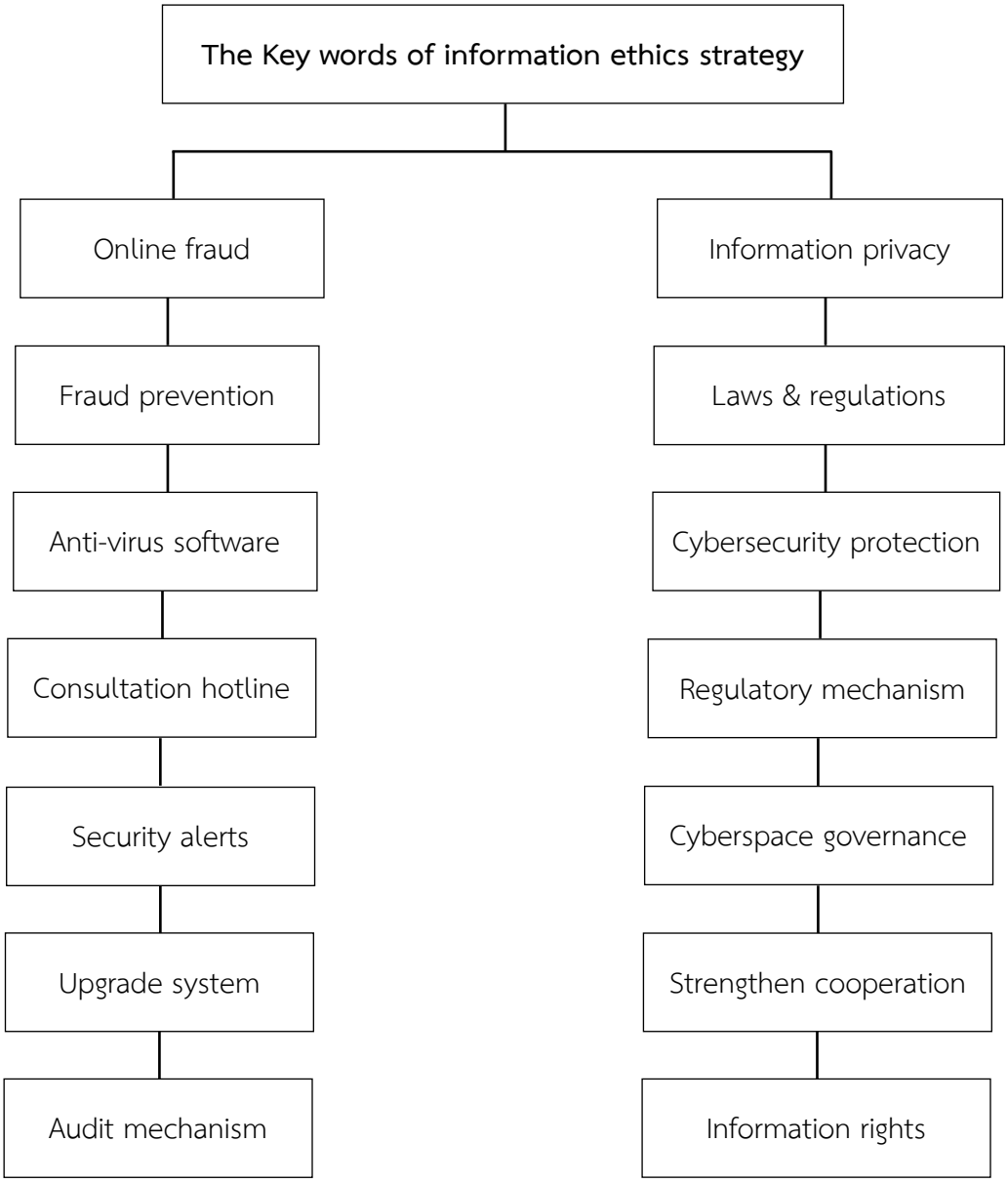

Figure 4.4 The key words of information ethics strategy

Information ethics includes fourteen strategies, and the key words of these strategies are extracted, as shown in Figure 4.4.

In summary, the researcher put forward a series of strategies for promoting the sustainable development of information literacy among the elderly in Xi'ancity. This strategy system covers four main aspects, with a total of 42 specific measures. Specifically, there are 9 measures for improving information awareness, aiming to

strengthen the elderly's cognition of the importance of information; 10 measures are set for enhancing information knowledge, focusing on enriching the elderly's reserve of basic information knowledge; 9 measures are included in boosting information competence, dedicated to helping the elderly master practical skills for information acquisition and processing; and 14 measures are formulated for strengthening information ethics, with the focus on cultivating the elderly's sense of moral norms and responsibility in the process of information application.

Phase 3: To evaluate the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

The analysis results present data on the evaluation of the proposed strategies in terms of its feasibility and adaptability. Experts evaluated the strategies using structured forms, and the data is reported using mean and standard deviation to determine the overall effectiveness of the strategies in addressing the information literacy among the elderly in Xi'an city.

Table 4.20 Mean & standard deviation of the evaluation for information awareness

Strategies to promote information literacy	Feasibility			Adaptability		
	$\overline{X}$	S.D.	level	$\overline{X}$	S.D.	level
Information awareness						
Increase the frequency of elderly users of mobile software tools and gradually improve their operational skills.	4.53	0.54	highest	4.53	0.63	highest
Cultivate the elderly's awareness of providing feedback on information needs, help them develop the habit of continuously browsing and acquiring information, and enhance their sensitivity to information.	4.45	0.67	high	4.49	0.71	high

Table 4.20 (Continued)

Strategies to promote information literacy	Feasibility			Adaptability		
	$\overline{X}$	S.D.	level	$\overline{X}$	S.D.	level
The elderly should strengthen their confidence, shift from passive acceptance to active embrace, and actively understand, participate in, and use mobile phones.	4.71	0.58	highest	4.71	0.58	highest
The elderly should learn information technology skills, accept new information, acquire new knowledge, and be good at seizing opportunities.	4.82	0.46	highest	4.82	0.46	highest
At the content delivery level, efforts should be made to help the elderly fully recognize their own capabilities, improve their negative self-evaluation, and dispel their doubts about themselves and information literacy services.	4.71	0.49	highest	4.57	0.79	highest
The information service content is spread through TV, radio and other traditional media, and the influence is enhanced by interactive live broadcast.	4.57	0.79	highest	4.86	0.38	highest
Government departments rely on community activity venues, carry out publicity campaigns, and leverage group effects and communication to raise the elderly's awareness of information services.	4.71	0.49	highest	4.86	0.38	highest

Table 4.20 (Continued)

Strategies to promote information literacy	Feasibility			Adaptability		
	$\overline{X}$	S.D.	level	$\overline{X}$	S.D.	level
Communities need to organize a series of engaging information literacy education activities, foster a strong atmosphere of informatization, and encourage the elderly to take the initiative to improve their own information literacy.	4.83	0.41	highest	4.67	0.82	highest
Rewards such as the title of "Lifelong Learner"or badges can be granted based on cumulative learning hours, daily check-ins and sharing activities, facilitating the elderly's sharing and display on media platforms.	4.51	0.61	highest	4.83	0.41	high
Total	**4.70**	**0.57**	**highest**	**4.65**	**0.56**	**highest**

According to Table 4.20, the data show that the experts' overall evaluation of the feasibility and adaptability of the strategy is very high. The overall evaluation of feasibility is the highest ($\overline{X}$=4.70, S.D.=0.57), while the overall evaluation of adaptability is also the highest ($\overline{X}$= 4.65, S.D.=0.56), indicating that the strategy demonstrates both highest feasibility and adaptability.

The most feasible strategy for improving information awareness among the elderly in Xi'an city is: "Communities need to organize a series of engaging information literacy education activities, foster a strong atmosphere of informatization, and encourage the elderly to take the initiative to improve their own information literacy." ($\overline{X}$=4.83, S.D.=0.41). The second most implemented aspect is: "The elderly should learn information technology skills, accept new information, acquire new

knowledge, and be good at seizing opportunities." ($\overline{X}$=4.82, S.D.=0.46). The strategy with the lowest feasibility is: "Cultivate the elderly's awareness of providing feedback on information needs, help them develop the habit of continuously browsing and acquiring information, and enhance their sensitivity to information." ($\overline{X}$=4.45, S.D.=0.67).

The most adaptable strategies for improving information awareness among the elderly in Xi'an city are: "The information service content is spread through TV, radio and other traditional media, and the influence is enhanced by interactive live broadcast." and "Government departments should rely on community activity venues (such as residential areas and nursing homes), carry out publicity campaigns, and leverage group effects and word-of-mouth communication to raise the elderly's awareness of information awareness services." ($\overline{X}$=4.86, S.D.=0.38). The second highest implementation is: "Rewards such as the title of "Lifelong Learner" or commemorative badges can be granted based on cumulative learning hours, daily check-ins and sharing activities, facilitating the elderly's sharing and display on media platforms." ($\overline{X}$=4.83, S.D.=0.41). The strategy with the lowest adaptability is: "Cultivate the elderly's awareness of providing feedback on information needs, help them develop the habit of continuously browsing and acquiring information, and enhance their sensitivity to information." ($\overline{X}$=4.49, S.D.=0.71).

Table 4.21 Mean & standard deviation of the evaluation for information knowledge

Strategies to promote information literacy	Feasibility			Adaptability		
	$\overline{X}$	S.D.	level	$\overline{X}$	S.D.	level
Information knowledge						
Information literacy training courses are conducted, olunteers teach the elderly how to access information.	4.63	0.82	highest	4.63	0.82	highest
Establish information sharing and learning groups, encourage the elderly to carry out group learning activities, and set up learning teams.	4.77	0.43	highest	4.77	0.43	highest
Vigorously carry out publicity and education to guide the elderly to understand the sustainability of information knowledge and stimulate their interest in learning. Organize a series of publicity events to vividly demonstrate the application scenarios of information knowledge.	4.69	0.48	highest	4.56	0.70	highest
Provide operational guidance and Q&A services to help the elderly master the basic functions of new media as an information channel.	4.43	0.72	high	4.43	0.72	high
Organize basic new media information competitions covering contents such as device button operations, basic software download functions and typing operations, aiming to create a relaxed learning atmosphere for the elderly.	4.86	0.38	highest	4.86	0.37	highest

Table 4.21 (Continued)

Strategies to promote information literacy	Feasibility			Adaptability		
	$\overline{X}$	S.D.	level	$\overline{X}$	S.D.	level
Promote literacy in information skills, prevention of common diseases, balanced diet, scientific exercise, and mental health, to enhance the elderly; strengthening awareness of anti-fraud.	4.86	0.39	highest	4.86	0.41	highest
Organize regular writing workshops, painting classes, photography clubs and video production training courses to provide a platform for the elderly to showcase themselves and exchange experiences.	4.71	0.49	highest	4.57	0.79	highest
Provide diversified learning resources covering a variety of formats such as carefully selected textual materials, clear and intuitive images, as well as vivid and interesting audio and video content, so as to meet the learning needs of different elderly groups.	4.71	0.49	highest	4.57	0.53	highest
Promote interaction and communication among participants. Online courses designed with different learning modules and schedules to meet the needs of learners.	4.81	0.40	highest	4.69	0.70	highest
Collect subjective and feedback from elderly regarding learning content and methods.	4.46	0.54	high	4.46	0.54	high
Total	**4.64**	**0.60**	**highest**	**4.69**	**0.51**	**highest**

According to Table 4.21, the data show that the experts' overall evaluation of the feasibility and adaptability of the strategy is very high. The overall evaluation of feasibility is the highest ($\overline{X}$=4.64, S.D.=0.60), the overall evaluation of adaptability is the highest ($\overline{X}$= 4.69, S.D.=0.51), indicating that the strategy demonstrates both highest feasibility and adaptability.

The strategies with the highest feasibility of information knowledge are: "Organize basic new media information competitions covering contents such as device button operations, basic software download functions and typing operations, aiming to create a relaxed learning atmosphere for the elderly." ($\overline{X}$=4.86, S.D.=0.38), and "Promote literacy in information skills, covering aspects such as prevention of common diseases, balanced diet, scientific exercise, and mental health maintenance, to enhance the quality of life for the elderly; as well as strengthening awareness of anti-fraud." ($\overline{X}$=4.86, S.D.=0.39). The strategy with the lowest feasibility is: "Provide operational guidance and Q&A services to help the elderly master the basic functions of new media as an information channel. Demonstrate the usage of new media through traditional media such as outdoor screens, thereby improving their efficiency in information acquisition." ($\overline{X}$=4.43, S.D.=0.72).

The strategies with the highest adaptability are: "Organize basic new media information competitions covering contents such as device button operations, basic software download functions and typing operations, aiming to create a relaxed learning atmosphere for the elderly." ($\overline{X}$=4.86, S.D.=0.37), and "Promote literacy in information skills, covering aspects such as prevention of common diseases, balanced diet, scientific exercise, and mental health maintenance, to enhance the quality of life for the elderly; as well as strengthening awareness of anti-fraud." ($\overline{X}$=4.86, S.D.=0.41). The strategy with the lowest adaptability is: "Provide operational guidance and Q&A services to help the elderly master the basic functions of new media as an information channel. Demonstrate the usage of new media through traditional media such as outdoor screens, thereby improving their efficiency in information acquisition." ($\overline{X}$=4.43, S.D.=0.72).

Table 4.22 Mean & standard deviation of the evaluation for information competence

Strategies to promote information literacy	Feasibility			Adaptability		
	$\overline{X}$	S.D.	level	$\overline{X}$	S.D.	level
Information competence						
In light of the characteristics and actual needs of the elderly, communities can offer information literacy training courses to help them master basic digital skills such as web browsing, information retrieval, and social media usage.	4.65	0.48	highest	4.75	0.46	highest
Set up dedicated activity rooms for elderly learning, equipped with devices such as computers, tablet computers and smartphones, to provide a convenient platform for the elderly to learn and practice.	4.72	0.54	highest	4.72	0.54	highest
Teach basic computer operation skills, such as system startup and shutdown, file management, and simple applications of common office software.	4.68	0.56	highest	4.73	0.41	highest
The basic information retrieval methods and the skills of using network security knowledge are systematically taught to the elderly.	4.43	0.70	high	4.62	0.48	highest
The image retrieval feature helps you find relevant information by uploading images, and you can search with voice commands.	4.58	0.54	highest	4.65	0.47	highest

Table 4.22 (Continued)

Strategies to promote information literacy	Feasibility			Adaptability		
	$\overline{X}$	S.D.	level	$\overline{X}$	S.D.	level
Help older adults master skills such as WeChat chat, video calls, mobile payments and other common functions.	4.40	0.58	high	4.57	0.50	highest
Establish and improve the monitoring and feedback mechanism for training effectiveness, utilizing regular assessments, classroom observations, and participant evaluations to promptly understand training outcomes and collect suggestions, thereby continuously optimizing the training program.	4.57	0.79	highest	4.43	0.79	high
Focus on integrating the practical life scenarios of the elderly, using simple and understandable language along with vivid case studies to enhance their comprehension and mastery.	4.81	0.38	highest	4.81	0.59	highest
Provide convenient digital services for the elderly, launching online social security applications and medical expense reimbursement services. Through these online platforms, the time spent waiting in queues at physical service counters effectively reduced.	4.71	0.49	highest	4.71	0.49	highest
Total	**4.62**	**0.56**	**highest**	**4.67**	**0.53**	**highest**

According to Table 4.22, the experts gave high overall evaluations on the feasibility and adaptability of the information competence strategy, among which the overall evaluation of feasibility is the highest ($\overline{X}$=4.62, S.D.=0.56), and the overall evaluation of adaptability is also the highest ($\overline{X}$=4.67, S.D.=0.53), indicating that the strategy have both the highest adaptability and the highest feasibility.

The most feasible strategy of the information competence strategy is: “Focus on integrating the practical life scenarios of the elderly, using simple and understandable language along with vivid case studies to enhance their comprehension and mastery.” ($\overline{X}$=4.81, S.D.=0.38). The lowest feasible strategy is: “Help older adults master skills such as WeChat chat, video calls, mobile payments and other common functions.” ($\overline{X}$=4.40, S.D.=0.58).

The most adaptable strategy of the information competence strategy is: “Focus on integrating the practical life scenarios of the elderly, using simple and understandable language along with vivid case studies to enhance their comprehension and mastery.” ($\overline{X}$=4.81, S.D.=0.59), and the strategy with the lowest adaptability is: “Establish and improve the monitoring and feedback mechanism for training effectiveness, utilizing regular assessments, classroom observations, and participant evaluations to promptly understand training outcomes and collect improvement suggestions, thereby continuously optimizing the training program.” ($\overline{X}$=4.43, S.D.=0.79).

Table 4.23 Mean & standard deviation of the evaluation for information ethics

Strategies to promote information literacy	Feasibility			Adaptability		
	$\overline{X}$	S.D.	level	$\overline{X}$	S.D.	level
Information ethics						
Establish a content review mechanism, combining technical means with manual review, to ensure the information on online platforms is healthy, positive, and lawful.	4.73	0.49	highest	4.59	0.51	highest
Teach basic operations of smartphones, the use of common social software, the process of online shopping, safety knowledge such as how to identify fraud and protect personal privacy.	4.74	0.66	highest	4.81	0.39	highest
The knowledge of fraud prevention is disseminated through various channels such as publicity boards, residents' meetings, TV public advertisements and official websites, to ensure that it can accurately reach the elderly.	4.80	0.57	highest	4.80	0.57	highest
The community organizes special training activities on information ethics and morality, inviting professionals to provide education for the elderly group on cybersecurity protection knowledge and personal information protection.	4.69	0.67	highest	4.69	0.67	highest
Strengthen the regulatory, and increase the punishment the information rights of the elderly.	4.44	0.59	high	4.76	0.46	highest

Table 4.23 (Continued)

Strategies to promote information literacy	Feasibility			Adaptability		
	$\overline{X}$	S.D.	level	$\overline{X}$	S.D.	level
Establish a rapid response mechanism to build a solid anti-fraud defense against suspicious situations reported by the elderly.	4.46	0.39	high	4.59	0.54	highest
Update your phone's lock screen password, payment password, and app login password in a timely manner.	4.58	0.47	highest	4.60	0.51	highest
Regularly install anti-virus software, firewalls and various security protection tools.	4.63	0.48	highest	4.63	0.48	highest
Adopt displays with large fonts and high contrast, add voice-assisted functions, and so on, to reduce the difficulty and cost for elderly users when implementing information security measures.	4.68	0.48	highest	4.72	0.46	highest
Set up a consultation and service hotline to address various problems that elderly users may encounter when operating technological products such as smartphones, smart home appliances and web applications.	4.76	0.59	highest	4.81	0.42	highest
Develop content covering health preservation knowledge, interpretation of policies and regulations, guidelines for daily services, and emergency assistance channels.	4.76	0.44	highest	4.84	0.37	highest

Table 4.23 (Continued)

Strategies to promote information literacy	Feasibility			Adaptability		
	$\overline{X}$	S.D.	level	$\overline{X}$	S.D.	level
China needs to deeply participate in the discussion and formulation of various international Internet governance rules and technical standards, and, inclusive, recognized and universally binding international cyberspace governance rule system.	4.36	0.57	high	4.36	0.57	high
Strengthen cybersecurity cooperation with countries around the world, and jointly build a sound cross-border mechanism covering multiple key links such as information sharing, and security alerts.	4.72	0.56	highest	4.67	0.53	highest
A global cooeration mechanism for cyberspace governance is established, aiming to promote in-depth exchanges and pragmatic collaboration among countries around the world in this field. By strengthening the signing of bilateral and multilateral cooperation agreements with other countries, we can advance the mutual learning of cyberspace governance experience and in-depth technical cooperation.	4.59	0.71	highest	4.74	0.38	highest
Total	**4.64**	**0.55**	**highest**	**4.69**	**0.49**	**highest**
Evaluation level of strategies	**4.65**	**0.57**	**highest**	**4.68**	**0.52**	**highest**

According to Table 4.23, the experts' overall evaluation of the feasibility and adaptability of the information ethics strategy is very the highest, among which the overall evaluation of feasibility is the highest ($\overline{X}$=4.64, S.D.=0.55), and the overall evaluation of adaptability is also the highest ($\overline{X}$=4.69, S.D.=0.49), indicating that the strategy have both the highest feasibility and the highest adaptability.

The strategy with the highest feasibility of the information ethics is: "The knowledge of fraud prevention is widely disseminated through various channels such as publicity boards, residents' meetings, TV public service advertisements and official websites, to ensure that it can accurately reach the elderly group." ($\overline{X}$=4.80, S.D.=0.57), and the strategy with the lowest is: " China needs to deeply participate in the discussion and formulation of various international Internet governance rules and technical standards, and build a fair, reasonable, open, inclusive, globally recognized and universally binding international cyberspace governance rule system." ($\overline{X}$=4.36, S.D.=0.57).

