Research on the Relationship Between Information Literacy Ability and Privacy Security of the Elderly Population under the Background of Digital Divide

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Abstract. In the current era of an aging population and the widespread popularity of smart products, the issue of privacy leakage faced by the elderly when using smart products has attracted much attention. However, research on the impact of age differences in information literacy on this issue is still lacking. This article takes WeChat as an example to analyze the role of this difference in privacy leakage among the elderly population and uses a combination of qualitative and quantitative methods to conduct a questionnaire survey of elderly people aged 60 and above. This article analyzes that the lower the information literacy ability of the elderly population, the higher the risk of privacy leakage; The lower the information literacy ability, the lower the awareness of privacy protection; The higher the frequency of social media usage, the lower the awareness of privacy protection. Based on this, it is proposed to carry out information literacy training for the elderly, guide the optimization of privacy settings on social media, and work together with all sectors of society to create an elderly-friendly digital environment, helping the elderly safely integrate into digital life and resolve privacy leakage issues.

Keywords: Information Literacy Ability, Privacy Security, Elderly Population, digital life.

1. Introduction

The digital divide is a global issue that refers to the gap in access to and use of information technology. This gap can exist between different social groups, but one significant manifestation is age differences. In recent years, China's population census data shows that the aging of the population has intensified, and society has entered the era of digital intelligence. However, for the elderly, it is difficult for them to quickly understand and use this technology, which puts them at a disadvantage in the digital world.

The elderly population has insufficient opportunities to access or use information infrastructure and inadequate information literacy capabilities. At the same time, the structural tension of social transformation has led to a digital divide among the elderly, which is reflected in three aspects: access gap, usage gap, and knowledge gap. In addition, the elderly population is more susceptible to privacy breaches and online fraud when using smart products due to unfamiliarity with the internet.

The concept of digital literacy, first proposed by Gilster, is the comprehensive ability to acquire, understand, organize, and critique digital information, focusing on individuals' behavior and abilities in a digital environment [1]. The concept of information literacy was first proposed by Paul Zurkowski at the National Commission on Libraries and Information Science (NCLS) in the United States, focusing on the comprehensive qualities of individuals in the information society. Although information literacy and digital literacy have different definitions, concepts, and frameworks, their connotations are the same. Therefore, papers related to digital literacy can be used as references.

The academic research on the information literacy and privacy security of the elderly mainly focuses on their social media use and bridging the digital divide. Xie Qiushan and others believe that elderly people need to integrate into the digital society due to their own survival, development, and social needs [2]. Yang Yahan found in her research that elderly people, due to their pursuit of higher-level needs, communicate with family and friends through social media, stay informed about current events, and pursue respect [3]. Liu Shuang et al. pointed out that the elderly population is unable to

learn online knowledge and finds it difficult to make timely changes to cope with the survival of the digital age [4]. The development of information technology has also brought about a new social governance problem of the information divide among the elderly population. Tan Xuenian believes that the elderly user group is prone to self-disclosure and privacy breaches in social network contexts, which may be due to their need for social network use and personal satisfaction [5]. It can be seen that it is extremely important to better protect the information privacy of elderly users on social networks.

Overall, the current focus on privacy and security issues for the elderly population in the context of the digital divide is mainly on exploring the digital divide and privacy protection for smart elderly care. Therefore, this article uses a questionnaire survey method to investigate the information literacy ability of the elderly population, focusing on studying the privacy protection issues arising from the impact of the digital divide on the elderly population.

2. Method and conclusion

2.1. Research design

2.1.1 Method objective

The survey method is a commonly used basic research method in scientific research. It comprehensively utilizes disciplinary methods such as observation to conduct a planned and thorough investigation of a phenomenon and analyzes and summarizes a large amount of collected data to provide regular conclusions for research. The most commonly used survey method is the questionnaire survey method, which distributes questions in the form of a table to relevant personnel to fill in their answers, and then collects, organizes, statistically analyzes, and studies them.

This study used a questionnaire survey method to randomly investigate the information literacy ability and information leakage issues of the elderly population in the era of the digital divide and sorted out the final data analysis rules to deeply analyze the relationship between the information literacy ability and privacy security of the elderly population.

2.2.2 Dimensional framework

In the context of the digital divide, Gu Lei et al.summarized and expanded relevant papers on specific content related to digital literacy [6]. Tan Xuenian found in his research that the frequency of elderly people using WeChat is generally higher [5]. Based on this, the independent variables of this study are information literacy ability and frequency of use of social media (such as WeChat). The dependent variables are privacy breach risk and privacy protection awareness, among which information literacy ability is mainly explored in this article through the ability to learn and discern information through social media. Based on the literature review, a privacy questionnaire survey was conducted to design two dependent variables: privacy leakage risk and privacy protection awareness.

2.2.3 Questionnaire composition

This study, based on the definition of the digital divide and the partial meaning of information literacy ability, analyzed and determined four dimensions of the information literacy framework for the elderly population through data collection and screening from multiple literatures, including information literacy ability, frequency of social media use, privacy disclosure risk, and privacy protection awareness. Zhou Yuqiong found that elderly people mainly use WeChat for social functions, and the duration and frequency of use are also relatively high [7]. Gu Lei et al. conducted a questionnaire survey and analysis on the level of digital literacy in their research, and Tan Xuenian conducted a survey and research