The strategies with the highest adaptability of for improving information ethics among the elderly in Xi'an city is: "Develop content covering health preservation knowledge, interpretation of policies and regulations, guidelines for daily services, and emergency assistance channels." ($\overline{X}$=4.84, S.D.=0.37). The strategy with the lowest adaptability is: "China needs to deeply participate in the discussion and formulation of various international Internet governance rules and technical standards, and build a fair, reasonable, open, inclusive, globally recognized and universally binding international cyberspace governance rule system." ($\overline{X}$=4.36, S.D.=0.57).

The Evaluation level of scale strategies show that the sustainable development strategy of information literacy for elderly people in Xi'an city has the highest level of feasibility ($\overline{X}$=4.65, S.D.=0.57) and adaptability ($\overline{X}$=4.68, S.D.=0.52) in four aspects

Chapter 5
Conclusion, Discussion, and Recommendations

This research focused on the Development of Strategies to Promote Sustainable Information Literacy among the Elderly in Xi'an City. The objectives of the study were as follows: 1) to study the current situation of information literacy among the elderly in Xi'an city. 2) to develop strategies for information literacy among the elderly in Xi'an city. 3) to evaluate the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

The sample group for the research comprised 384 elderly people selected used systematic sampling from 5 communities in Xi'an, and 10 experts selected used purposive sampling. The research instruments included 1) Questionnaire; 2) Interview form; 3) Evaluation form. The statistical methods used for data analysis included Index of Item-Objective Congruence (IOC), Percentage, Mean, Standard deviation.

Conclusion

The research in the strategies for improving the sustainable development of the information literacy among the elderly in Xi'an city. The researcher summarizes the conclusion into three parts, details as follows:

Phase1: Results of studying the current situation of information literacy among the elderly in Xi'an city.

Phase2: Results of developing strategies for information literacy among the elderly in Xi'an city.

Phase3: Results of evaluating the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

The details of the research conclusions were as follow:

Phase 1: Results of studying the current situation of information literacy among the elderly in Xi'an city.

After analyzing the current situation of information literacy among the elderly in Xi'an city from four dimensions-information awareness, information knowledge, information competence, and information ethics-it is found that there is a need for improvement to varying degrees in all these four aspects.

According to the data in Chapter 4, it was found that the current situation of information literacy among the elderly in Xi'an city in four aspects was at high level ($\overline{X}$=3.85, S.D.=0.84). Considering the results of this research, aspects ranged from the highest to lowest level were as follows: the highest level was information awareness ($\overline{X}$=3.91, S.D.=0.83), followed by information knowledge ($\overline{X}$=3.90, S.D.=0.87), information competence ($\overline{X}$=3.84, S.D.=0.81), and information ethics was the lowest level ($\overline{X}$=3.76, S.D.=0.83).

Information awareness was found to have eight sub-variables, which ranged from the highest to the lowest needs assessment values. These sub-variables include: "Think that learning information technology will be very helpful to life", "To improve information awareness through learning methods such as lectures/training", "Will actively accept and learn information that is beneficial to personal development", "Follow the latest news updates on the Internet", "After information literacy training, your sensitivity to information has improved", "The frequency of using a computer or a mobile phone", "Has a good awareness of information needs and feedback when conducting information activities", "To encounter difficulties or problems in life, want to seek solutions through the Internet".

Information knowledge was analyzed across eight key aspects, ranging from the highest to the lowest needs assessment values. These include: "Understand information related information crime, information pollution and other information security knowledge", "Participate in related online information knowledge Competitions", "Understand information related laws and regulations and ethical knowledge, such as intellectual property, privacy, copyright", "Utilize online

resources to enhance information Knowledge", "Understand the current development process and trends of information literacy", "Engage in regular study to update information knowledge", "Willing to participate in information literacy teaching courses or activities", "Periodically assess one's level of information Knowledge".

Information competence were assessed across eight sub-variables that also ranged from the highest to the lowest needs assessment values. These sub-variables are: "Edit text, audio, video, pictures and so on", "Retrieve, obtain, and filter out a large amount of information using devices such as mobile phones or computers", "Use mobile phone or computer device for online shopping", "When reading information, pay attention to identify the usefulness and credibility of information", "Able to install and download internet software", "Conduct periodic evaluations of one's information competence", "Use the Internet for information exchange and sharing activities", "Able to accurately filter out target information from a large amount of retrieved information".

Information ethics was analyzed through eight sub-variables. These variables ranged from the highest to the lowest needs assessment values, highlighting areas that need attention, such as: "Report and stop the dissemination of harmful and false information to others", "Ability to understand digital copyright and disseminate information legally and responsibly", "Capable of ensuring the protection of personal and others' privacy information in the process of information utilization and production", "The community should strengthen the emphasis on information ethics education", "Strengthening information law education helps improve individual legal literacy", "Capability to protect digital devices by installing and activating protection software such as firewalls", "Ability to identify dangerous websites and Internet fraud in the digital environment", "Know that there are multiple risks in a digital environment".

This analysis laid the groundwork for the strategic development of information literacy, and will focus on the strategies developed to address these

identified needs. The SWOT-PEST analysis and TOWS matrix will be used to align the development strategies with the needs assessment results.

Phase 2: Results of developing strategies for information literacy among the elderly in Xi'an city.

To develop strategies for information literacy among the elderly in Xi'an city was based on the formulated strategies by analyzing the current situation. These strategies were developed using SWOT-PEST analysis and the TOWS matrix. There are forty-two strategies in total. The comprehensive strategies are detailed below:

There are nine strategies for information awareness.

The frequency of four strategies mentioned by experts is 90%.

Cultivate the elderly's awareness of providing feedback on information needs, help them develop the habit of continuously browsing and acquiring information, and enhance their sensitivity to information. 4) The elderly should learn information technology skills, accept new information, acquire new knowledge, and be good at seizing opportunities. 7) Government departments should rely on community activity venues (such as residential areas and nursing homes), carry out publicity campaigns, and leverage group effects and word-of-mouth communication to raise the elderly's awareness of information awareness services. 8) Communities need to organize a series of engaging information literacy education activities, foster a strong atmosphere of informatization, and encourage the elderly to take the initiative to improve their own information literacy.

The frequency of two strategies mentioned by experts is 80%.

Increase the frequency of elderly users of mobile software tools and gradually improve their operational skills. 3) The elderly should strengthen their confidence, shift from passive acceptance to active embrace, and actively understand, participate in, and use mobile phones.

The frequency of three strategies mentioned by experts is 70%.

At the content delivery level, efforts should be made to help the elderly fully recognize their own capabilities, improve their negative self-evaluation, and

dispel their doubts about themselves and information literacy services. 6) The information service content is spread through TV, radio and other traditional media, and the influence is enhanced by interactive live broadcast. 9) Rewards such as the title of “Lifelong Learner” or commemorative badges can be granted based on cumulative learning hours, daily check-ins and sharing activities, facilitating the elderly’s sharing and display on media platforms.

For information knowledge, ten strategies are proposed.

The frequency of four strategies mentioned by experts is 90%.

1) Information literacy training courses are conducted, where volunteers teach the elderly how to access information. 3) Vigorously carry out publicity and education to guide the elderly to understand the sustainability of information knowledge and stimulate their interest in learning. Organize a series of publicity events to vividly demonstrate the application scenarios of information knowledge in daily life. 4) Provide operational guidance and Q&A services to help the elderly master the basic functions of new media as an information channel. Demonstrate the usage of new media through traditional media such as outdoor screens, thereby improving their efficiency in information acquisition. 6) Promote literacy in information skills, covering aspects such as prevention of common diseases, balanced diet, scientific exercise, and mental health maintenance, to enhance the quality of life for the elderly; as well as strengthening awareness of anti-fraud.

The frequency of four strategies mentioned by experts is 80%.

Establish information sharing and learning groups, encourage the elderly to carry out group learning activities, and set up mutual-aid learning teams. 8) Provide diversified learning resources covering a variety of formats such as carefully selected textual materials, clear and intuitive images, as well as vivid and interesting audio and video content, so as to meet the learning needs of different elderly groups. 9) Promote interaction and communication among participants. Online courses can be designed with different learning modules and schedules to meet the needs of diverse learners. 10) Collect subjective perceptions and feedback from elderly individuals regarding learning content and methods.

The frequency of two strategies mentioned by experts is 70%.

Organize basic new media information competitions covering contents such as device button operations, basic software download functions and typing operations, aiming to create a relaxed learning atmosphere for the elderly.

Organize regular writing workshops, painting classes, photography clubs and video production training courses to provide a platform for the elderly to showcase themselves and exchange experiences.

In the dimension of information competence, nine strategies are proposed.

The frequency of five strategies mentioned by experts is 90%.

In light of the characteristics and actual needs of the elderly, communities can offer information literacy training courses to help them master basic digital skills such as web browsing, information retrieval, and social media usage. 3) Teach basic computer operation skills, such as system startup and shutdown, file management, and simple applications of common office software. 5) The image retrieval feature helps you find relevant information by uploading images, and you can search with voice commands. 6) Help older adults master skills such as WeChat chat, video calls, mobile payments and other common functions. 8) Focus on integrating the practical life scenarios of the elderly, using simple and understandable language along with vivid case studies to enhance their comprehension and mastery.

The frequency of two strategies mentioned by experts is 80%.

Set up dedicated activity rooms for elderly learning, equipped with devices such as computers, tablet computers and smartphones, to provide a convenient platform for the elderly to learn and practice. 4) The basic information retrieval methods and the skills of using network security knowledge are systematically taught to the elderly.

The frequency of two strategies mentioned by experts is 70%.

Establish and improve the monitoring and feedback mechanism for training effectiveness, utilizing regular assessments, classroom observations, and participant

evaluations to promptly understand training outcomes and collect improvement suggestions, thereby continuously optimizing the training program.

Provide convenient digital services for the elderly, such as launching online social security applications and medical expense reimbursement services. Through these online platforms, the time spent waiting in queues at physical service counters can be effectively reduced.

To improve information ethics, the following fourteen strategies are proposed.

The frequency of seven strategies mentioned by experts is 90%.

1) Establish a content review mechanism, combining technical means with manual review, to ensure the information on online platforms is healthy, positive, and lawful. 3) The knowledge of fraud prevention is widely disseminated through various channels such as publicity boards, residents' meetings, TV public service advertisements and official websites, to ensure that it can accurately reach the elderly group. 4) The community organizes special training activities on information ethics and morality, inviting professionals to provide education for the elderly group on cybersecurity protection knowledge and personal information protection. 7) Update your phone's lock screen password, payment password, and app login password in a timely manner. 9) Adopt displays with large fonts and high contrast, add voice-assisted functions, and so on, to reduce the difficulty and cost for elderly users when implementing information security measures. 10) Set up a consultation and service hotline to address various problems that elderly users may encounter when operating technological products such as smartphones, smart home appliances and web applications. 11) Develop content covering health preservation knowledge, interpretation of policies and regulations, guidelines for daily services, and emergency assistance channels.

The frequency of three strategies mentioned by experts is 80%.

Strengthen and improve the regulatory mechanism, and increase the punishment for the infringement of the personal information rights of the elderly.

Regularly install anti-virus software, firewalls and various security protection tools. 14) A global cooperation mechanism for cyberspace governance is established, aiming to promote in-depth exchanges and pragmatic collaboration among countries around the world in this field. By strengthening the signing of bilateral and multilateral cooperation agreements with other countries, we can advance the mutual learning of cyberspace governance experience and in-depth technical cooperation.

The frequency of four strategies mentioned by experts is 70%.

Teach the basic operations of smartphones, the use of common social software, the process of online shopping, as well as safety knowledge such as how to identify online fraud and protect personal privacy. 6) Establish a rapid response mechanism to build a solid anti-fraud defense against suspicious situations reported by the elderly. 12) China needs to deeply participate in the discussion and formulation of various international Internet governance rules and technical standards, and build a fair, reasonable, open, inclusive, globally recognized and universally binding international cyberspace governance rule system. 13) Strengthen cybersecurity cooperation with countries around the world, and jointly build a sound cross-border collaboration mechanism covering multiple key links such as information sharing, joint response and security alerts.

Phase 3: Results of evaluating the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

The feasibility and adaptability of the 42 strategies for promoting the sustainable development of information literacy among the elderly in Xi'an were evaluated from four aspects: information awareness, information knowledge, information competence, and information ethics. The results show that the feasibility and adaptability of these 42 strategies are both at a relatively high level, with the specific results as follows:

1) The feasibility of the 42 strategies was analyzed from four aspects. The results show that the feasibility scores of these 42 strategies range from 4.36 to 4.86,

which fall into the high or highest level, indicating that the 42 strategies are highly feasible.

2) The adaptability of the 42 strategies was analyzed from four aspects: information awareness, information knowledge, information competence, and information ethics. The scores range from 4.36 to 4.86, all falling into the relatively high or highest level, which indicates that the formulated strategies have high adaptability and are suitable for implementation in the practical work of Xi'an city.

Feasibility of the Developed Strategies

The feasibility of the forty-two strategies was similarly evaluated, with average scores for each of the four aspects indicating the practicality and ease of implementation. The analysis shows:

Information awareness: Feasibility was rated between 4.45 and 4.83, showing that communities organize information literacy education activities that are wide-ranging in coverage, far-reaching in influence and strong in appeal, strengthen the cultivation of the elderly's information literacy, and create a strong information atmosphere, which is conducive to the elderly improving their own information literacy consciously.

Information knowledge: Strategies in this area received scores ranging from 4.43 to 4.86, demonstrating the feasibility of the content of information literacy services should shift from traditional knowledge imparting to more extensive knowledge popularization, covering areas closely related to the elderly's lives such as digital skills, healthcare, and anti-fraud.

Information competence: Feasibility scores for strategies to improve information competence were between 4.43 and 4.81, showing strong feasibility for creating learning atmosphere through interaction and support among family members is an important way to help the elderly improve their digital literacy.

Information ethics: The feasibility of strategies in this area scored between 4.36 and 4.80, indicating that strategies focused on organizing anti-fraud lectures on a regular basis and popularize anti-fraud knowledge through channels such as

communities, television and the Internet, so as to effectively enhance the elderly's awareness of self-protection.

Adaptability of the Developed Strategies

The adaptability of the forty-two strategies was analyzed using the average scores for each of the four aspects. The results show that the strategies are well-suited to addressing the current needs and challenges faced by information literacy of the elderly in Xi'an city. The analysis indicates the following:

Information awareness: The adaptability of strategies in this area was rated between 4.49 and 4.86, showing high appropriateness in releasing information service content through traditional media such as television and radio, as well as new media platforms including social networks and self-media, and enhance the influence by virtue of live interactive sessions.

Information knowledge: Strategies in this area scored between 4.43 and 4.86. In particular, it is highly adaptable to organize quiz activities on the basic knowledge of smartphones and computers, covering device switching, key functions, basic software operations, etc., and create a fun and educational learning atmosphere for the elderly through interesting interactions.

Information competence: The adaptability of strategies aimed at promoting sustainable learning ranged between 4.43 and 4.81, patiently to explain information skills to the elderly and correctly demonstrate the use of mobile phone functions, such as taking photos, making video calls and making payments. This strategy has a high degree of adaptability.

Information ethics: With scores ranging from 4.36 to 4.84, the strategies for information ethics is considered highly appropriate, especially in terms of establishing information sharing platforms to provide reliable information resources for the elderly.

In conclusion, the evaluation results demonstrate that the developed strategies for promoting sustainable information literacy of the elderly in Xi'an city are both highly feasible and adaptable. The strategies effectively address the

identified needs and challenges in the digital era, it provides reference for improving the information literacy of the elderly group in Xi'an city.

Discussion

From the research results on the development of strategies for promoting sustainable development information literacy among the elderly in Xi'an city, the research findings can be discussed and classified according to the research objectives into three phases, as follows:

Phase 1: Results of studying the current situation of information literacy among the elderly in Xi'an city.

Phase 2: Results of developing strategies for information literacy among the elderly in Xi'an city.

Phase 3: Results of evaluating the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

Phase 1: Results of studying the current situation of information literacy among the elderly in Xi'an city.

The current situation of information literacy among the elderly in Xi'an city in four aspects was at high level ($\overline{X}$=3.85, S.D.=0.84). Considering the results of this research, aspects ranged from the highest to lowest level were as follows: the highest level was information awareness ($\overline{X}$=3.91, S.D.=0.83), followed by information knowledge ($\overline{X}$=3.90, S.D.=0.87), information competence ($\overline{X}$=3.84, S.D.=0.81), and information ethics was the lowest level ($\overline{X}$=3.76, S.D.=0.83). Information literacy of the elderly in Xi'an city in four aspects was at high level.

Information awareness is the highest level in information literacy among the elderly in Xi'an city. This result is consistent with Gu Lei & Xu Shengju (2024) suggest that help the elderly change their mindsets, abandon the stereotype that the elderly have weak abilities to understand and accept new things, and encourage them to actively participate in and learn to use intelligent devices. At the same time, Liu Di (2024) also believes that the elderly should develop the ability to solve information-

related problems, overcome the fear of difficulties, and establish the concept of lifelong learning. When confronted with information skills, they should adopt a positive attitude to observe and think. The elderly should also proactively enhance their awareness of self-learning digital devices. Shi Qinggong (2025) also mentioned it is crucial to improve the digital literacy of the elderly, as their attitudes, motivations and learning methods directly affect the effectiveness. By actively engaging with digital technologies, the elderly can overcome their initial fears and unfamiliarity, and master these skills through continuous practice. Integrating newly acquired digital skills into daily life can not only improve their quality of life, but also enhance their independence and autonomy in the digital society.

The performance of information knowledge is at a high level. Jiang Yilu & Wen Taoying (2024) proposed developing knowledge-based courses for seniors, covering essential computer skills including device operation, button functions, software functionalities, and basic digital operations. These programs help older adults recognize the benefits of digital technology while reducing their initial resistance to new devices. The introductory course modules-Computer Basics, Network Fundamentals, Data Storage, and File Management-focus on keyboard/mouse usage, computer operation principles, staying updated with industry trends, and mastering essential skills like document editing and image processing. Liu Xiaolin (2025) pointed out that in addition to organizing specialized training programs for institutions, communities, and volunteers, it is recommended to leverage modern technological tools for remote education, live-streamed courses, and online seminars, thereby providing more seniors with opportunities to learn digital technologies. Simultaneously, combining online and offline approaches, we should organize digital cultural activities such as online essay contests and digital photography workshops. By integrating digital technology with the daily lives of elderly groups who are interested in these areas, we can effectively encourage seniors to proactively embrace the digital society.

The performance in information competence is at a high level. Wang Pei'an (2023) advocates for sustained efforts to develop digital products tailored for the

elderly. This includes creating age-friendly devices and applications that meet their specific needs and daily requirements, characterized by “digitalization, intelligence, and connectivity”. For instance, smartphone apps should feature “senior-friendly versions” with simplified interfaces and intuitive controls, such as streamlined banking apps, chatbots, video platforms, audio tools, travel guides, and payment systems. These solutions aim to eliminate complex procedures while maintaining clear operation guidance. Qu Manqi (2025) notes that social organizations and institutions are leveraging their strengths to create platforms, diversify formats, and enhance digital literacy initiatives for seniors. For instance, BesTV IPTV launched the “Lingling Shencheng” channel, designed to bridge the digital divide by teaching smart device usage through TV programming. Volunteers serve as “digital mentors,” “information assistants,” and “tech experience specialists,” providing consultations at telecom service outlets and offering feedback on age-friendly app modifications during visits to tech companies. The “Lingling Code” a smiley design created with seniors’ input, has become a hallmark of “Smart Elderly Assistance” volunteer services. Wherever the code is displayed, dedicated volunteers help seniors navigate smart devices.

Information ethics is at a high level. According to Huang Jiahao & Ma Li (2024), strengthen supervision and management of digital resources. Establish a data protection mechanism under the big data environment, enhance elderly individuals’ awareness of digital security, standardize their usage of digital resources, prevent the leakage and dissemination of personal privacy data, and improve the security protection of digital resources. Pan Zheng & Lu Yuhui. (2025) argues that digital platforms should enhance self-regulation and prioritize elderly user protection. Establishing rigorous algorithmic review mechanisms and appropriate data collection standards is crucial to restrict addictive, pandering, or misleading algorithms, prevent excessive information gathering from causing personal data leaks, and create a safe, clean, user-friendly, and diverse digital ecosystem for seniors. Concurrently, anti-addiction systems and age-friendly features should be developed by embedding time reminders, permission controls, spending limits, parental supervision,

personalized recommendation removal, and inappropriate content filtering into application platforms. These measures aim to reduce the likelihood and harm of digital addiction among older adults. Notably, such anti-addiction solutions should prioritize respecting seniors' autonomy and independence, employing more advisory approaches like suggestions and reminders rather than rigid "one-size-fits-all" policies that may infringe on elderly users' rights.

Phase 2: Results of developing strategies for information literacy among the elderly in Xi'an city.

The development of strategies for promoting sustainable development information literacy among the elderly in Xi'an city centered around four main areas: information awareness, information knowledge, information competence, and information ethics. The formulated strategies addressed gaps identified in In order to enhance the challenges of the digital society for the elderly, it is necessary to strengthen the training of digital literacy improvement for the elderly, provide psychological and social support for the elderly, and promote the digital integration and literacy improvement of the elderly and aimed at enhancing their adaptability to the digital era.

Strategies to promote the improvement of information literacy among the elderly, improving the elderly's information literacy mainly include adopting diversified teaching forms of information literacy education for the elderly in communities, such as small-class teaching, one-on-one tutoring, scenario simulation, and case analysis, so as to meet the learning habits and acceptance abilities of different elderly people, it is necessary to strengthen the construction of the teaching staff for information literacy education of the elderly in communities, improve teachers' teaching capabilities and communication skills through professional training, and encourage the recruitment of experienced volunteers to participate in teaching, this view is highly consistent with the strategy proposed by Wang Lianlian & Shao Aiqun (2021). The strategies also highlighted the effects of improving information literacy among older persons in the community, which aligns with Ma Lili (2024) said that constructing sound safeguard mechanisms of all types

and information infrastructure is the foundation for smart city development. Enhancing the application level and commercial popularization of smart city technologies is the key to driving its progress. Strengthening the government's governance capacity and public service level is the core of smart city construction. And selecting appropriate training models is an important guarantee for ensuring the effectiveness of training programs. Strengthening the construction of information security protection systems aligns with Yue Ziqi's (2021) proposal to ensure cybersecurity and enabling elderly users to access the internet with peace of mind and convenience is a key goal for building an age-friendly digital environment. This concept is highly aligned with China's national-level initiatives to formulate and improve cybersecurity laws and regulations, effectively promoting the coordinated development of informatization and information security protection, and laying a solid foundation for the elderly to integrate into digital life. The research findings align with Yue Xiaoshuang's (2023) advocacy for enhancing elderly populations' immunity and resilience against misinformation, guiding seniors to accurately discern rumors. Improve the information ethics and legal literacy of the elderly group, and extensively disseminate the norms of information ethics as well as knowledge of relevant laws and regulations among elderly people. Help them establish a correct view of information, and guide them to focus on acquiring, distinguishing and sharing true, reliable and valuable information in daily life, avoiding the spread of false or harmful content. Verified through practice, the promotion and implementation of these strategies across the province have demonstrated high feasibility and adaptability, effectively meeting the practical needs of the elderly group for improving information literacy in the information age.

Phase 3: Results of evaluating the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

The results of evaluating the feasibility and adaptability of the developed strategies for promoting sustainable development information literacy among the elderly in Xi'an city revealed that both the feasibility and adaptability were rated at highest levels.

This evaluation underscores that the strategies were carefully formulated based on academic processes and systematically assessed by experts to ensure their relevance and practicality. The evaluation process was an essential step in ensuring the effectiveness of the strategies, as it provided a clear framework for monitoring their implementation and making necessary adjustments. In line with Wang Miao's (2022) views, strategic evaluations promote continuous improvement, adaptability, and resource optimization. This evaluation process not only supports the sustainable development of elderly people but also strengthens the community's ability to remain agile in an evolving educational landscape. Overall, evaluating the appropriateness and feasibility of these strategies is crucial for achieving sustainable development education among elderly people.

Recommendations

General Recommendation

In applying the strategies derived from this research, they can be implemented at multiple levels, including:

1) To the elderly: The core of improving the elderly's digital literacy lies in the fact that their attitudes, learning motivations, and practical operational behaviors will directly determine the learning outcomes and application levels of digital skills. The primary task is to help the elderly fully recognize and understand the importance and practicality of digital technology in modern life. First, the elderly should be encouraged to actively access and use various digital tools, and skillfully integrate newly acquired digital skills into daily scenarios such as daily necessities, clothing, food, housing, transportation, social interaction and entertainment, which can significantly enhance the convenience and sense of happiness in their lives. Second, the elderly should learn and master a series of digital security knowledge and practical skills, such as identifying online fraud, preventing telecom fraud, and protecting personal privacy information.

2) To community: To further meet the diverse needs of the elderly, communities should offer advanced courses and provide personalized tutoring

services for seniors with special requirements, helping them continuously improve their comprehensive technology application capabilities after mastering basic skills. It is crucial to establish a continuous education tracking mechanism and a regular effect evaluation system. This will help to timely understand the elderly's learning progress and skill mastery, ensuring that they can truly apply the learned knowledge and skills to daily life, such as online registration, mobile payment, and social communication, thus significantly improving their quality of digital life and facilitating their smooth integration into the rapidly developing digital society.

3) To Elderly Care Center: Senior care facilities regularly organize digital skills training lectures and practical workshops, and launch Silver-Haired Computer Classes. During these classes, staff members adopt a hands-on teaching approach to patiently guide the elderly to master the methods of e-book reading, online database searching, and the use of various digital resources. By organizing a variety of digital reading-themed activities and online information retrieval competitions, these initiatives can effectively stimulate the elderly's interest in learning and enhance their enthusiasm for actively acquiring information.

4) To government: On the one hand, the relevant government departments need to formulate targeted policies and measures, introduce subsidy policies for the purchase of digital devices, and effectively reduce the financial burden on the elderly when buying smart phones, tablet computers and other devices. Meanwhile, they should encourage and guide telecom operators and technology manufacturers to actively develop and promote age-friendly digital products—such as simplifying the operation interface, enlarging the font size and volume, and adding voice assistance functions—to make them easier for the elderly to learn and use. On the other hand, the government should further strengthen the construction of digital infrastructure and strive to achieve full coverage of network signals as well as the convenience and inclusiveness of network services. By advancing the "Internet Plus Elderly Care" action plan, we can help build an intelligent elderly care service system, enabling the elderly to conveniently enjoy smart elderly care services such as online medical consultation, remote care, and community service reservations,

while gradually improving their own digital skills and literacy in the process of practical use.

Future Researches

1) Strengthen exchanges and cooperation with international scholars to jointly study the international comparison and experience of information literacy among the elderly. This study focuses on the information literacy of the elderly in Xi'an city. The information literacy of the elderly is a global topic. To find the best practices in the world, and to provide experience and inspiration for the comprehensive participation and integration of the elderly in the information society.

2) Guide older people to actively participate in the digital society and provide effective education and training measures. With the continuous development of senior education and the deepening of digital literacy awareness, future research needs to further improve and update the existing digital literacy framework. This means paying attention to emerging digital technologies, educational models and learning environments, and integrating them into the cultivation of digital literacy. At the same time, it also provides a broader field and opportunities for in-depth exploration for related research, promoting the development and innovation of digital literacy education.

3) To effectively stimulate and enhance the elderly's sensitivity and attention to information, thereby enabling them to recognize and appreciate the crucial role that information plays in modern society. This involves not only increasing their awareness but also encouraging active engagement with various sources of information, fostering a deeper understanding of how access to timely and relevant information can significantly impact their daily lives, decision-making processes, and overall well-being in an increasingly digital and interconnected world. Relying on community colleges, online platforms, and senior universities, we will establish an inclusive and lightweight mechanism for continuing education on information literacy.

In conclusion, future research on digital inclusion for the elderly requires continuous refinement. It must identify new research frontiers with substantial

academic value while exploring sustainable development goals 4 and 10, particularly lifelong learning initiatives to enhance digital literacy. This approach aims to fundamentally address information literacy challenges faced by vulnerable groups like seniors, ultimately achieving the vision of universal digital access.

Appendices

Appendix A

List of Specialists and Letters of Specialists Invitation for IOC Verification

List of Specialists Invitation for IOC Verification

NO.	Position
1	Assistant.Prof. Dr of Bansomdejchaopraya Rajabhat University
2	Assistant.Prof. Dr. of Bansomdejchaopraya Rajabhat University
3	Professor of Xi'an Jiaotong University
4	Professor of Shaanxi Normal University
5	Professor of Xi'an International Studies University

Ref.No.MHESI 0643.14/ว.15

Bansomdejchaopraya Rajabhat
University 1061 Soi Itsarapap 15,
Itsarapap Road, Hiranruchi,
Thonburi, Bangkok, Thailand 10600

10th February, 2025

Subject Invitation to validate research instrument

Dear Assistant. Prof. Dr. Narongwat Mingmit

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

1.Assistant Professor Dr.Areeya Juichamlong	Major Advisor
2.Assistant Professor Dr.Sunate Thaveethavornsawat	Co-advisor
3.Assistant Professor Dr.Phisanu.Bangkheow	Co-advisor

The thesis advisory committee and the student have considered that you are an expert in this field.Your recommendations would be useful for further improvement of this research instrument.

With your expertise, we would like to ask your permission to validate the attached research instrument. In this regard, we would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Yours faithfully

(Assistant Professor Dr.Tanaput Chancharoen)
Vice Dean of Graduate School for Dean of Graduate School

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10th February, 2025

Subject Invitation to validate research instrument

Dear Assistant. Prof. Dr.Touchakorn Suwancharas

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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2.Assistant Professor Dr.Sunate Thaveethavornsawat	Co-advisor
3.Assistant Professor Dr.Phisanu.Bangkheow	Co-advisor

The thesis advisory committee and the student have considered that you are an expert in this field.Your recommendations would be useful for further improvement of this research instrument.

With your expertise, we would like to ask your permission to validate the attached research instrument. In this regard, we would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Yours faithfully

(Assistant Professor Dr.Tanaput Chancharoen)
Vice Dean of Graduate School for Dean of Graduate School

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Ref.No.MHESI 0643.14/ว.15

Bansomdejchaopraya Rajabhat
University 1061 Soi Itsarapap 15,
Itsarapap Road, Hiranruchi,
Thonburi, Bangkok, Thailand 10600

10th February, 2025

Subject Invitation to validate research instrument

Dear Wu Feng, Professor of Xi'an Jiaotong University

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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10th February, 2025

Subject Invitation to validate research instrument

Dear Liu Mengzhi, Professor of Shaanxi Normal University

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information literacy among the elderly in Xi'an City". The thesis committee is as follows:

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Thonburi, Bangkok, Thailand 10600

10th February, 2025

Subject Invitation to validate research instrument

Dear Huang Jianyou, Professor of Xi'an International Studies University

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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Appendix B

Official Letter

List of Invitation Interview Experts

NO.	Professional title & Position
1	Professional title:Professor Position:Political Science and Law Data Institute
2	Professional title:Professor Position:China Internet Network Information Center
3	Professional title:Professor Position:Information Technology Center
4	Professional title:Professor Position:Nankai University
5	Professional title:Professor Position:Renmin University of China
6	Professional title:Professor Position:Xi’an Association on Aging Information
7	Professional title:Professor Position:China Research Center on Aging
8	Professional title:Professor Position:Xi'an Elderly Care Service Center
9	Professional title:Professor Position:Ministry of Industry and Information Technology
10	Professional title:Professor Position:Xi'an Cybersecurity Center

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Thonburi, Bangkok, Thailand 10600

10th February, 2025

Subject Invitation to join an interview as an expert

Dear Wang Limei, Professor of Director of the Data Rule of Law Research Center

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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10th February, 2025

Subject Invitation to join an interview as an expert

Dear Zhang Xiao, Professor of Deputy Director of the China Internet Network Information Center

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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Itsarapap Road, Hiranruchi,
Thonburi, Bangkok, Thailand 10600

10th February, 2025

Subject Invitation to join an interview as an expert

Dear Wei Ran, Professor of Chief Engineer of the Data Research Center

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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Thonburi, Bangkok, Thailand 10600

10th February, 2025

Subject Invitation to join an interview as an expert

Dear Yuan Xin, Professor of Director of the Strategic Research Center for Aging Society Governance

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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University 1061 Soi Itsarapap 15,
Itsarapap Road, Hiranruchi,
Thonburi, Bangkok, Thailand 10600

10th February, 2025

Subject Invitation to join an interview as an expert

Dear Zhai Zhenwu, Professor of Director of the Center for Population and Development Studies at Renmin University of China

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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10th February, 2025

Subject Invitation to join an interview as an expert

Dear Wang Shusheng, Professor of President of Xi'an Association on Aging Information

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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10th February, 2025

Subject Invitation to join an interview as an expert

Dear Li Jing, Professor of Director of the Institute for Aging Society and Culture

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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10th February, 2025

Subject Invitation to join an interview as an expert

Dear Zhang Ming, Professor of Director of Xi'an Elderly Care Service Center

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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10th February, 2025

Subject Invitation to join an interview as an expert

Dear Zhao Zhiguo, Professor of Director of the Information Bureau, Ministry of Industry and Information Technology

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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Thonburi, Bangkok, Thailand 10600

10th February, 2025

Subject Invitation to join an interview as an expert

Dear Li Xiangyang, Professor of Director of Xi'an Cybersecurity Center

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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List of Specialists Invitation for Strategies Evaluation

The following persons were invited as evaluation experts to evaluate the feasibility and adaptability of promote sustainable development of the information literacy among the elderly in Xi'an city.

NO.	Name	Position
1	Cao Li	Professor of Xi 'an elderly University
2	Chen Xue	Professor of Xi 'an Beilin Community Nursing Home
3	Zhang Mei	Professor of Xi 'an Lianhu Community Nursing Home
4	Li Wei	Professor of Xi 'an Yanta Community Nursing Home
5	Chen Mi	Professor of Xi 'an Baqiao Community Nursing Home
6	Zhao Li	Professor of Xi 'an Weiyang Community Nursing Home
7	Guo Ke	Professor of Shaanxi Provincial Elderly Care Center
8	Wang Zixuan	Professor of Hui Cheng pension institution

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Thonburi, Bangkok, Thailand 10600

10th February, 2025

Subject Invitation to participate in the strategic assessment as an expert

Dear Cao Li, Professor of Xi 'an elderly University

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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10th February, 2025

Subject Invitation to participate in the strategic assessment as an expert

Dear Chen Xue, Professor of Xi 'an Beilin Community Nursing Home

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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10th February, 2025

Subject Invitation to participate in the strategic assessment as an expert

Dear Zhang Mei, Professor of Xi 'an Lianhu Community Nursing Home

Regarding Mrs. Hui Shan with student code 6573139012, a doctoral student majoring in Sustainable Development Education Management at Bansomdejchaopraya Rajabhat University. The thesis is entitled "Development of srategy to promote sustainable information liteacy among the elderly in Xi'an City". The thesis committee is as follows:

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10th February, 2025

Subject Invitation to participate in the strategic assessment as an expert

Dear Li Wei, Professor of Xi 'an Lianhu Community Nursing Home

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Subject Invitation to participate in the strategic assessment as an expert

Dear Chen Mi, Professor of Xi 'an Baqiao Community Nursing Home

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Subject Invitation to participate in the strategic assessment as an expert

Dear Zhao Li, Professor of Xi 'an Welyang Community Nursing Home

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Subject Invitation to participate in the strategic assessment as an expert

Dear Guo Ke, Professor of Shaanxi Provincial Elderly Care Center

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Subject Invitation to participate in the strategic assessment as an expert

Dear Wang Zixuan, Professor of Hui Cheng pension institution

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The thesis advisory committee and the student have considered that you are an expert in this field. Therefore, Graduate School would like to invite you to interview to provide the student with suggestions for her research.

Yours faithfully

(Assistant Professor Dr.Tanaput Chancharoen)
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Appendix C

Research Instrument

Questionnaire: the current situation of development of strategy to promote sustainable information literacy among the elderly in Xi'an city

Description:

1. This questionnaire investigates the current situation of sustainable development information literacy among the elderly in Xi'an city. Its purpose is to examine the primary manifestations of sustainable development information literacy among the elderly in Xi'an city.

2. The survey questionnaire on the current situation of sustainable development information literacy among the elderly in Xi'an city divided into two sections. The first section collects personal information, while the second section investigates the primary manifestations of sustainable development information literacy among the elderly in Xi'an city, comprising 32 questions.

3. Please click √ on the column that represents your opinion on the current situation of sustainable development information literacy among the elderly in Xi'an city.

Thank you

Mrs. Hui Shan
A doctoral student in Educational Management for Sustainable Development
Bansomdejchaopraya Rajabhat University

Part 1: Personal Information of respondents

1. Gender: ☐ Male ☐ Female

2. Age:

☐ 60 -70years old ☐71-80 years old ☐ 81-90 years old ☐ over 90 years old

3. Educational background:

☐ Primary school below ☐ Primary school ☐Junior middle school

☐ Senior middle school ☐ Bachelor degree ☐ Graduate degree

4. Health condition: ☐Healthy ☐Unhealthy

5. Monthly income:

☐<3,000RMB ☐3,001-5,000RMB ☐5,001-7,000RMB ☐>7,000RMB

6. Type of work prior to retirement:

☐ Manager ☐Worker ☐ Farmer ☐ Salesperson☐ Teaching staff

☐Medical staff ☐ Governmental staff ☐ Out of work

Part 2: The current situation of sustainable development information literacy among the elderly in Xi'an city

5 = Always, it expresses that the level of sustainable professional competence among the elderly was at the highest level

4= Often, it expresses that the level of sustainable professional competence among the elderly was at a high level

3 =Sometimes, it expresses that the level of sustainable professional competence among the elderly was at a middle level

2 = Rarely, it expresses that the level of sustainable professional competence among university lecturers was at a low level

1 = Never, it expresses that the level of sustainable professional competence among university lecturers was at the lowest level

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Current situations				
		5	4	3	2	1
The current situation of information awareness						
1	The frequency of using a computer or a mobile phone					
2	Think that learning information technology will be very helpful to life					
3	To improve information awareness through learning methods such as lectures / training					
4	To encounter difficulties or problems in life, want to seek solutions through the Internet					
5	Follow the latest news updates on the Internet					
6	Has a good awareness of information needs and feedback when conducting information activities.					
7	After information literacy training, your sensitivity to information has improved.					
8	Will actively accept and learn information that is beneficial to personal development.					

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Current situations				
		5	4	3	2	1
The current situation of information knowledge						
1	Engage in regular study to update information knowledge					
2	Willing to participate in information literacy teaching courses or activities					
3	Understand information related laws and regulations and ethical knowledge, such as intellectual property, privacy, copyright					
4	Understand information related information crime, information pollution and other information security knowledge					
5	Understand the current development process and trends of information literacy.					
6	Utilize online resources to enhance information knowledge					
7	Participate in related online information knowledge competitions.					
8	Periodically assess one's level of information knowledge					

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Current situations				
		5	4	3	2	1
The current situation of information competence						
1	Use mobile phone or computer device for online shopping					
2	Retrieve, obtain, and filter out a large amount of information using devices such as mobile phones or computers.					
3	When reading information, pay attention to identify the usefulness and credibility of information					
4	Use the Internet for information exchange and sharing activities					
5	Edit text, audio, video, pictures and so on					
6	Able to accurately filter out target information from a large amount of retrieved information.					
7	Able to install and download internet software					
8	Conduct periodic evaluations of one's information competence					

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Current situations				
		5	4	3	2	1
The current situation of information ethics						
1	Ability to understand digital copyright and disseminate information legally and responsibly					
2	Know that there are multiple risks in a digital environment					
3	Capability to protect digital devices by installing and activating protection software such as firewalls					
4	Capable of ensuring the protection of personal and others' privacy information in the process of information utilization and production.					
5	Ability to identify dangerous websites and Internet fraud in the digital environment					
6	Report and stop the dissemination of harmful and false information to others.					
7	The community should strengthen the emphasis on information ethics education.					
8	Strengthening information law education helps improve individual legal literacy.					

Recommendation

.....

.....

.....

Thank you for your kind cooperation in completing the questionnaire!

Researcher

Mrs. Hui Shan

Interview: Development of strategy to promote sustainable information literacy among the elderly in Xi'an city

Description:

1. This interview form is about how to formulate sustainable development strategies for information literacy among the elderly in Xi'an city.The purpose of this study is to formulate sustainable development strategies for information literacy among the elderly in Xi'an city and to evaluate the sustainable development strategies for information literacy among the elderly in Xi'an city.

2. This interview form is for expert review. It is divided into two parts.

3. Your comments on the interview form will help develop sustainable development strategies to promote the sustainable development of information literacy among the elderly in Xi'an city. Answering this questionnaire will not affect you personally. The data provided will be an overview and the researcher aims to use the data for research purposes only.

Thank you for your support.

Mrs. Hui Shan
A doctoral student in Educational Management for Sustainable Development
Bansomdejchaopraya Rajabhat University

Part 1: Personal Information

Interviewer.....Interview Date.....

Interview Time.....Interviewee.....

Gender.....Age.....

Education background.....Position.....

Work place.....

Part 2: The current situation of sustainable development information literacy among the elderly in Xi'an city.

Instruction: Please provide your opinion on the following statement

1. What is the current situation of sustainable development information awareness among the elderly in Xi'an city? How can the sustainable development the elderly's information awareness be promoted?

2. What is the current situation of sustainable development information knowledge among the elderly in Xi'an city? How can the sustainable development the elderly's information knowledge be promoted?

3. What is the current situation of sustainable development information competence among the elderly in Xi'an city? How can the sustainable development the elderly's information competence be promoted?

4. What is the current situation of sustainable development information ethics among the elderly in Xi'an city? How can the sustainable development the elderly's information ethics be promoted?

Evaluation Form for Validity

Validity Evaluation Form for the Current Situation of the Sustainable Development of information literacy among the elderly in Xi'an city

Research Title: Development of strategy to promote sustainable information literacy among the elderly in Xi'an city

Research Objectives:

1. To study the current situation of information literacy among the elderly in Xi'an city.

2. To develop strategies for information literacy among the elderly in Xi'an city.

3. To evaluate the feasibility and adaptability of strategies to improve information literacy among the elderly in Xi'an city.

Assessor _____ **Workplace** _____

Position _____

Directions:

When using the questionnaire, please consider the consistency of the questionnaire about whether each of the current situation of information literacy of the elderly in Xi'an. After considering it, please check in the corresponding box. Use the following criteria for consideration. Rating is+1.There is an opinion that "Corresponds to definition." Rating is 0. There is an opinion that "Not sure it corresponds to definition." Rating is -1. There is an opinion that "Inconsistent with definition."

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Evaluation result		
		-1	0	1
	information awareness			
1	The frequency of using a computer or a mobile phone			
2	Think that learning information technology will be very helpful to life			
3	To improve information awareness through learning methods such as lectures / training			
4	To encounter difficulties or problems in life, want to seek solutions through the Internet			
5	Follow the latest news updates on the Internet			
6	Has a good awareness of information needs and feedback when conducting information activities.			
7	After information literacy training, your sensitivity to information has improved.			
8	Will actively accept and learn information that is beneficial to personal development.			

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Evaluation result		
		-1	0	1
	information knowledge			
1	Engage in regular study to update information knowledge			
2	Willing to participate in information literacy teaching courses or activities			
3	Understand information related laws and regulations and ethical knowledge, such as intellectual property, privacy, copyright			
4	Understand information related information crime, information pollution and other information security knowledge			
5	Understand the current development process and trends of information literacy.			
6	Utilize online resources to enhance information knowledge			
7	Participate in related online information knowledge competitions.			
8	Periodically assess one's level of information knowledge			

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Evaluation result		
		-1	0	1
	information competence			
1	Use mobile phone or computer device for online shopping			
2	Retrieve, obtain, and filter out a large amount of information using devices such as mobile phones or computers.			
3	When reading information, pay attention to identify the usefulness and credibility of information			
4	Use the Internet for information exchange and sharing activities			
5	Edit text, audio, video, pictures and so on			
6	Able to accurately filter out target information from a large amount of retrieved information.			
7	Able to install and download internet software			
8	Conduct periodic evaluations of one's information competence			

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Evaluation result		
		-1	0	1
	information ethics			
1	Ability to understand digital copyright and disseminate information legally and responsibly			
2	Know that there are multiple risks in a digital environment			
3	Capability to protect digital devices by installing and activating protection software such as firewalls			
4	Capable of ensuring the protection of personal and others' privacy information in the process of information utilization and production.			
5	Ability to identify dangerous websites and Internet fraud in the digital environment			
6	Report and stop the dissemination of harmful and false information to others.			
7	The community should strengthen the emphasis on information ethics education.			
8	Strengthening information law education helps improve individual legal literacy.			

Appendix D

The Results of the Quality Analysis of Research Instruments

The Index of Objective Congruence (IOC)

Development of strategy to promote sustainable information literacy among the elderly in Xi'an city

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Experts					IOC	Conclusion
		1	2	3	4	5		
	The current situation of information awareness							
1	The frequency of using a computer or a mobile phone	1	1	1	1	1	1	consistent
2	Think that learning information technology will be very helpful to life	1	1	1	1	1	1	consistent
3	To improve information awareness through learning methods such as lectures / training	1	1	1	1	1	1	consistent
4	To encounter difficulties or problems in life,want to seek solutions through the Internet	1	1	1	1	1	1	consistent
5	Follow the latest news updates on the Internet	1	1	1	1	1	1	consistent
6	Has a good awareness of information needs and feedback when conducting information activities.	1	1	1	1	1	1	consistent
7	After information literacy training, your sensitivity to information has improved.	1	1	1	1	1	1	consistent
8	Will actively accept and learn information that is beneficial to personal development.	1	1	1	1	1	1	consistent

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Experts					IOC	Conclusion
		1	2	3	4	5		
	The current situation of information knowledge							
1	Engage in regular study to update information knowledge	1	1	1	1	1	1	consistent
2	Willing to participate in information literacy teaching courses or activities	1	1	1	1	1	1	consistent
3	Understand information related laws and regulations and ethical knowledge, such as intellectual property, privacy, copyright	1	1	1	1	1	1	consistent
4	Understand information related information crime, information pollution and other information security knowledge	1	1	1	1	1	1	consistent
5	Understand the current development process and trends of information literacy.	1	1	1	1	1	1	consistent
6	Utilize online resources to enhance information knowledge	1	1	1	1	1	1	consistent
7	Participate in related online information knowledge competitions.	1	1	1	1	1	1	consistent
8	Periodically assess one's level of information knowledge	1	1	1	1	1	1	consistent

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Experts					IOC	Conclusion
		1	2	3	4	5		
	The current situation of information competence							
1	Use mobile phone or computer device for online shopping	1	1	1	1	1	1	consistent
2	Retrieve, obtain, and filter out a large amount of information using devices such as mobile phones or computers.	1	1	1	1	1	1	consistent
3	When reading information, pay attention to identify the usefulness and credibility of information	1	1	1	1	1	1	consistent
4	Use the Internet for information exchange and sharing activities	1	1	1	1	1	1	consistent
5	Edit text, audio, video, pictures and so on	1	1	1	1	1	1	consistent
6	Able to accurately filter out target information from a large amount of retrieved information.	1	1	1	1	1	1	consistent
7	Able to install and download internet software	1	1	1	1	1	1	consistent
8	Conduct periodic evaluations of one's information competence	1	1	1	1	1	1	consistent

NO	Development of strategy to promote sustainable information literacy among the elderly in Xi'an city	Experts					IOC	Conclusion
		1	2	3	4	5		
	The current situation of information ethics							
1	Ability to understand digital copyright and disseminate information legally and responsibly	1	1	1	1	1	1	consistent
2	Know that there are multiple risks in a digital environment	1	1	1	1	1	1	consistent
3	Capability to protect digital devices by installing and activating protection software such as firewalls	1	1	1	1	1	1	consistent
4	Capable of ensuring the protection of personal and others' privacy information in the process of information utilization and production.	1	1	1	1	1	1	consistent
5	Ability to identify dangerous websites and Internet fraud in the digital environment	1	1	1	1	1	1	consistent
6	Report and stop the dissemination of harmful and false information to others.	1	1	1	1	1	1	consistent
7	The community should strengthen the emphasis on information ethics education.	1	1	1	1	1	1	consistent
8	Strengthening information law education helps improve individual legal literacy.	1	1	1	1	1	1	consistent

The Record of Interview Results

Interviewee 1:

1. What is the current situation of sustainable development information awareness among the elderly in Xi'an city? How can the sustainable development the elderly's information awareness be promoted?

The elderly population lacks sufficient awareness of online information, failing to recognize the importance of learning information technology to solve daily life problems, and lacks the concept of "smart living." Their primary channels for obtaining information remain traditional media, with a deficiency in modern information thinking. They are unable to utilize the internet to assist their work and daily lives, resulting in an inability to practically experience the convenience brought by modern information development to people's everyday routines. Additionally, their learning initiative is weak, lacking the consciousness of lifelong learning, and they exhibit low willingness to improve their own information literacy. These findings clearly indicate that the elderly group has relatively weak information awareness and lacks the necessary sense of urgency regarding the digital divide they currently face, which further prevents them from fully integrating into the digital society.

To promote sustainable development information awareness of the elderly, several strategies can be implemented. **Strategy 1:** The government should assume the responsibility for top-level design and policy guidance, with a focus on improving both the hardware and software environments for the digital lives of the elderly. In terms of hardware environment safeguards, it is necessary to accelerate the construction of digital infrastructure that aligns with an aging society. For software environment safeguards, efforts should continue to promote the introduction of normative documents such as policies and regulations, guide the establishment of standards for internet accessibility and aging-friendly adaptations, strengthen supervision over the conduct of digital service providers, and rigorously combat

online violence and fraud that infringe upon the personal and property safety of the elderly. **Strategy 2:** Optimize and improve access channels for digital resources.

Accelerate the deployment of new infrastructure such as gigabit optical networks, 5G networks, and IPv6, continuously expand network coverage, enhance network quality, and improve the service capabilities of digital facilities and smart products. **Strategy 3:** Conduct targeted publicity campaigns on official platforms such as television, WeChat, and Douyin, tailored to the characteristics of the elderly. Enhance the recognition of digital products among the elderly population and attract more seniors to participate.

2. What is the current situation of sustainable development information knowledge among the elderly in Xi'an city ? How can the sustainable development the elderly's information knowledge be promoted?

Older adults have acquired certain foundational learning conditions in terms of media and digital knowledge and skills, but their digital knowledge and skills as well as basic information literacy remain relatively poor and require improvement. While they possess a deep foundation in information resource acquisition, there is still significant room for enhancement in their scientific knowledge reserves.

To improve the information literacy of older adults, the following strategies are recommended. **Strategy 1:** The government should establish knowledge-based courses covering fundamental aspects of smartphones, computers, and related technologies, including device power operations, button functions, basic software features, and essential computer operation skills. This will help elderly individuals correctly understand the conveniences brought by digital devices and alleviate their resistance toward digital technology. **Strategy 2:** Support various regions and industries in developing training programs, coordinating planning efforts, and designing differentiated training content. Encourage the provision of high-quality, free digital education resources and online learning services to the public. **Strategy 3:** Centered on the needs of digital life, work, learning, and innovation, leverage formats such as videos, animations, virtual reality, and live streaming to enhance and strengthen digital literacy and skills training resources.

2. What is the current situation of sustainable development information competence among the elderly in Xi'an city? How can the sustainable development the elderly's information competence be promoted?

The elderly have relatively low media exposure, and in today's digital era, their ability to create and innovate information is severely limited. Most elderly individuals express feeling willing but unable in this regard. In terms of information evaluation and discernment, there is a significant gap between the elderly's self-perception and their actual performance. While most believe they pay attention to information sources and possess some ability to discern information, they often struggle to accurately judge the authenticity of information in practice. Additionally, the majority of elderly individuals are generally not proficient in using digital devices to search for information and are heavily affected by information overload, making it difficult for them to properly filter target information.

To effectively enhance and sustain information competence among the elderly, a comprehensive and proactive approach is necessary.**Strategy 1:** Establish dedicated elderly assistance sections on television, radio, and public transit multimedia platforms to regularly broadcast and loop tutorials on the functions and usage methods of smart devices or APP applications. Printed promotional manuals can also be produced for easy retention and reference by senior citizens. **Strategy 2:** Offer practical courses covering IT operations and applications, including the use of smartphones, computers, and other devices to solve real-life problems or enhance quality of life. For instance, community centers could set up computer classrooms with courses on image processing, internet usage, blogging, and smartphone operation. **Strategy 3:** Optimize e-commerce platforms for greater ease of use, effectively lowering the barrier for elderly users. By switching to "Elderly Mode" or "Care Mode," features such as enlarged text, voice search, and photo-based product matching can be enabled, assisting seniors in online shopping with improved visual clarity, perception, and recognition.

4. What is the current situation of sustainable development information ethics among the elderly in Xi'an city? How can the sustainable development the elderly's information ethics be promoted?

The freedom of cyberspace results in a certain lack of protection for users' privacy and security. Elderly individuals with lower levels of information ethics and morality are prone to falling into various online traps, inadvertently or intentionally exposing personal or others' information, thereby providing opportunities for criminals. Most elderly people possess a relatively high awareness of personal information security but lack knowledge of information ethics and laws, with their personal information ethics and social responsibility development levels remaining relatively low, necessitating further guidance. The elderly are generally capable of respecting others' privacy, cautiously handling unfamiliar files online, and maintaining a correct attitude toward unverified rumors. However, objectively, they often lack sufficient ability to discern information resources. Implementing relevant strategies is crucial. **Strategy 1:** Strengthen moral demonstration and guidance, and deepen the construction of online integrity. All parties, including governments at all levels, research institutions, industry organizations, enterprises, and online communities, should take proactive measures to urge digital technology and product developers to adhere to professional ethics and standards. **Strategy 2:** Encourage relevant enterprises to establish positions for mobile interface design testers. The primary responsibility of mobile interface design testers is to evaluate the usability and accessibility of products through firsthand experience during the development and testing of mobile applications, providing feedback and improvement suggestions. By creating these positions, enterprises can gain a more comprehensive understanding of the needs of visually impaired users and enhance product usability. **Strategy 3:** The ethical care spirit of information literacy in an aging society should not only be reflected in the design philosophy of smart device R&D and application entities but also in fostering an atmosphere of ethical care throughout society.

Interviewee 2:

1. What is the current situation of sustainable development information awareness among the elderly in Xi'an city? How can the sustainable development the elderly's information awareness be promoted?

The information awareness among elderly people in Xi'an is weak, and their willingness to improve it is not strong enough. Smart information devices serve as a bridge for us to obtain information and utilize digital solutions to address daily life problems in today's society. As a representative product of smart information devices, mobile phones play a pivotal role in modern society and have become an indispensable part of people's lives. Due to their inherent physiological limitations, the elderly often only master basic operations, which restricts their frequency of using smart devices and prevents them from establishing close connections with the information-driven society.

Promoting sustainable information awareness of the elderly in Xi'an requires a comprehensive strategy. **Strategy 1:** Based on the actual situation of information literacy education in Xi'an City, establish competency standards for internet information literacy among China's elderly population. The government should introduce incentive measures to encourage active corporate participation in the digital service adaptation for aging populations, such as providing preferential policies like tax reductions and financial subsidies. **Strategy 2:** Formulate corresponding laws, regulations, and policy systems to provide more systematic safeguards for improving digital literacy and skills among the elderly. Additionally, categorize and consolidate laws and regulations related to elderly education to form a comprehensive legal implementation framework, thereby offering a more structured legal foundation for the development of elderly education. **Strategy 3:** Increase the supply of aging-friendly smart terminals and promote the adaptation of internet applications for the elderly. Accelerate the advancement of information accessibility initiatives, develop and promote digital assistive services for people with disabilities, and leverage digital technology to enhance convenience in their daily lives, employment, and education.

2. What is the current situation of sustainable development information knowledge among the elderly in Xi'an city? How can the sustainable development the elderly's information knowledge be promoted?

In the dimension of information knowledge, elderly individuals exhibit a preference for knowledge acquisition and retention, meaning the internal knowledge reserves within individuals (such as the two types of knowledge: scientific knowledge and cultural information) have not developed in a balanced manner. To a certain extent, this has led to the formation of an "information cocoon" in knowledge, resulting in a "disadvantaged" state in their digital media knowledge and scientific information reserves.

To enhance information knowledge of the elderly in Xi'an, several strategies should be implemented. **Strategy 1:** Construct an information literacy system around five themes: information creation as a process, information has value, research as inquiry, scholarship as conversation, and searching as strategic exploration. **Strategy 2:** Offer a series of courses including computer network technology, fundamentals of information science, development and utilization of information resources, and literature retrieval and utilization. Encourage elderly individuals to engage in social interactions by establishing digital skills learning groups for seniors, organizing regular collective learning and discussion sessions, and facilitating mutual sharing of insights and experiences. **Strategy 3:** Leverage online studios to host internet knowledge competitions aimed at improving seniors' awareness of online knowledge, broadening their knowledge base, enhancing their ability to resolve network-related issues, and stimulating their interest in learning about digital technologies.

3. What is the current situation of sustainable development information competence among the elderly in Xi'an city? How can the sustainable development the elderly's information competence be promoted?

Older adults generally have poor information search skills. Although they maintain a relatively positive attitude toward learning digital information technologies, their motivation for information seeking is weak, and their ability to use digital

information technologies remains limited. Many elderly individuals report that they do not actively seek information on a regular basis, instead relying on neighbors, children, or others to relay information to them.

To enhance and sustain information competence, a comprehensive strategy is necessary. **Strategy 1:** Establish dedicated consultation and service hotlines to provide timely assistance and support for elderly individuals encountering issues while using technological products. **Strategy 2:** Offer convenient and secure technological products and services tailored for the elderly, such as optimizing user safety settings on interfaces, implementing age-friendly adjustments, and reducing the cost for elderly users to adopt information security practices. **Strategy 3:** Launch experiential courses, such as those offered by Beilin Community, which provides specialized sessions for the elderly covering Google search and browsing, basic operations of Scratch programming language, and fundamental smartphone usage.

4. What is the current situation of sustainable development information ethics among the elderly in Xi'an city? How can the sustainable development the elderly's information ethics be promoted?

In the information utilization phase, elderly groups are at significantly higher risk of being exploited by malicious actors and big data holders due to their lack of awareness and understanding of security risks related to data usage. This makes them prime targets for fraud, which manifests through harassment calls, spam messages, malicious software redirects, viruses, fraudulent websites, and scam calls, among other forms of harm.

To effectively promote sustainable information ethics, a well-rounded and proactive approach is essential. **Strategy 1:** Establish and improve the personal information protection management system, clarifying responsibilities and requirements for the collection, use, storage, helping them achieve internet freedom and enhancing their security awareness. **Strategy 2:** Conduct systematic cybersecurity and privacy protection education through community education institutions, senior

universities, and other channels to help the elderly master basic digital media information security knowledge, such as setting application permissions, downloading security protection software, and clearing online traces. **Strategy 3:** Communities, public security bureaus, and other departments should regularly organize smart device usage assistance activities for elderly community members.

Interviewee 3:

1. What is the current situation of sustainable development information awareness among the elderly in Xi'an city? How can the sustainable development the elderly's information awareness be promoted?

Elderly people in Xi'an possess a certain level of information value awareness, recognizing the important role information plays in daily life. To some extent, they maintain a positive learning attitude by proactively acquiring information technology skills and accessing online information to improve their quality of life.

However, they exhibit slight deficiencies in terms of information needs and awareness of information feedback. Their motivation for information needs primarily revolves around daily living and social interactions, presenting a passive tendency, while lacking self-improvement demand consciousness.

To effectively promote information awareness of the elderly in Xi'an, a multifaceted approach is necessary. **Strategy 1:** All sectors of society should reach a consensus to strengthen the promotion of internet skills, enabling the elderly to fully recognize the importance of these skills in modern society. For instance, engaging promotional methods such as short videos can be utilized to vividly demonstrate the wide-ranging applications of internet skills in daily life, thereby encouraging the elderly to embrace the internet as a fashionable trend. **Strategy 2:** Encourage elderly individuals to participate in social activities and stimulate their enthusiasm for learning online skills through intergenerational communication initiatives such as "intergenerational reading." **Strategy 3:** Develop online communities tailored for the elderly, covering areas such as health and wellness, self-cultivation, current affairs

and culture, entertainment and leisure, and service marketplaces. The design and operation of these online communities should fully consider the physical characteristics and cognitive habits of the elderly to simplify usability and encourage their active participation.

2. What is the current situation of sustainable development information knowledge among the elderly in Xi'an city? How can the sustainable development the elderly's information knowledge be promoted?

As an important component of information literacy, information knowledge serves as the foundation for the development of elderly individuals' information literacy capabilities. The specific challenges exhibited by elderly residents in Xi'an in the dimension of information knowledge include uneven development in information knowledge reserves and a certain degree of disconnection between knowledge and practice. Elderly individuals demonstrate relatively poor mastery of media and IT fundamentals as well as basic information concepts, while their overall level of scientific and cultural knowledge is relatively better. Moreover, a significant gap exists between their reserves of scientific knowledge and cultural knowledge. Most elderly individuals in Xi'an possess abundant cultural knowledge reserves but relatively insufficient scientific information knowledge reserves, reflecting the current state of uneven development in their information knowledge reserves.

To effectively enhance and sustain information knowledge of the elderly in Xi'an should adopt a multi-pronged approach. **Strategy 1:** Use technological products prudently, learn and master the basic operations of devices such as smartphones and computers, and avoid randomly clicking links or downloading attachments without proper understanding. Install and update security software to ensure device safety. **Strategy 2:** Enterprises should pay more attention to the needs of the elderly in software design, tailoring products according to their thought processes, behavioral habits, and physical capabilities. For instance, in terms of user experience, design simple and easy-to-use interfaces for the elderly to help them quickly grasp operational methods. Create a clean mode for the elderly, reduce

advertisements targeted at them, and add dialect voice recognition features to meet their diverse needs. **Strategy 3:** Enterprises should take on social responsibility, increase R&D investment, lower production costs, and actively promote the development of smart health and elderly care products, enabling the elderly to access affordable and cost-effective solutions.

3. What is the current situation of sustainable development information competence among the elderly in Xi'an city? How can the sustainable development the elderly's information competence be promoted?

Over half of the elderly population reported being unable to proficiently use electronic devices such as smartphones or tablets to search for information online. Nearly 60% or more even stated they were unfamiliar with common digital devices like computers and mobile phones, lacking proficiency in using various social media platforms and online communication tools. Furthermore, over 70% of elderly individuals believed they could not accurately filter target information from vast amounts of data. This demonstrates that most elderly people have poor acceptance and utilization capabilities regarding digital information technology, as well as weak information filtering abilities. The capacity to search and filter information, along with the ability to use information technology, serves as an intuitive reflection of elderly individuals' information literacy in the digital era and constitutes a crucial component of their overall information literacy. Weak performance in these areas will directly hinder the improvement of elderly individuals' quality of life in terms of informatization and impact their ability to keep pace with the development of the digital information age.

To effectively promote and sustain information competence of the elderly in Xi'an, a strategic and multifaceted approach is necessary. **Strategy 1:** Strengthen technical guidance for the elderly in digital media through relevant training programs, especially instructing them on how to use smartphones. For example, communities such as Yanta Community and Baqiao Community have organized "Smartphone Classes," where community staff or young volunteers disseminate relevant

knowledge to elderly groups. **Strategy 2:** Integrate and utilize educational resources such as community education institutions and vocational education centers, improve the construction of public service systems including cultural centers, libraries, and comprehensive cultural stations, and carry out digital skills training activities tailored to the needs of the elderly based on local conditions. For instance, establish learning experience bases and enhance educational services for sick and solitary elderly individuals. **Strategy 3:** Cultivate a group of "local mentors" proficient in online skills through various forms such as community activities, senior universities, and cultural salons. These "local mentors" act like the initial seeds of a chain reaction, playing a role in stimulating the learning motivation of the group.

4. What is the current situation of sustainable development information ethics among the elderly in Xi'an city? How can the sustainable development the elderly's information ethics be promoted?

The lack of a sound regulatory system necessitates review and refinement by professional and authoritative experts to ensure information remains undistorted during dissemination and achieves its intended purpose. The current information regulatory framework faces numerous challenges, including a shortage of authoritative experts, difficulties in collaboration among experts, and the widespread circulation of unverified information online, which can even generate significant impact. The information security and ethical literacy of the elderly population require improvement. Affected by the digital divide and degenerative changes in their own capabilities, older adults not only encounter substantial difficulties in learning to use smart devices but also lag behind in acquiring health knowledge, searching for health information, and discerning its validity. This further increases their vulnerability to health-related misinformation.

To enhance and sustain information ethics of the elderly in Xi'an , a strategic approach is necessary. **Strategy 1:** Further improve relevant laws and regulations such as the "Personal Information Protection Law of the People's Republic of China," clarify the joint liability of information controllers, and introduce

the principle of no-fault liability to address the allocation of burden of proof. Simultaneously, strengthen the crackdown on the leakage of elderly individuals' personal information to ensure legal accountability. **Strategy 2:** Adhere to governing the internet, operating online platforms, and using the internet in accordance with the law. Strengthen the governance of cyberspace ecology and standardize the order of online information dissemination. Actively promote legal education on the internet, enhance netizens' legal awareness and rule-of-law thinking, strengthen self-discipline among internet users, and guide the public to consciously resist harmful online information and illegal activities. **Strategy 3:** Establish and improve norms for online civility, popularize the concept of civilized internet usage, and develop a positive and healthy online culture. Further refine the combined mechanism of government, family, and society for educating the elderly on internet literacy, continuously improve their digital competency, guide healthy and rational use of digital products and services, and promote a societal consensus on civilized internet governance, usage, engagement, and development.

Interviewee 4:

1. What is the current situation of sustainable development information awareness among the elderly in Xi'an city? How can the sustainable development the elderly's information awareness be promoted?

Faced with new technologies, the elderly are filled with inner contradictions. On one hand, they wish to access more information and convenience through the internet, but on the other hand, they fear their inability to use these tools and the risk of being deceived. They worry about falling behind the times and hesitate to communicate with others online. Consequently, their interest in improving information literacy diminishes, leading to a lack of information knowledge, weak information awareness, and low levels of information utilization, among other issues.

Promoting sustainable sustainable development information awareness of the elderly in Xi'an requires a comprehensive strategy. **Strategy 1:** Promote the

popularization of elderly-friendly products. For example, focus on advancing information accessibility initiatives, launch more digital products and application software specifically designed for the elderly, enabling them to integrate more fully and conveniently into digital life. **Strategy 2:** Utilize traditional media such as television, radio, and newspapers, as well as community bulletin boards, to stay informed about news, knowledge, and policies related to digital technology. Strategy 3: Participate in digital technology lectures and training activities organized by communities to learn about the development and applications of digital technology.

2. What is the current situation of sustainable development information knowledge among the elderly in Xi'an city? How can the sustainable development the elderly's information knowledge be promoted?

On one hand, some elderly individuals lack access to digital information devices and have limited understanding or ability to use digital tools and communication methods, preventing them from benefiting from the convenience and opportunities brought by information technology. On the other hand, some elderly people have relatively low levels of basic information literacy and scientific knowledge, lacking the ability to correctly comprehend and apply information. This imbalance in knowledge reserves leads to a disconnect between knowledge and practice. Even though some elderly individuals possess abundant information knowledge, the absence of practical opportunities and platforms prevents them from translating what they have learned into concrete actions and practices, thereby hindering their ability to fully utilize information resources to enhance their personal development and quality of life.

To effectively enhance and sustain information knowledge should employ a multifaceted strategy. **Strategy 1:** For example, launch a "Family Account" feature for elderly users on Douyin, allowing their children to monitor parents' usage patterns and provide necessary attention and reminders. **Strategy 2:** The development of digital resources should first conduct learning needs analysis among elderly learners, taking their interests as the starting point to stimulate enthusiasm for learning and

encourage proactive engagement with new knowledge. **Strategy 3:** This includes leisure and entertainment programs, hobby-based courses, cultural cultivation, health self-care, dietary culture classes, as well as "learning-wellness integration" and "travel-wellness integration" initiatives like thematic study tours. These serve as second classroom activities that promote social engagement, community service, and participation in societal activities.

3. What is the current situation of sustainable development information competence among the elderly in Xi'an city? How can the sustainable development the elderly's information competence be promoted?

There is confusion in identifying information content, and the accuracy of information evaluation is low. Most elderly individuals lack the habit of discerning the usefulness and credibility of information when reading it. They generally exhibit a deficiency in awareness and habits of proper information evaluation and analysis. Moreover, they demonstrate relatively weak abilities in distinguishing the authenticity of information, with over half of the elderly population unable to identify common false information encountered in daily life.

To effectively promote and sustain information competence, a comprehensive approach is required. **Strategy 1:** The widespread adoption of emerging channels such as live-streaming e-commerce, with features like real-time interaction and diverse formats, has bridged the gap with the elderly population. It not only provides emotional value but also achieves differentiation in products, content, and scenarios, delivering a more suitable online shopping experience. **Strategy 2:** Establish a national-level digital skills lifelong education service platform, designing course systems and supporting learning resources and services that comply with relevant standards. **Strategy 3:** Integrate the strengths of senior universities and higher education institutions to standardize training for elderly education volunteers, achieving integrated development of vocational and continuing education. Communities, elderly care institutions, and nonprofit organizations should promote technical training activities that combine education with elderly care, providing social

services such as lectures, workshops, skills training, and home-based teaching for the elderly. Fully utilize distance education and open education course resources.

4. What is the current situation of sustainable development information ethics among the elderly in Xi'an city? How can the sustainable development the elderly's information ethics be promoted?

Among elderly individuals who frequently use digital smart devices to access online information, as a demographic group that came into contact with internet information relatively late, their lack of information discernment often renders them unable to distinguish truth from falsehood when exposed to the vast and complex array of online content. They struggle to differentiate between valid information and misinformation. Given the current inadequacies in online regulation, a significant amount of pseudoscience and rumors flood the digital landscape visible to the elderly. This population, lacking the ability to discern such information, often becomes the primary victims of online misinformation. For the elderly themselves, internal barriers and insufficient digital literacy can foster a heightened sense of caution toward the online world, which may even evolve into fear and resistance toward integrating into the digital information society. This psychological barrier hinders the development and enhancement of their information literacy skills.

To effectively promote sustainable information ethics, a strategic and comprehensive approach is essential. **Strategy 1:** Enhance the public's ability to identify and protect against illegal activities such as online rumors, telecom fraud, and information theft by organizing cybersecurity lectures and training sessions, producing and distributing promotional materials, and conducting online video campaigns. **Strategy 2:** Strengthen the promotion and awareness of laws and regulations related to personal information and privacy protection to elevate public consciousness in this regard.

Interviewee 5:

1. What is the current situation of sustainable development information awareness among the elderly in Xi'an city? How can the sustainable development the elderly's information awareness be promoted?

Older adults experience functional decline, primarily manifested in sensory and perceptual aspects. Their visual acuity decreases, visual field narrows, and they become less adaptable to bright light. Hearing weakens, sensory sensitivity declines, and finger and joint flexibility diminishes, all of which hinder keyboard and mouse operation. At the cognitive level, memory deteriorates, and they react more slowly and achieve less success when learning new programs compared to younger individuals. These barriers, to some extent, undermine older adults' confidence in learning to use the internet.

To effectively promote and sustain information awareness, several strategic actions are necessary. **Strategy 1:** Enhance the ability to discern information authenticity by reading relevant promotional materials and participating in cybersecurity training courses. **Strategy 2:** Internet platforms should actively promote collaboration with professional institutions to develop elderly education content on digital skills, anti-fraud awareness, and other topics. By leveraging resources such as Douyin e-commerce, they can motivate middle-aged and elderly individuals to learn through initiatives like "earning points through learning and exchanging points for shopping discounts." **Strategy 3:** It is recommended that government departments, senior universities, communities, and families work together to actively conduct digital skills training for the elderly. This will further increase smartphone usage rates, improve proficiency in software operations, and help bridge the "digital divide" or eliminate "digital blind spots" among older adults.

2. What is the current situation of sustainable development information knowledge among the elderly in Xi'an city? How can the sustainable development the elderly's information knowledge be promoted?

The elderly population generally lacks relative information literacy, with their understanding of the operational principles behind basic information technology products in daily life remaining at a superficial level. They also have incomplete knowledge of commonly used intelligent software and limited familiarity with mainstream internet culture.

To effectively enhance and sustain information knowledge the elderly should adopt a strategic approach. **Strategy 1:** Establish dedicated elderly assistance sections on television, radio, and public transit multimedia platforms to regularly broadcast and loop tutorials on the functions and usage methods of smart devices or APP applications. Printed promotional manuals can also be produced for easy retention and reference by senior citizens. **Strategy 2:** Offer courses such as smartphone usage classes, mobile short video production, and zero-basic PS tutorials. **Strategy 3:** Encourage internet websites and mobile APP companies to develop elderly-friendly versions, care editions, or barrier-free interfaces for their pages and applications. This includes eliminating the adverse effects of forced advertisements and misleading prompts, while prioritizing products with large fonts, enlarged icons, and simplified operations. Provide specialized "senior access" services featuring one-click functionality, text prompts, and other accessibility features.

3. What is the current situation of sustainable development information competence among the elderly in Xi'an city? How can the sustainable development the elderly's information competence be promoted?

Due to the particularities of historical development, the elderly generally have a low level of education, with most struggling to attain basic literacy and reading skills. This creates obstacles in their ability to comprehend and process information, subsequently impairing their information utilization capabilities. Additionally, it restricts their ability to operate computers, the internet, and other information media. Such barriers diminish their motivation to learn how to use smartphones, forcing them to rely on limited channels for information access and resulting in a generally low level of information literacy.

To effectively promote and sustain information competence, a strategic and proactive approach is essential. **Strategy 1:** The platform design should fully consider the characteristics and learning needs of the elderly, developing an online mutual assistance learning platform that is simple and easy to learn with a clean interface for the elderly.

This will enhance the interactive functions of online learning, expand the appeal and influence of digital learning, and reduce the sense of distance and loneliness brought by digital learning. **Strategy 2:** Through multi-dimensional service platforms such as online platforms, mobile terminals, radio and television, and printed materials, create an atmosphere of humanistic care to reduce the digital learning barriers for elderly learners. This not only promotes the transformation of learning methods for elderly learners but also helps enhance their learning confidence. **Strategy 3:** Develop hardware products and software applications suitable for the elderly and people with disabilities, promote the aging-friendly and barrier-free transformation of internet websites and applications, and implement the Silver Age Science Popularization Action.

4. What is the current situation of sustainable development information ethics among the elderly in Xi'an city? How can the sustainable development the elderly's information ethics be promoted?

Some elderly people have limited understanding of information ethics and weak awareness of information laws, often unaware of whether their actions violate information ethics or regulations. Their ability to discern information is relatively low, which may lead them to publish or disseminate online remarks that are inconsistent with social morality, norms, or civilization. Additionally, the internet is flooded with false information, advertisements, rumors, and sensationalized content, as many unscrupulous media outlets take statements out of context to attract attention and fabricate fake news. Some elderly individuals lack basic judgment in evaluating information, blindly forwarding and spreading such content, infringing on others' privacy, and contributing to the emergence of negative phenomena.

To effectively promote sustainable information ethics, a structured and proactive approach is essential. **Strategy 1:** Improve policy support and funding guarantee mechanisms, adopt multiple measures to increase investment in weak links, accelerate the formulation and revision of regulations and systems related to mobile payments, prevention of online fraud, and accessibility modifications, and establish a number of digital literacy and skills enhancement training bases. **Strategy 2:** Establish relevant laws, regulations, industry standards, and access guidelines for application design, which will provide a reliable framework for the healthy development of technology, help ensure the development and application of intelligent technology, and thus effectively maintain the security of technology. **Strategy 3:** Highlight the necessity of government regulation and guidance. "Purify the online environment, especially targeting issues of concern to the elderly such as online fraud. The government needs to formulate relevant regulatory standards and provide necessary guidance and supervision to enterprises."

Interviewee 6:

1. What is the current situation of sustainable development information awareness among the elderly in Xi'an city? How can the sustainable development the elderly's information awareness be promoted?

The elderly are able to recognize the importance of information, accurately express their attitudes toward it, and believe that mastering more useful information can help them live better lives. This awareness among these seniors is inseparable from the community's publicity efforts. Community workers periodically visit households or organize promotional activities to educate the elderly on the significance of information and raise awareness about preventing telecom fraud.

To effectively promote and sustain information awareness, a multifaceted strategy is essential. **Strategy 1:** Internet platforms need to start from the actual concerns of middle-aged and elderly people, continuously optimize product functions and platform content, emphasize "catering to their preferences" to achieve

"deep understanding and resonance." At the same time, it is necessary to respect the diverse needs of the public, and various social services should adopt a combination of online and offline methods to accommodate groups who reject digital life. **Strategy 2:** Enhance the enthusiasm and autonomy of elderly people in participating in community education activities. Social media and relevant institutions should strive to promote the learning concept of "learning in old age and contributing in old age," changing society's views and attitudes toward the elderly group. This will enable the elderly to build determination and confidence in learning information technology knowledge, allowing them to maintain a positive mindset toward new things.

Additionally, it is essential to shift the elderly's mindset, encouraging them to integrate into modern society. **Strategy 3:** In the process of conducting education, communities should clearly select teaching content based on the elements of information literacy cultivation. Through methods such as problem guidance and creating teaching scenarios, they should stimulate the learning interest of elderly people.

2. What is the current situation of sustainable development information knowledge among the elderly in Xi'an city? How can the sustainable development the elderly's information knowledge be promoted?

With the rapid development of global informatization, the lack of information knowledge will make it difficult for the elderly population to adapt to complex information environments, thereby affecting their decision-making ability, innovation capability, and competitiveness. More directly speaking, the deficiency of information knowledge among the elderly will impact their daily life in terms of information acquisition and utilization.

To effectively enhance and sustain information knowledge, a comprehensive approach is essential. **Strategy 1:** Improve the community-based online learning service system. To enable elderly individuals to enjoy high-quality educational services, it is necessary to continuously expand online learning resources and arrange for community staff to provide offline assistance. This ensures that

seniors can promptly contact on-site personnel when encountering difficulties, thereby establishing a comprehensive learning service system and creating a favorable learning environment and atmosphere for the elderly. **Strategy 2:** Develop television channels and entertainment programs primarily targeting elderly audiences to motivate and encourage more seniors to actively participate in digital skills learning. **Strategy 3:** In response to the strong demand among elderly individuals for digital skills training, industries closely related to people's livelihoods—such as telecommunications, banking, and healthcare institutions—can collaborate with township or community organizations to conduct offline public welfare lectures and training workshops.

3. What is the current situation of sustainable development information competence among the elderly in Xi'an city? How can the sustainable development the elderly's information competence be promoted?

Limited by educational levels, the vast majority of elderly individuals cannot use Pinyin, making traditional search methods a major obstacle for them in information retrieval. Platforms can provide multiple search options such as image-based search and voice search, while also prioritizing or setting handwriting input as the default input method to better accommodate the elderly demographic.

To effectively promote sustainable information competence of the elderly in Xi'an, a strategic and focused approach is essential. **Strategy 1:** Guide family members to care more for the elderly through extensive publicity, such as encouraging younger generations to show concern and support for the elderly in learning video chatting, browsing articles, scanning QR codes, etc.; Friends and neighbors, especially peers, can provide the elderly with more direct usage experiences, thereby enhancing their learning efficiency. **Strategy 2:** The media can increase publicity on the digital lives of the elderly to raise public awareness of the importance of improving their digital skills. At the same time, various forms of public welfare activities, such as "Digital Assistance for the Elderly" volunteer services, can be carried out to provide more help and support for the elderly. **Strategy 3:** Website

interfaces can also be designed with the elderly as the focus, enhancing age-friendly features. Whether it's the layout format, color scheme, font size, etc., all should be considered based on the needs and habits of the elderly to facilitate their browsing and operation.

4. What is the current situation of sustainable development information ethics among the elderly in Xi'an city? How can the sustainable development the elderly's information ethics be promoted?

In today's information society, information technology has brought us benefits as well as new forms of alienation. Cases and phenomena such as "doxing," "cyberbullying," and "online fraud" are frequently reported, reminding us of the urgent need to strengthen information ethics. This is particularly critical for elderly individuals who lack the ability to discern information and are often exploited by "opinion leaders," unwittingly becoming accomplices to a small minority with ulterior motives in achieving their personal goals. Leveraging community-based elderly education, targeted course content, and community activities to vigorously promote and popularize basic internet knowledge, information ethics, and information laws and regulations can effectively help the elderly enhance their information morality.

To effectively promote sustainable information ethics, a strategic and focused approach is essential. **Strategy 1:** Strengthen the governance of cyberspace ecology, regulate online communication order, actively carry out online legal education, and enhance self-discipline among netizens. **Strategy 2:** Establish and improve internet civilization norms, develop a positive and healthy online culture, further refine the education mechanism for internet literacy, and guide the healthy and rational use of digital products and services. **Strategy 3:** Urge digital technology and product developers to abide by professional ethics and guidelines, promote responsible artificial intelligence, and guide the public to comply with digital society rules.

Interviewee 7:

1. What is the current situation of sustainable development information awareness among the elderly in Xi'an city? How can the sustainable development the elderly's information awareness be promoted?

The first step to eliminating "digital fear" is to establish digital awareness. The so-called digital awareness encompasses two aspects. On one hand, it refers to the clear and accurate understanding that the "silver-haired population" should have of their own positioning in the context of today's digital era. On the other hand, digital awareness also means that the "silver-haired population" possesses the basic ability to recognize and utilize digital information and services, as well as the objective cognitive capacity to understand new media products.

To effectively promote and maintain information awareness, a strategic and multifaceted approach is necessary. **Strategy 1:** Utilizing the internet and short videos can help elderly individuals strengthen connections with friends and family, increase opportunities to meet new people, and gain access to various social activities such as educational training. This has a positive effect on enhancing their subjective well-being and social adaptation. At the same time, online and offline activities for the elderly are not mutually exclusive or substitutive but rather mutually supportive and reinforcing. **Strategy 2:** Middle-aged and elderly individuals, especially those living alone or in empty-nest households, should be encouraged to actively engage with the internet. They should be provided with relevant information to better participate in social activities. Meanwhile, their digital rights should be respected, and excessive interference in their online behavior should be avoided. However, necessary reminders and guidance should be given as appropriate. **Strategy 3:** The government should focus on building learning-oriented cities that integrate elderly care and education, rationally allocate talent resources from universities and society, and encourage people of all ages to embrace new technologies and knowledge. At the same time, efforts should be accelerated to attract talent in the

field of elderly welfare technology research and development, jointly advancing the construction of a new "all-age-friendly" city.

2. What is the current situation of sustainable development information knowledge among the elderly in Xi'an city? How can the sustainable development the elderly's information knowledge be promoted?

In the digital era, mastering information knowledge is a fundamental skill that every citizen should possess. By learning and acquiring information knowledge, the elderly can gain a more comprehensive understanding of information technology, thereby developing a clearer perception of networks and smart devices. This helps the elderly to initially form an information technology mindset, cultivate information thinking abilities, and to some extent, apply information technology to solve a series of problems in their daily lives at home. At the same time, it enables the elderly to stay informed about the development trends of information technology.

To effectively promote and sustain information knowledge,the elderly should adopt a holistic and proactive approach. **Strategy 1:** Give full play to the important role of social welfare organizations and volunteers. Through door-to-door services, targeted publicity, course offerings, and real-life participation, we can demonstrate humanistic care, help the elderly solve problems encountered in the process of digital integration, popularize digital survival skills, and accelerate the pace of digital integration. **Strategy 2:** The younger generation should focus on learning deep-level feedback content during the process of giving back, emphasizing the establishment of information security awareness and enhancing the elderly's ability to discern information. They can popularize the principles behind smart devices and digital technology to their elders, helping them understand new things and trends, while also reducing obstacles in the learning process. **Strategy 3:** Community education should meet the learning needs of the elderly based on their learning characteristics, while also valuing their interests, basic knowledge and abilities, and personal needs. The educational content should be designed to be simple and easy

to learn, enabling the elderly to master and effectively apply it with ease, thereby enhancing the effectiveness of community education.

3. What is the current situation of sustainable development information competence among the elderly in Xi'an city? How can the sustainable development the elderly's information competence be promoted?

The information literacy of elderly individuals is generally low, making it difficult for them to effectively conduct information retrieval and searches. They also lack the basic information skills needed to utilize information technology for daily life, hindering their smooth integration into the information society. In other words, the information competency level of the elderly population is insufficient to support their seamless adaptation to the digital society or active participation in normal social activities, let alone realize the broader societal vision of active aging. In daily life, elderly individuals rarely engage in activities such as text editing using Word, navigation via Gaode/ Baidu Maps, online train ticket purchases, or searching for needed information through browsers like Baidu.

To effectively enhance and sustain information competence, a comprehensive and proactive approach is required. **Strategy 1:** The smart water meters installed for elderly people living alone and the big data platform operating behind them serve as a successful case of "digital riders." When the reading of a smart water meter is less than 0.01 cubic meters within 12 hours, the big data platform triggers an alarm, enabling community neighborhood committees to receive the message promptly and visit the elderly. **Strategy 2:** The design of mobile phone models should align with the handheld habits of elderly users, featuring convenient button layouts. The interface and functionality should cater to their needs while accommodating common application scenarios in the digital society. **Strategy 3:** For elderly individuals with certain financial capabilities, stronger learning abilities, and higher technological acceptance, enterprises should intensify efforts in developing "Internet + smart elderly care" products and applications. By integrating medical

resources, public services, and leisure entertainment through cutting-edge technologies, personalized services can be tailored for the elderly.

4. What is the current situation of sustainable development information ethics among the elderly in Xi'an city? How can the sustainable development the elderly's information ethics be promoted?

Older adults exhibit deficiencies in digital information security ethics. The decline in basic capabilities not only manifests as weak digital skills but also hinders the development of digital literacy and digital thinking. The lack of digital literacy and digital thinking is prominently reflected in insufficient awareness and ability to identify potential risks in online information. When encountering cyber fraud such as "red envelope scams" or "health product scams," as well as platform privacy breaches, they struggle to effectively recognize and respond, making them more vulnerable targets. Older adults represent the demographic with the highest financial losses from online scams. Meanwhile, certain smartphones come pre-installed with unnecessary applications, exposing personal information while inundating users with advertisements that are difficult to distinguish as genuine or deceptive. The evolving landscape of cyber fraud and privacy violations, compounded by the natural conservative mindset of the elderly toward new technologies, fosters distrust and "technophobia" toward digital products. In some cases, this even leads to outright rejection.

To effectively promote sustainable information ethics, a strategic and individualized approach is essential. **Strategy 1:** Empower the elderly through legislation by revising and improving relevant laws and regulations concerning information accessibility, anti-fraud, and digital rights protection, thereby eliminating algorithmic discrimination and digital bias against vulnerable groups such as the elderly in society and reversing the widening gap between different groups in the digital society. **Strategy 2:** Deepen international cooperation, strengthen policy dialogue and coordination, jointly formulate international rules to promote the development of age-appropriate media technologies, and establish unified or

compatible technical standards and ethical norms to ensure the universality, safety, and sustainability of the technologies. **Strategy 3:** As the main body of technological innovation, enterprises should actively respond to market demands on one hand, increasing R&D investment in the field of age-appropriate media and continuously launching new products and services tailored to the media usage habits of the elderly. On the other hand, they should uphold humanistic care and social responsibility.

Interviewee 8:

1. What is the current situation of sustainable development information awareness among the elderly in Xi'an city? How can the sustainable development the elderly's information awareness be promoted?

In the design and sales process of new media products, efforts should be made to further stimulate and meet the information needs of the "silver-haired group," enhance the benefits that new media brings to this demographic, and foster their subjective willingness to integrate into the digital society. This approach can better overcome and eliminate the exclusion mentality among the "silver-haired group," thereby encouraging them to actively embrace digital life.

To effectively enhance and sustain information awareness, a strategic approach is essential. **Strategy 1:** Promote diversified learning among elderly individuals based on their knowledge structure, age differences, living conditions, and other objective factors. Provide targeted educational services tailored to their interests and learning needs to meet the diverse requirements of different elderly groups, thereby fully leveraging their active role in receiving information literacy education. **Strategy 2:** Hardware aspects. Communities should strengthen infrastructure development to provide foundational facilities for conducting information literacy education for the elderly. Communities must emphasize creating a conducive teaching environment, including upgrading hardware facilities, increasing community investment, and fostering a positive community atmosphere. Additionally,

proper management and maintenance of infrastructure should be ensured to establish communities as key hubs for elderly education while achieving the goal of enhancing their information literacy. **Strategy 3:** Establish a correct concept of informatization. Educational development does not exist in isolation but is closely linked to social, economic, and political factors. Only by achieving informatization at the societal level can coordinated informatization development be realized across education, public services, politics, and the economy. This will advance community informatization, family informatization, and school informatization, ultimately creating a community education system with strong informatization attributes.

2. What is the current situation of sustainable development information knowledge among the elderly in Xi'an city? How can the sustainable development the elderly's information knowledge be promoted?

The information knowledge is insufficiently comprehensive and exhibits imbalance, with notably limited understanding of computer-related technical skills but relatively better mastery of WeChat-related technical skills. Information knowledge constitutes a mandatory competency requirement for elderly populations in their information usage. Without adequate information skill knowledge, enhancing the information literacy level of elderly groups would be unattainable. Meanwhile, while some elderly populations can currently utilize mobile phones for travel-related activities, significant knowledge gaps exist regarding registration and usage of certain complex software systems. The lack of corresponding information knowledge as effective support results in structural imbalance between complex and basic information knowledge levels among the elderly population.

To effectively enhance and sustain information knowledge, the elderly should implement a strategic approach focused on continuous improvement. **Strategy 1:** Promote "advanced" learning for the elderly after they have acquired solid foundational knowledge. Through scientific and reasonable educational methods, establish basic courses and teaching content that meet the needs of cultivating information literacy among the elderly, transforming them into a "high-

knowledge group." **Strategy 2:** Adopt a "low-threshold, friendly and mutual assistance" community-based elderly education model, offering free online knowledge training to maximize elderly participation. **Strategy 3:** Encourage the elderly to engage in social interactions by establishing digital skills learning groups for them. Regularly organize collective learning and discussion sessions to share insights and experiences. This not only enhances their digital skills but also strengthens their social abilities and self-confidence.

3. What is the current situation of sustainable development information competence among the elderly in Xi'an city? How can the sustainable development the elderly's information competence be promoted?

Older adults often lack sufficient internet experience to discern the credibility of online information, resulting in poor information discrimination skills. Their ability to utilize information also requires improvement. Additionally, they lack the necessary skills to operate digital devices, leading to inefficiency in using such technologies. The widespread adoption of digital technology has shifted many social functions from offline to online, including daily activities such as shopping, healthcare, and transportation. Taking hospital visits as an example, with the popularization of digital healthcare, making advance appointments via apps has become the norm. However, this process involves multiple steps, such as downloading the app, registering with real-name authentication, searching for the target hospital, locating the appointment section, and filling in patient information. For the elderly, each step is abstract and challenging. Many struggle to master these operations even after prolonged attempts, ultimately giving up or seeking help from younger generations. This digital barrier, stemming from a lack of operational skills, significantly disrupts the daily lives of older adults.

To effectively promote and sustain information competence, a strategic approach is essential. **Strategy 1:** Apply artificial intelligence to online healthcare for the elderly by monitoring and analyzing their physical indicators in real time, promptly providing early warnings, diagnosis, treatment, rehabilitation, and other

relevant information. **Strategy 2:** The government can also adopt policy support and public awareness campaigns, increase financial subsidies, and regularly organize free information technology training sessions for the elderly at designated locations to enhance their digital literacy and internet usage skills. **Strategy 3:** Regarding platform content, while strictly ensuring information quality, it is essential to emphasize humanistic care. The language should be simple and easy to understand.

4. What is the current situation of sustainable development information ethics among the elderly in Xi'an city? How can the sustainable development the elderly's information ethics be promoted?

With the development of modern business models, services such as online shopping, digital payments, and navigation maps all require the provision of personal information as a prerequisite. Citizens' ID numbers, phone numbers, fingerprint data, and other private details are increasingly being presented in digital form, leading to the growing economic value of personal information. At this point, some criminals exploit the common vulnerability among elderly individuals—their limited understanding of security precautions related to smart technologies—and use various pretexts to deceive large numbers of seniors into divulging their private information. As aging societies emerge and the proportion of elderly populations continues to rise, the issue of information security for this demographic has become increasingly prominent. Ensuring the personal data security of seniors in the digital age has become a focal point of societal concern. This issue not only affects the immediate interests of the elderly but also relates to social harmony, stability, and sustainable development.

To effectively promote sustainable information ethics, a strategic and adaptive approach is essential. **Strategy 1:** In response to misinformation, relevant authorities should improve the online regulatory system, media outlets should establish rumor response mechanisms, and family members should strengthen science education for the elderly to provide them with a safer digital living experience. **Strategy 2:** Enhance the security and privacy of products and services to

maximize the protection of elderly users' information privacy, prevent illegal activities such as telecom fraud resulting from information leaks, and eliminate psychological fears among the elderly in the internet era. **Strategy 3:** In user guidelines, operation manuals, and other content interfaces for digital software, digital innovation entities should clearly differentiate risks across multiple types and business models, design more intuitive digital graphics, and integrate risk prevention with elderly-friendly, personalized elements to guide the elderly in scientifically identifying and effectively mitigating potential risks posed by digital technologies.

Interviewee 9 :

1. What is the current situation of sustainable development information awareness among the elderly in Xi'an city? How can the sustainable development the elderly's information awareness be promoted?

When facing high-tech products, one should maintain a normal mindset. Digital products are creations of the digital era, designed by humans to serve humanity, with their fundamental purpose being to facilitate human life rather than divide social strata. It is crucial to avoid deifying digital products and to clearly recognize their instrumental nature, thereby becoming the master of these products.

To ensure the sustainable information awareness of the elderly in Xi'an, a comprehensive strategy is necessary. **Strategy 1:** To enable the elderly to enjoy the convenience brought by the internet, the Ministry of Industry and Information Technology launched a nationwide special campaign for the aging-friendly and barrier-free adaptation of internet applications. Based on the usage habits and needs of the elderly, the campaign focuses on guiding internet websites and mobile applications (APPs) closely related to their daily lives to carry out aging-friendly and barrier-free adaptations. It aims to achieve breakthroughs in high-frequency scenarios of the elderly's daily routines and has yielded positive results. **Strategy 2:** Authoritative institutions can leverage official accounts to disseminate advocacy and science popularization content on active aging, helping the elderly regain self-efficacy

and confidence. This approach can mitigate their resistance to the digital environment to some extent and enhance their intrinsic motivation. **Strategy 3:** Efforts should be made to meet the educational needs of the elderly in information literacy as a prerequisite.

2. What is the current situation of sustainable development information knowledge among the elderly in Xi'an city? How can the sustainable development the elderly's information knowledge be promoted?

Older adults lack information literacy, with some constrained by their own cultural backgrounds and knowledge structures, having never received information technology education; some elderly individuals lack the motivation to learn due to unfamiliarity with or perceived irrelevance of information knowledge, thus unwilling to engage; others desire to learn but do not know where to start, or have attempted and studied but retreated due to frustration. In summary, as information knowledge grows exponentially while older adults lack fundamental information literacy, they find it difficult to adapt to the changes in the information society.

To ensure the sustainable information knowledge of the elderly in Xi'an, a comprehensive strategy is necessary. **Strategy 1:** Leverage communities, elderly care service institutions, and senior universities to research and develop instructional materials on smart product usage for the elderly. Conduct training activities such as video tutorials, experiential learning, trial applications, experience sharing, and mutual assistance to effectively address difficulties faced by the elderly in using smart technologies, thereby facilitating their access to smart products and services. **Strategy 2:** Social organizations can establish digital skills training workshops, inviting professionals to provide the elderly with foundational knowledge and hands-on operational training. Additionally, they can organize visits to digital service institutions, such as online banking and e-commerce platforms, allowing the elderly to personally experience the convenience of digital technologies. **Strategy 3:** Enterprises should actively respond to government initiatives by increasing R&D investments to develop digital products tailored for the elderly. This includes creating large-text versions of

apps with enlarged fonts and icons, simplifying operational procedures to make smartphones and computers more accessible. Develop voice assistants to help the elderly perform various tasks through voice interaction, such as making calls, sending messages, and retrieving information. Introduce smart wearable devices, like health-monitoring bracelets and smartwatches, to track the elderly's health status in real time and provide emergency assistance features.

3. What is the current situation of sustainable development information competence among the elderly in Xi'an city? How can the sustainable development the elderly's information competence be promoted?

The community has not provided corresponding information technology learning materials for the elderly. Since the previous computer class materials were mainly in printed form and were not updated or reprinted in a timely manner, the elderly's interest in learning computers has declined. The students basically did not purchase information technology learning materials themselves, which has affected their learning of information technology knowledge represented by computers and smartphones. The elderly group lacks educational resources in information technology, and many elderly students reported that they wanted to improve their knowledge in this area but struggled to find or did not know how to search for relevant learning resources. Currently, online teaching resources related to information technology education for the elderly are also relatively scarce.

To effectively promote and sustain information competence, a multifaceted approach is required. **Strategy 1:** Various media targeting the elderly population should consciously assume responsibility, adhere to journalistic professionalism, strictly follow media norms to scrutinize information published on new media platforms, while also integrating and optimizing information push mechanisms to facilitate retrieval and access for elderly users. **Strategy 2:** In the community-based smart elderly care system, relevant stakeholders should conduct in-depth research on the actual needs of the local elderly population. Using indicators such as living habits, comprehensive capabilities, and age requirements of the elderly as survey

content, they should design and provide intelligent devices and services that are truly suitable for elderly users. **Strategy 3:** Strengthen professional training in information literacy services. Incorporate smart elderly care skills training into the community-based vocational training programs for unemployed individuals and laid-off workers, with a focus on information technology, psychological counseling, and home care, to enhance the service awareness and skill levels of elderly care service personnel.

4. What is the current situation of sustainable development information ethics among the elderly in Xi'an city? How can the sustainable development the elderly's information ethics be promoted?

Older adults lack corresponding awareness of rights and the capacity to safeguard them. The so-called awareness of rights refers to a specific social group's recognition, assertion, and demand for their own interests and freedoms, as well as their social evaluation of others' recognition, assertion, and demands. Awareness of rights primarily encompasses three levels: recognition of rights, assertion of rights, and demand for rights. Among these, recognition of rights refers to citizens' understanding and awareness of the scope of rights they are entitled to, serving as the foundation and prerequisite for citizens to assert and exercise their rights. However, most older adults, constrained by their educational background and knowledge level, exhibit low awareness of rights, with a significant portion even unaware of the enactment and implementation of the Law on the Protection of the Rights and Interests of the Elderly. Without awareness of rights, it is naturally difficult to assert and exercise relevant rights to protect one's own interests. Moreover, the majority of the elderly population lacks a proper understanding of litigation, either failing to correctly exercise litigation rights or displaying a pronounced resistance to litigation. In an internet society where infringement incidents frequently occur, weak capacity to safeguard rights undermines confidence and enthusiasm for participating in digital life, further hindering older adults from bridging the "digital divide" and integrating into digital life.

To effectively promote and sustain information ethics, a multifaceted approach is required. **Strategy 1:** Strengthen supervision over all aspects of health information dissemination, including disseminators, information content, and communication channels. Official authoritative media should continuously improve the speed of compiling and releasing health information and science popularization, establish specialized databases for health science popularization with timely updates, and prevent false, erroneous, or delayed information from causing harm and health risks to the public. **Strategy 2:** For rumors that have already emerged, timely debunking should be conducted through social media to help the elderly group distinguish between true and false knowledge and avoid an infodemic. Relevant departments should strengthen the qualification supervision of self-media, establish access standards and industry supervision mechanisms, and promptly shut down and penalize self-media accounts that spread false information. **Strategy 3:** The regulatory model requires establishing an elderly-adaptive digital technology system at the societal level and developing a healthy development mechanism that integrates early warning and supervision.

Interviewee 10 :

1. What is the current situation of sustainable development information awareness among the elderly in Xi'an city? How can the sustainable development the elderly's information awareness be promoted?

Most elderly individuals experience fear when first exposed to the internet and related smart products due to their lack of understanding of technical principles and usage methods. This often leads to involuntary anxiety, a sense of difficulty, and significant technological stress and psychological pressure. They tend to perceive the internet as highly challenging to operate, doubt their ability to learn and integrate into it, exhibit low self-efficacy, and are reluctant to proactively learn new applications.

To effectively promote and sustain information awareness of the elderly in Xi'an, a multifaceted approach is required. **Strategy 1:** Currently, elderly individuals still face multiple challenges in the digital world, such as cultural barriers and misinformation, making it difficult for them to overcome technophobia and resistance during their attempts at digital integration. Building an elderly-friendly online environment enables seniors to access mental enjoyment and emotional resonance, thereby further promoting their digital inclusion. **Strategy 2:** Closely linking with the daily lives of elderly individuals, teach them knowledge and skills that can help solve common life problems. Emphasize the connection between information literacy education and the learning and daily lives of seniors, fostering their awareness of information literacy and motivating their enthusiasm to participate in such education.

Strategy 3: To facilitate "advanced" learning for elderly individuals, it is necessary to continuously explore and establish information literacy goals suitable for seniors. With the support of relevant national policies, promote institutions such as senior universities, community education departments, and senior activity centers to actively implement these measures. **Strategy 4:** Improve relevant laws, regulations, and administrative standards to strengthen the protection of elderly individuals' digital rights. Enact and promulgate legal provisions related to safeguarding seniors' digital rights, ensuring their entitlements when participating in digital life, and enhancing their trust in digital products and services.

2. What is the current situation of sustainable development information knowledge among the elderly in Xi'an city? How can the sustainable development the elderly's information knowledge be promoted?

Due to physiological aging caused by age, elderly people experience a decline in their ability to remember, convey, and comprehend information. They also lack the knowledge base to operate smart devices, making it difficult for them to fully enjoy the convenience and efficiency brought by digital services. Some elderly

individuals, despite having the capability and knowledge, are subjectively unwilling to adopt new technologies, thus falling behind in the internet era.

To effectively promote and sustain information knowledge, a multifaceted approach is required. **Strategy 1:** Elevating silver-haired content as a "National Elderly Care Project" to enhance its prioritization. This initiative aims to enable the elderly to acquire more scientific knowledge, achieve enriched spiritual fulfillment, and enjoy high-quality later-life experiences through premium silver-haired content. **Strategy 2:** Establish and refine network platforms aligned with local elderly care realities and information resources to achieve data sharing, eliminate "information silos," and improve communication efficiency among government entities, enterprises, communities, and other stakeholders in elderly care services. **Strategy 3:** Implement unified industry standards, regulatory frameworks, and entry-exit mechanisms to safeguard market order and foster a policy environment conducive to the healthy development of the information literacy services sector.

3. What is the current situation of sustainable development information competence among the elderly in Xi'an city? How can the sustainable development the elderly's information competence be promoted?

Older adults generally lack digital information skills, coupled with the complexity of various application software functions, intricate operations, and unfriendly interfaces, which hinder the widespread adoption of these applications among the elderly population. The inability to use such software brings numerous inconveniences to their daily lives, such as difficulties in shopping, handling affairs, making payments, staying in touch with family and friends, accessing medical services (including appointments and purchasing medication), booking train or plane tickets, and hailing taxis.

To effectively promote and sustain information competence, the elderly should adopt a comprehensive and reflective approach. **Strategy 1:** The "Internet+ Elderly Meal Assistance" service model has achieved standardized, normalized, and information-based management. All elderly meal assistance points-including

community elderly care service stations, elderly care centers, open internal canteens of institutions, socialized catering units, and community meal assistance sites-have been integrated into a unified district-wide meal assistance platform under the shared brand "Parents' Canteen." The "Parents' Canteen" WeChat mini-program not only meets the self-service meal ordering needs of the elderly but also provides meal delivery services. **Strategy 2:** The government can attract external talent through financial subsidies and policy support. For example, it can employ experts and high-end technical professionals from other cities or provinces via talent recruitment programs, offering competitive salaries and benefits to guide the city's smart elderly care services. Additionally, by collaborating with relevant enterprises, more intelligent and convenient elderly care equipment can be developed. **Strategy 3:** Constant attention must be paid to the intrinsic connectivity and systematic nature of the teaching content. Instruction should start with the most basic operations of computers, mobile devices, smartphones, and other equipment, then gradually progress to file editing, internet browsing, sending and receiving emails, and other tasks.

What is the current situation of sustainable development information ethics among the elderly in Xi'an city? How can the sustainable development the elderly's information ethics be promoted?

The digital rights system for the elderly population remains incomplete. A well-established rights protection framework is the prerequisite for safeguarding fundamental rights from infringement. Digital rights, referred to as "traditional rights in digital content," represent a purely incremental expansion of rights in terms of content and can still be protected within the traditional framework of rights and obligations. However, the infringement patterns of rights among the digitally disadvantaged elderly are unique. Beyond online fraud and illegal corporate collection and exploitation of user data, most violations stem from passive behaviors—neither involving active infringement by identifiable subjects nor deriving from clear protective obligations as a source of duty. This misalignment with the logic

of traditional rights and obligations frameworks poses challenges. While there is no dispute regarding the infringement of legitimate rights among the elderly, significant difficulties arise in determining how such rights should be asserted. The root cause lies in the fact that these interests lack concrete expression within the current legal framework, leaving no legal basis to evaluate entities that bear only moral obligations for relief and protection.

Moreover, in the rapidly evolving digital era, digital technology has permeated various aspects of social life, reshaping service delivery models. Online reservations, electronic payments, and ride-hailing services have become commonplace. In this context, an individual's ability to use digital devices, access information, and protect personal data and privacy security has become an intrinsic capability essential for digital survival. Yet, these are precisely the capabilities that the elderly lack and that remain unaddressed in the existing rights and obligations system. The traditional rights protection framework no longer meets the needs of safeguarding elderly rights in the current social landscape, necessitating urgent improvements.

To effectively promote sustainable information ethics, a strategic and multifaceted approach is required. **Strategy 1:** Strengthen information supervision and privacy protection, promptly review and patch platform system vulnerabilities, severely crack down on illegal activities such as the sale of elderly care service-related information, and enhance the security and confidentiality of information services. **Strategy 2:** Clarify reward and punishment mechanisms to reinforce privacy protection. Strengthen technical safeguards for data storage and transmission, establish comprehensive procedures for information collection, storage, transfer, and usage to ensure individual accountability; hold those responsible for information leaks accountable and impose penalties in accordance with relevant laws and regulations; improve transparency in data usage, ensuring that personal health data is fully disclosed in a manner understandable to individuals to protect their right to know and privacy rights. **Strategy 3:** Refine relevant laws and regulations. Define the

scope of health information within personal data and identify responsible entities, standardize data collection practices, and establish specialized laws and regulations to protect such data, ensuring that the personal information of all citizens, including the elderly, is effectively safeguarded both institutionally and in practice.

Appendix E

Certificate of English

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This is to certify that

Mrs. Hui Shan

Achieved BSRU English Proficiency Test (BSRU-TEP) level

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Given on 7th February 2025

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Director

Appendix F

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Title: Development of a Strategy to Promote Sustainable Information Literacy Among the Elderly in Xi'an City
Authors: Hui Shan, Areeya Juichamlong, Sunate Thaveethavomsawat & Phisanu Bangkheow

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Development of a Strategy to Promote Sustainable Information Literacy Among the Elderly in Xi'an City

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Received: August 3, 2025 Accepted: August 28, 2025 Online Published: September 15, 2025

doi:10.5430/wje.v15n3p51 URL: https://doi.org/10.5430/wje.v15n3p51

Abstract

This study examined sustainable development strategies to enhance the information literacy of older adults in Xi'an. This paper aimed to (1) study the current situation of sustainable information literacy of older people in Xi'an; (2) provide strategies for improving sustainable information literacy of older people in Xi'an; and (3) evaluate the adaptability and feasibility of these strategies. The sample group consisted of 384 older people from five communities in Xi'an, selected using systematic and simple random sampling methods. Data were collected through questionnaires, structured interviews with ten experts, and evaluations by eight high-level administrators. The research instruments included a questionnaire to gather quantitative data on information literacy of older people, structured interviews to gather qualitative insights from experts, and evaluation forms to assess the feasibility of the proposed strategies. The findings revealed that while the overall level of sustainable information literacy of older people in Xi'an was high, there was significant variation across different aspects. Based on the SWOT-PEST matrix model, this paper systematically analyzes the external macro-environmental opportunities and threats to information literacy among older people in Xi'an from four aspects: politics, economy, society, and technology. It also examines the internal micro advantages and disadvantages and proposes countermeasures and suggestions accordingly.

The study developed 42 strategies for improving information literacy, including nine for information awareness, 10 for information knowledge, 9 for information competence, and 14 for information ethics. The adaptability and feasibility of strategies for improving the sustainable development of information literacy of older people in Xi'an in four aspects were at the highest level, with the values between 4.50 and 5.00 ($\bar{x}$=4.68 and ==4.65), which means the strategies for improving the sustainable development of information literacy of older people in Xi'an are adaptable and feasible.

Keywords: sustainable development strategy, information literacy, older people, SWOT analysis, PEST analysis

1. Introduction

The global aging process is accelerating, and it is imperative to address the issue of aging. Since the beginning of the 21st century, the world has continued to develop with each passing day, and information technology has injected fresh and vigorous energy into the development of all countries. In such a favorable development situation, the aging of the population is showing an increasingly pronounced trend, gradually spreading from developed countries to the rest of the world. It has become the focus of global attention. On July 11, 2024, the Population Division of the United Nations Department of Economic and Social Affairs released its latest report on the occasion of the 35th World Population Day (United Nations, Department of Economic and Social Affairs, Population Division, 2024).

As can be seen in the report, the global population aged 65 and over is expected to reach 2.2 billion by the end of 2070. Meanwhile, the population aged 80 and over is projected to reach 265 million by the mid-2030s, indicating an irreversible growth trend in population aging. According to the "China Development Report 2020: Development Trends and Policies of Chinese Population Aging" recently released by the China Development Research Foundation, the period from 2035 to 2050 is China's aging period. At the peak of the population, projections show that by 2050, China's elderly population aged 65 and above will reach 380 million, accounting for nearly 30% of the total

population. The elderly population aged 60 and above is expected to reach almost 500 million, accounting for more than one-third of the total population (Development Report, 2020).

China's Xi'an has a population of 1.02 million older adults over the age of 60 (Xi'an Bureau of Statistics, 2023). The Education Development Plan for the Elderly (2016-2020) points out that the development of education for older people is an important measure to actively respond to the aging of the population, realize the modernization of education, and build a learning society, and is an inevitable requirement to meet the diverse learning needs of older people, improve the quality of life of older people, and promote social harmony (The Education Development Plan for the Elderly, 2020). Good information literacy can shape a positive concept of aging throughout society, cultivate "elderly talents" who can adapt to the development of an information society, and actively respond to population aging, thereby further promoting the construction of a learning society and a smart society (Jiang, 2020).

Given this, this study selects the elderly group in Xi'an as the survey object to analyze the current situation of information literacy among older people. Then it proposes strategies and suggestions to enhance the digital literacy of older people, providing a reference for elderly policy.

Research Objectives

1. To study the current situation of information literacy of older people in Xi'an.

2. To develop strategies for information literacy of older people in Xi'an.

3. To evaluate the adaptability and feasibility of strategies to improve information literacy of older people in Xi'an.

Research Questions

Based on the objectives above, the following research questions were posed:

1. What is the current situation of information literacy of older people in Xi'an?

2. What are the strategies for improving the information literacy of the elderly in Xi'an?

3. How to evaluate whether the strategy of information literacy of the elderly in Xi'an is adaptable and feasible?

2. Literature Review

2.1 Research on Information Literacy

The term "information literacy," introduced by Zurkowski (1974), remains a vitally important concept in library and information science. Zurkowski declared that "people trained in the application of information resources to their work can be called information literates" (p. 6), connecting the facility with information tools and resources to workplace problem-solving. In this definition, Zurkowski (1974) suggested that (1) information resources are applied in a work situation, (2) techniques and skills are needed for using information tools and primary sources, and (3) information is used in problem solving.

In 1979, the IIA (Information Industry Association) presented a definition of information literacy that did not include the confining specification of information being used in the workplace, as was the case with Zurkowski: "The IIA defines an information literate as a person who knows the techniques and skills for using information tools in molding solutions to problems (Garfield, 1979)." The same year, in an article on the future of the librarianship profession, Taylor (1979) introduced the concept of information literacy, noting that an approximate definition of information literacy would include the following elements: (1) that solutions to many (not all) problems can be aided by the acquisition of appropriate facts and information; (2) that knowledge of the variety of information resources available (who and where) is a requisite of this literacy; (3) that the informing process, which is continual, is as necessary as the spot information process, which is occasional; and (4) that there are strategies (when and how) of information acquisition (Taylor, 1979).

The concept of information literacy first appeared in the 70s of the 20th century. Still, from the analysis of the essence of information literacy, the literature retrieval skills education and user education carried out by libraries in the early days can be regarded as the embryonic form of the concept of information literacy. These eventually evolved into information literacy (Pi, 2003). With the development of science and technology and the exponential growth of social media, readers' demand for literature and information is increasingly diversified, and a strong ability to retrieve and utilize literature has become a basic quality required of people. To improve the ability of users in these aspects, the library has carried out a wide range of user education, such as bibliographic education and literature retrieval education. At the same time, the rapid development of information technology has enabled the library to begin using computer

management extensively, which undoubtedly raises higher requirements for users' retrieval abilities.

Information literacy has also been described as a way of learning (Bruce, 2008). This interpretation relates information literacy to the concept of lifelong learning (Bruce 2003). Other ideas about information literacy include, for instance, Lloyd's (2005) concept of 'information literacy landscapes' and an understanding of information literacy as encompassing information management and handling skills (e.g., Huvila, 2010; Talja, 2010). Before exploring the theoretical frameworks for information literacy in further detail, let us briefly consider the components of the composite term: "information" and "literacy."

Compared to other countries, the proposal and research on information literacy in China are relatively late. In the early 90s of the 20th century, information literacy began to appear in some newspapers and magazines. Later, with the introduction of the concept of information literacy, scholars and experts began to study it. There are several influential definitions of information literacy in China.

Ma (1997) defined information literacy as "various information qualities possessed by individual members in the information society, including information wisdom (involving information knowledge and skills), information ethics, information awareness, information concept, information potential, information psychology, etc."This article discusses information literacy earlier and lays the framework for the concept of information literacy in China.

Zhang et al. (2025) proposed in their paper, "Research Status and Development Trends of Information Literacy Education in China Based on CiteSpace," that the study employed bibliometric methods and CiteSpace visualization software. Using CSSCI academic papers from the China National Knowledge Infrastructure (CNKI) database as data samples, it demonstrated the dynamic evolution process of research authors, institutions, hotspots, cutting-edge trends, and developmental trajectories in China's information literacy education field. Meanwhile, the paper employed content analysis methods to interpret and summarize the core viewpoints of the literature, thoroughly analyzing the current characteristics, existing issues, and future development trends in information literacy education research in China.

In conclusion, both the descriptions of the concept of information literacy by foreign scholars and the research on information literacy by Chinese scholars are conducted within their respective national contexts. Both have different meanings, and it is a diversified and hierarchical comprehensive concept that dynamically develops and changes with varying stages of development and the requirements of the times. Currently, most research on the connotation of information literacy among Chinese scholars is conducted at four levels: information awareness, information knowledge, information ability, and information ethics.

Linking the Framework to Community Implementation. In addition to treating information literacy as informed learning and practice-based knowledge (Bruce, 2008; Lloyd, 2005), we also consider community-level strategy formation for older adults. Wang and Shao (2021) propose practical, community-anchored approaches for improving elderly information literacy; we therefore use their principles to help structure our strategy set and to interpret feasibility/adaptability judgments. This positioning ensures that the four-pillar model (awareness, knowledge, competence, and ethics) informs the measurement and actionable design of community education initiatives.

2.2 Research on Information Literacy Among the Elderly

Kim et al. (2022) examined the relationship between elderly individuals' information literacy and life satisfaction using structural equation modeling. They found a positive correlation between older people's information literacy level and their life satisfaction.

Rigg and Kazemek. (2010) Little research has been done on the literacy needs and interests of elders. Consequently, many programs of literacy training for the elderly are based on inadequate and inaccurate information.

Diteeyont and Ku. (2021) The elderly benefit from using the Internet for various purposes, and achieving Internet literacy is essential for their participation as digital citizens. This study investigates the levels and influential factors of Internet literacy among 534 older people in Thailand. The results indicated that participants generally possessed an intermediate level of Internet literacy. Most older people possessed solid knowledge and skills in using digital tools and applying strategies to access information from reliable online resources. They could also communicate and protect their personal information on online platforms.

Ma (2014) A Smart community is an integral part of smart city construction, and improving the information literacy of community residents, especially elderly residents, is of great significance to strengthen the construction of smart cities and accelerate the coordinated economic and social development of beautiful China. Based on the analysis of the current situation of community normalization and the factors affecting the improvement of information literacy

of the elderly, this paper proposes a "three-dimensional dynamic cultivation system" model to improve the information literacy of the elderly in Ningbo, four paths of "consolidating the foundation, grasping the key, highlighting the core, and ensuring the effect," as well as six security strategies of "basic security, financial security, organizational security, legal security, talent security, and cultural security."

3. Research Methodology

3.1 The Population

The study population comprises five communities in Xi'an. The number of elderly people over 60 in Beilin community is 246,000, accounting for 24.22%; the number of elderly people over 60 in Lianhu community is 199,000, accounting for 19.53%; the number of elderly people over 60 in Yanta community is 303,000, accounting for 29.69%; the number of elderly people over 60 in Weiyang community is 158,000, accounting for 15.36%; and the number of older people over 60 in Baqiao community is 114,000, accounting for 11.20% (XI'an Bureau of Statistics, 2024). According to the Krejcie and Morgan sampling table (1970), the sample group for this study consisted of 384 elderly individuals from five communities in Xi'an, selected using systematic sampling.

3.2 Research Instrument

Two distinct samples were used by design: 10 interviewees (community administrators) for qualitative elaboration and 8 experts for strategy evaluation—hence the difference in counts.

The research tools used in this study included a questionnaire, an interview form, and an evaluation form.

3.3 Questionnaire

Part I: Survey on Basic Information about Respondents. It was used to understand the relevant background of the respondents, including their gender, age, educational background, health condition, monthly income, and type of work before retirement.

Part 2: According to information literacy, the questionnaire is divided into four aspects: information awareness, information knowledge, information competence, and information ethics. The questionnaire is designed in four dimensions.

The average value interpretation, based on Likert (1932), is outlined as follows:

4.50-5.00: Expresses the highest level.

3.50-4.49: Expresses a high level.

2.50-3.49: Expresses a medium level.

1.50-2.49: Expresses a low level.

1:00-1:49: Expresses the lowest level.

3.4 Interview Form

Methodological clarification: Semi-structured individual interviews were conducted with 10 community education administrators to supplement survey findings. Separately, an expert panel of 8 specialists rated the proposed strategies using an evaluation form; the expert conducted no focus group.

Step 1: Based on the results of the questionnaire survey and the analysis of the current situation regarding information literacy, a corresponding structured focus group interview form was developed, covering four aspects: information awareness, information knowledge, information competence, and information ethics.

Step 2: SWOT-PEST analysis

(1) The expert holds relevant qualifications/experience in information literacy, community education, or digital inclusion.

This study employed the SWOT-PEST analysis method to comprehensively and systematically analyze the research subjects of Strengths, Weaknesses, Opportunities, and Threats, as well as Political, Economic, Social, and Technological factors, to provide a feasible strategy for promoting the sustainable development of information literacy among the elderly in Xi'an.

3.5 Evaluation Form

Evaluate the suitability and feasibility of the strategies for information literacy of the elderly in Xi'an. The study invited eight experts from five communities in Xi'an to assess the suitability and feasibility of the strategy.

The average value interpretation, based on Likert (1932), is outlined as follows:

4.50-5.00: Expresses the highest level.

3.50-4.49: Expresses a high level.

2.50-3.49: Expresses a medium level.

1.50-2.49: Expresses a low level.

1:00-1:49: Expresses the lowest level.

4. Research Results

The researchers conducted a comprehensive analysis of the data, segmented into the following parts:

4.1 Descriptive Analysis

According to Table 1, the sample consists of 201 male respondents, accounting for 52.34%, and 183 female respondents, accounting for 47.66%. The proportion of males among the respondents is relatively higher. Regarding age, the main range is 60-70 years old, with 182 older people, accounting for 47.39% of the total population. The second group consisted of individuals aged 71-80 years, comprising 124 older people, which accounted for 32.29%. Among the elderly aged 81-90, 56 were interviewed, accounting for 14.58%. The number of people over 90 years old was the lowest, with only 22 people, accounting for 5.74%.

The educational background of older people is below primary school, with 77 people, accounting for 20.05%. The elderly with primary school education accounted for the most significant number, comprising 174 people, which represents 45.31% of the total. There were 85 elderly people with junior middle school education, accounting for 22.14%. The number of senior middle schools was 24, accounting for 6.25% of the total number of schools. There were 17 with a bachelor's degree, accounting for 4.43%. The number of elderly people with a graduate degree was the lowest, with only 7, accounting for 1.82%.

In terms of health conditions, the physical health of the elderly is generally good, with 249 older people in good health, accounting for 64.84%. Some of the elderly had some physical diseases, such as heart disease, high blood pressure, and disability. There were 135 elderly people with disabilities, accounting for 35.16%.

For a monthly income, there are 139 people with an income of less than 3,000 RMB, accounting for 36.20%. The largest group of elderly individuals, comprising 167 people, accounted for 43.49% and had a monthly income of 3,001-5,000 RMB. The monthly income ranges from 5,001 to 7,000 RMB, and there are 53 elderly people, accounting for 13.80%. There are 25 elderly individuals with a monthly income exceeding 7,000 RMB, accounting for 6.51% of the total.

For the type of work before retirement, the number of elderly people engaged in sales work is 79, accounting for 20.57% of the total. This was also the highest type of job among respondents. The number of workers was 70, accounting for 18.23% of the total workforce. The number of farmers was 54, accounting for 14.06% of the total. The number of educators and medical workers was 48 and 36, respectively, accounting for 12.50% and 9.38% of the total. The number of government personnel was 31, accounting for 8.07% of the total. Twenty-three people have been engaged in the management profession, accounting for 5.99%. The manager profession is also the least represented of all job types. The number of unemployed was 43, accounting for 11.20%.

Table 1. Analysis of the Personal Information and Participants

	Personal Information	Frequency	Percentage
Total		384	100%
Gender	Male	201	52.34%
	Female	183	47.66%
Age	60-70	182	47.39%
	71-80	124	32.29%
	81-90	56	14.58%
	>90	22	5.74%
Educational background	Primary school below	77	20.05%
	Primary school	174	45.31%
	Junior middle school	85	22.14%
	Senior middle school	24	6.25%
	Bachelor's degree	17	4.43%
	Graduate degree	7	1.82%
Health condition	Healthy	249	64.84%
	Unhealthy	135	35.16%
Monthly income	<3,000 RMB	139	36.20%
	3,001-5,000 RMB	167	43.49%
	5,001-7,000 RMB	53	13.80%
	>7,000RMB	25	6.51%
Type of work before retirement	Manager	23	5.99%
	Worker	70	18.23%
	Farmer	54	14.06%
	Salesperson	79	20.57%
	Teaching staff	48	12.50%
	Medical staff	36	9.38%
	Governmental staff	31	8.07%
	Out of work	43	11.20%

The analysis focuses on the four main aspects of information literacy: information awareness, information knowledge, information competence, and information ethics. The data are presented using mean and standard deviation to reflect the overall levels of information literacy among older people (Table 2).

Table 2. The Average Value and Standard Deviation of the Current Situation of Sustainable Information Literacy (n=384)

Rank NO.	Information literacy of the elderly in Xi'an	$\bar{X}$	S.D.	level
1	Information awareness	3.91	0.83	High
2	Information knowledge	3.90	0.87	High
3	Information competence	3.84	0.81	High
4	Information ethics	3.76	0.83	High
	Total	3.85	0.84	High

According to Table 2, the current state of information literacy among the elderly in Xi'an in four aspects was at a high level ($x = 3.85$). Considering the results of this research, aspects ranged from the highest to lowest level were as follows: the highest level was information awareness (.x̄=3.91), followed by information knowledge (x̄= 3.90), information competence (x̄= 3.84), and information ethics was the lowest level (x̄= 3.76).

Developing an Educational Management Strategy. A SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) was conducted to categorize the internal and external factors affecting the information literacy of older people in Xi'an. Based on the SWOT findings, a TOWS analysis was used to create strategic recommendations by aligning internal strengths and weaknesses with external opportunities and threats. The TOWS analysis helped formulate actionable strategies for enhancing information literacy among the elderly in Xi'an, ensuring that these strategies leverage strengths, mitigate weaknesses, capitalize on opportunities, and address threats. In this study, PEST analysis can enable community managers to accurately and comprehensively understand the opportunities and threats brought to the community by the external environment, which mainly analyzes the external macro environment faced by the community from the four dimensions of politics, economy, society, and technology, thus putting forward an effective sustainable development strategy(Table 3\4).

Table 3. SWOT-PEST Analysis Table of Information Literacy for the Elderly in Xi'an

	Politics (P)	Economy (E)	Society (S)	Technology (T)
Strengths (S)	SP1The government attaches great importance to the promotion of information literacy	SE1Enterprises establish special funds and subsidy policies to support the research and development and application of informatized elderly care technologies	Establish the Digital Aging and Information Accessibility Alliance	ST1: Enrich the forms and content of digital skills training for the elderly
	SP2China's Ministry of Industry and Information Technology has launched a nationwide campaign to adapt Internet applications	SE2The government increases the intensity of financial subsidies, and regularly offers free information technology training activities at fixed locations	SS2The community organizes information technology training lectures	ST2: Establish and improve the information data backup and recovery mechanism
	SP3The government establishes an information service platform	SE3: Attract enterprises and social organizations to participate in the field of information-based elderly care	SS3The community provides information service talents for the elderly	ST3Design product interface and operation process suitable for the use habits of the elderly
Weaknesses (W)	WP1The coverage of policies is narrow, and the publicity is not in place, making it difficult for the elderly to access new technologies	WE1The income level of some elderly people is low, resulting in insufficient purchasing power for the elderly	WS1There are too few skilled operators to train the elderly	WT1The needs of the elderly are pretty different, and the problem of product interface design is prominent
	WP2Lack of an aging-friendly, sustainable development information education policy system	The WE2 supply and demand of products are not smooth, and the elderly have limited access to information	WS2The sense of social integration is weakened. They are unable to integrate into the pace of modern society	WT2The number and variety of products suitable for the elderly are limited
	WP3Lack of long-term mechanisms for the construction of the digital rule of law	WE3Some elderly people have outdated consumption concepts and have a lower desire to consume	WS3The media's publicity efforts for the digital lives of the elderly are insufficient	WT3The platform interface design is complex, and it is difficult for the elderly to find the key information entrance

Table 3. SWOT-PEST Analysis Table of Information Literacy for the Elderly in Xi'an(continued)

	Politics (P)	Economy (E)	Society (S)	Technology (T)
Opportunities (O)	OP1China has entered the digital information society	OE1Increasing the income of the elderly is a necessary condition for the development of information literacy	OS1Appropriate consumer projects and convenient consumption methods	OT1: OT1Enhancing the digital literacy and skills of the elderly population is in line with the requirements of the digital age
	OP2The rapid evolution of media technology	OE2Sustained economic growth provides material support for the development of information literacy	OS2Communities, old-age care institutions, public welfare organizations, and other organizations have organized training activities	OT2The government has launched the "Special Action for Internet Application Aging and Barrier-Free Transformation"
	OP3The internet penetration rate is increasing year by year	OE3Enhance consumer purchasing power, promote economic growth	OS3The number of elderly Internet users is increasing year by year	OT3With the development of artificial intelligence technology, the demand for informatization is increasing day by day
Threats (T)	TP1The policies and regulations regarding information release, utilization, and supervision are not yet well-established	TE1The investment costs for information infrastructure and internet construction are relatively high	TS1The lack of learning support provided by families and community education institutions leads to the dilemma of information literacy services	TT1Ubiquitous digital environment and the disconnection with the learning ability of the elderly
	TP2Public digital information resources supply is relatively lagging behind	TE2Elderly consumers have conservative consumption concepts and limited income	TS2The elderly have a low willingness to learn independently and are resistant to digital devices	TT2The information platform management system is not perfect, and the information identification ability is lacking
	TP3Uneven distribution of public digital information resources	TE3Enterprises develops products suitable for aging populations, which have high production costs	TS3Digitization is reshaping traditional modes of production and life	TT3The elderly lack awareness of data security risks

Table 4. TOWS Matrix Analysis

	Internal Strengths	Internal Weaknesses
External Opportunities	SO (Leverage Strengths to Seize Opportunities) Strategy	WO (Overcome Weaknesses to Seize Opportunities) Strategy
	1. Stimulate the information awareness of the elderly in Xi'an	1. Guide the elderly in Xi'an to actively learn information, knowledge, and skills
	2. Change the mindset, dispel the fear of numbers, and encourage broad participation	2. Actively develop educational content on media information dissemination and production literacy for the elderly
	3. Cultivate consciousness, steadily promote lifelong learning, and promote continuous participation	3. Create an excellent knowledge dissemination and education platform, and carry out online information literacy education
	ST (Leverage Strengths to Counteract Threats) Strategy	WT (Minimize Weaknesses to Avoid Threats) Strategy
External Threats	1. Create a social atmosphere of support and give more learning support to the elderly	1. Strengthen the supervision of the information environment to ensure the safety of the elderly's participation in digitalization
	2. Give full play to the role of family education, carry out intergenerational interaction, and reverse feeding education	2. Guide enterprises to assume social responsibilities and improve the performance of products suitable for the elderly
	3. Strengthen the construction of teachers for information literacy in community education for the elderly	3. Improve awareness of network security and build a clean cyberspace
	4. Improve infrastructure and service construction to meet the needs of digital literacy	4. Deepen international cooperation and governance

Through a SWOT-PEST analysis of the questionnaire and interview results on the current status of information literacy of the elderly in Xi'an, a draft strategy to improve the sustainable development of information literacy of the elderly in Xi'an was proposed.

For the four dimensions of information literacy — information awareness, information knowledge, information ability, and information ethics — a total of 42 strategies are proposed (Table 5). This paper conducted in-depth interviews with 10 individuals responsible for community education management and proposed a corresponding strategy. A purposive sampling method was used.

The interviewees of 10 persons who are in charge of community education management were required to have the following qualifications) have been working in the community for more than 10 years, 2)who has expertise in education, and 3) who is willing to participate in a structured interview. 4) must be willing to review their interview transcripts for validation.

Table 5. Strategies to Promote Sustainable Development Information Literacy of the Elderly in Xi'an

Aspect	Strategies
	1)Increase the frequency of digital software tool usage among elderly individuals to enhance their operational skills gradually.
	2)Actively cultivate elderly individuals' awareness of information perception and demand feedback, maintain the habit of continuously browsing and acquiring information, and improve their sensitivity to information.
	3)Elderly individuals should maintain an optimistic mood, strengthen their courage and confidence, shift from passivity to initiative, and actively understand, participate in, and experience digital life.
	4)Elderly individuals should learn skills related to information technology, abandon preconceived notions about new media, actively embrace new things, acquire relevant knowledge, and seize opportunities in the information-driven society.

1. Information awareness	5)In terms of content delivery, efforts should be made to help elderly individuals fully recognize their capabilities, improve their negative self-evaluations, and dispel their doubts about themselves and information literacy services.
	6)Utilize traditional media such as television and radio, as well as new media platforms like social networks and self-media, to disseminate information service content, and enhance its influence through interactive livestreaming.
	7)Government departments should conduct promotional activities in community gathering places such as neighborhoods and nursing homes, leveraging group effects to increase elderly individuals' awareness and trust in information consciousness services through word-of-mouth, striving for comprehensive coverage.
	8)Communities can organize extensive, influential, and attractive information literacy education activities for the elderly. Strengthening the cultivation of information literacy among the elderly in terms of mindset and creating an intense informatization atmosphere will encourage the elderly to improve their information literacy consciously.
2. Information knowledge	9) Information literacy service platforms can provide elderly individuals with identity verification through assessment methods, such as daily check-in sharing and accumulated total learning time. This can be achieved by awarding the title of "Lifelong Learner" or issuing commemorative badges, allowing them to share their achievements within their social circles.
	1)Regularly organize information, knowledge training courses, and lectures, inviting professionals and volunteers to teach elderly individuals how to acquire and evaluate information effectively, as well as utilize technological tools.
	2)Establish information knowledge study groups, encouraging elderly individuals to form study groups for collective learning.
	3)Cultivate learning interest and motivation: Through publicity and education, guide elderly individuals to recognize the importance of learning information and knowledge and stimulate their interest and intrinsic motivation.
	4)Utilize traditional media forms such as outdoor bulletin boards and handmade posters to demonstrate, guide, and answer questions about the specific steps for using new media among elderly community members, helping them gain a basic understanding of new media as an information channel and improving their information acquisition efficiency.
	5)Hold information knowledge quiz competitions covering basic knowledge related to smartphones, computers, and other devices, including functions of device switches, buttons, basic software features, and fundamental computer operations, fostering a learning atmosphere among the elderly.
	6)The content of information literacy services should shift from traditional knowledge dissemination to more accessible science popularization, covering areas closely related to elderly individuals' lives, such as digital skills, health and wellness, and anti-fraud awareness.
	7) Encourage elderly individuals to actively participate in information content activities, including the cultivation of various forms of expression such as writing, painting, photography, and video production.
	8) Relevant cultural departments can provide diverse learning resources on platforms, including text, images, audio, and video content, to meet the learning needs of different elderly individuals.
	9)Offer online courses or host webinars to deliver knowledge and facilitate interactive exchanges through live or recorded broadcasts.
3. Information competence	10) Implement online assessments and learning feedback mechanisms, evaluating elderly individuals' learning outcomes through quizzes and questionnaires, and providing personalized learning recommendations based on the evaluation results.
	1)The community carries out information literacy training through "Silver Hair Classroom" programs, helping them learn basic digital skills, e.g, internet browsing, information searching, and social media

	usage.
	2)Establish elderly learning activity rooms, provide basic information equipment for the elderly to learn and practice, and help them understand and use new technological devices.
	3)Organize elderly information technology exchange activities, which may include basic computer operations, internet usage, online shopping, online payments, etc.
	4)Establish dedicated information literacy education channels or columns for the elderly, providing high-quality information that meets their needs and expanding their access to informational knowledge.
	5)Smart devices provide multiple retrieval methods, such as image retrieval and voice retrieval.
	6)Recruit volunteers within the community to conduct guidance activities on smartphone usage for the elderly.
	7) Conduct pre-service and post-service training for community elderly information literacy teachers in a planned and step-by-step manner, and establish a continuing education guarantee and evaluation index system for community elderly education teachers.
	8) Children can patiently explain information skills to the elderly, demonstrating the correct use of mobile phone functions such as taking photos, video calls, and making payments.
	10) Provide digital services, such as launching online social security and medical reimbursement services, which enable elderly individuals to apply and inquire via the internet, thereby reducing waiting time and physical fatigue associated with queuing.
	1)The government should strengthen the review of online platform content systems, swiftly and accurately identify and filter harmful information to prevent its dissemination and eliminate its spread.
	2) Communities, police stations, and other departments should regularly organize workshops to assist with the use of smart devices, helping elderly individuals achieve internet freedom and enhancing their awareness of security precautions.
	3)Regularly organize anti-fraud lectures, utilizing community channels, television, and the internet to promote anti-scam knowledge and strengthen the self-protection awareness of the elderly.
	4) Communities can organize training activities related to information ethics and morality, inviting professionals to educate the elderly on information verification, cybersecurity, and other relevant topics.
	5) Strengthen the crackdown on the leakage of elderly individuals' personal information to ensure legal accountability.
	6) Establish a "Family Anti-Fraud Hotline," allowing elderly individuals to promptly communicate with family members for verification when encountering suspicious calls.
4. Information ethics	7) Regularly check and update personal information protection settings, such as mobile phone lock screen passwords and payment passwords.
	8) Install and update security software, such as antivirus programs and firewalls, to ensure device security.
	9) Provide technical support by offering convenient and secure technology products and services for the elderly, such as optimizing user security settings, interfaces, and making age-friendly adjustments to reduce the cost of implementing information security measures for elderly users.
	10) Establish dedicated consultation and service hotlines to provide timely assistance and support for issues elderly individuals encounter while using technology products.
	11)Communities should establish information-sharing platforms to provide reliable information resources for the elderly.
	12) Actively participate in the formulation of international cyber governance rules. China should engage in the development of relevant international internet governance rules and standards, proposing Chinese perspectives and solutions at various international internet governance conferences and forums

to promote the formation of globally recognized international laws.

13) Strengthen cooperation with other countries in the field of cybersecurity, establishing transnational collaboration mechanisms such as information sharing, joint response, and security alerts to combat cross-border cybercrime, prevent cyberattacks and data breaches, and enhance the overall level of global cybersecurity.

14) Actively advocate for the establishment of a cooperative mechanism for global cyberspace governance, promoting exchanges and collaboration among nations in cyberspace governance. Strengthen the signing of bilateral or multilateral agreements with other countries to facilitate the sharing of experiences and technical cooperation in cyber governance, thereby fostering a co-governance framework for global cyber governance.

4.2 Adaptability and Feasibility of the Strategies

A total of eight experts were invited to evaluate the adaptability and feasibility of educational management strategies for enhancing students' sustainable learning abilities in higher vocational institutions in Guangdong Province. The analyzed results are expressed in terms of mean and standard deviation, as shown in Table 6.

Clarification: Experts' evaluations pertain to the proposed strategies themselves; no real-world implementation was conducted at this stage.

Table 6. Evaluation of the Adaptability and Feasibility of Strategies to Promote Sustainable Information Literacy of the Elderly in Xi'an Across Four Aspects

Strategies to Promote Sustainable information literacy of the elderly in Xi'an	Adaptability			Feasibility		
	$\bar{x}$	S.D.	level	$\bar{x}$	S.D.	level
Information awareness	4.70	0.57	Highest	4.65	0.56	Highest
Information knowledge	4.64	0.60	Highest	4.69	0.51	Highest
Information competence	4.67	0.53	Highest	4.62	0.56	Highest
Information ethics	4.69	0.49	Highest	4.64	0.55	Highest
Total	4.68	0.55	Highest	4.65	0.55	Highest

According to table 4.15, the adaptability and feasibility of strategies for improving the sustainable development of sustainable development information literacy of the elderly in Xi'an in four aspects were at the highest level with the values between 4.50 and 5.00 ($\bar{x}$=4.68 and $\bar{x}$=4.65) which means the strategies for improving the sustainable development of information literacy of the elderly in Xi'an are adaptable and feasible.

5. Discussion

This study developed and evaluated community-based strategies to enhance older adults' information literacy across four pillars—awareness, knowledge, competence, and ethics—and examined their feasibility and adaptability. The findings align with informed-learning perspectives on information literacy (Bruce, 2008) and with socially situated practice (Lloyd, 2005). They also reflect classic emphases on structured access and retrieval (Taylor, 1979) and China-specific conceptualizations of formation processes (Ma, 1997). Guided by Wang and Shao (2021) for community-level operationalization, the SWOT–PEST analysis translates abstract pillars into concrete, locally adaptable actions that experts rated as feasible.

Awareness. The observed need to raise problem recognition and risk perception aligns with informed learning (Bruce, 2008) and practice-based accounts of noticing information opportunities (Lloyd, 2005). Strategies that foreground everyday triggers (e.g., health, benefits, safety) resonate with Wang and Shao (2021) on community messaging and outreach.

Knowledge. Gaps in understanding sources, channels, and credibility criteria echo Taylor's (1979) emphasis on structured access, with Ma's (1997) contributions highlighting locally recognizable systems—the strategy set, therefore, couples source orientation with credibility scaffolds embedded in community programs.

Competence. Variability in search, evaluation, and organization skills supports a skills-forward intervention track. Bruce (2008) and Lloyd (2005) practiced explicit and teachable methods in community settings. Hands-on, coached tasks, as anticipated by Wang & Shao (2021), are appropriate for progressive uptake.

Ethics. Concerns about privacy, data protection, and misinformation necessitate the adoption of standardized behaviors within everyday practices (Lloyd, 2005). Our ethics-focused actions (consent, password hygiene, rumor-checking routines) mirror community protocols recommended by Wang and Shao (2021).

Strategies to promote the improvement of information literacy among the elderly, it is necessary to improve the information-based training mechanism for community education for the elderly, create an information-based environment and atmosphere for community education for the elderly, rationally set up information literacy courses for community education for the elderly, adopt diversified teaching forms of information literacy for community education for the elderly, and strengthen the construction of teachers' team for information literacy in community education for the elderly, This view is highly consistent with the strategy proposed by (Wang & Shao, 2021). The strategies also highlighted the effects of improving information literacy among older persons in the community, which aligns with Ma Lili (2014) said that improving various guarantee mechanisms and information facilities is the foundation, improving the application degree of smart city technology and business popularity is the key, the government's management ability and service level is the core, and selecting the training mode is the guarantee to improve the training effect. Strengthening the construction of information security protection systems aligns with Yue's (2024) proposal to safeguard cybersecurity, enabling elderly users to access the internet with confidence and establish an age-friendly digital environment. This perspective resonates with China's national-level efforts to formulate cybersecurity laws and regulations, achieving coordinated development between informatization and information security. Moreover, improvements in teaching ability, especially in terms of feedback and student engagement, were considered crucial for maintaining high educational standards (Yin et al., 2017). The research findings align with Yue's (2023) advocacy for enhancing the immunity and resilience of elderly populations against misinformation, guiding seniors to discern rumors accurately. By strengthening the dissemination of information ethics guidelines and legal knowledge among older adults through educational initiatives and legal awareness programs, this approach aims to cultivate their ethical consciousness and legal literacy. It emphasizes the importance of fulfilling information responsibilities while prioritizing the acquisition and sharing of reliable, valuable information. Ultimately, these strategies were deemed highly feasible and appropriate for implementation in communities across the province.

Position within the Literature. While Bruce (2008), Lloyd (2005), Taylor (1979), and Ma (1997) provide the conceptual rationale and measurement anchors for the four-pillar model, Wang and Shao (2021) supply the implementation logic at the community level. Our findings suggest that feasibility and adaptability are highest when conceptual pillars are mapped to specific community practices (training formats, outreach routines, and support roles) in line with their recommendations, thereby closing the gap between theory and local delivery.

6. Conclusion

The following recommendations can be presented based on the findings of the study:

1)To the elderly: The elderly population plays a vital role in enhancing their digital literacy, with their attitudes, motivations, and learning behaviors directly impacting outcomes. To achieve this, seniors should first fully recognize the importance of digital technology. On one hand, they need to proactively engage with digital tools, overcoming initial fears and unfamiliarity through persistent practice. By integrating newly acquired digital skills into their daily lives, individuals can enhance the quality of life while strengthening their independence and autonomy in the digital age. On the other hand, leveraging their rich life experiences and wisdom, seniors should remain vigilant when facing digital security risks. By learning to identify online scams and protect their personal information, individuals can effectively avoid potential hazards and safeguard their digital safety. These strategies should be incorporated into the plan identified in this study as guidelines for development to support continued lifelong education.

2)To the community: Communities prioritize developing and implementing foundational digital literacy programs that not only teach seniors how to use smart devices but also help them overcome tech adoption challenges through hands-on practice. By creating inclusive and encouraging learning environments, communities spark seniors 'interest in digital education while reducing their concerns about technology barriers. Advanced courses and personalized coaching are provided to enhance seniors' technical proficiency. Furthermore, continuous educational tracking and effectiveness evaluations ensure that seniors can apply the skills they have acquired in daily life, improving their

digital living standards and facilitating their full integration into the digital society. Communities are recommended to develop multi-year implementation plans that incorporate these strategies, ensuring a gradual yet comprehensive approach to improve the information literacy of the elderly.

3)To the government: Government agencies should play a leading role in enhancing digital literacy among the elderly. First, authorities must strengthen policy support for senior citizens' digital development by formulating targeted measures to ensure equal access and protection in the adoption, usage, and creation of technology. This includes introducing subsidies for digital device purchases to alleviate financial burdens while encouraging telecom providers and manufacturers to develop user-friendly products. Second, governments should enhance digital infrastructure development to ensure comprehensive network coverage and accessible services. The "Internet + Elderly Care" initiative will drive the establishment of innovative elderly care systems, enabling seniors to access convenient services while improving their digital literacy. Ultimately, increased public awareness campaigns are essential for dispelling fears and misconceptions about technology, promoting its importance and security, and promoting proper online behavior. These strategies will empower older adults to adopt digital lifestyles while maintaining active information literacy, enabling them to adapt to the evolving demands of the digital age.

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Acknowledgments

Not applicable.

Authors contributions

Not applicable.

Funding

Not applicable.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Sciedu Press.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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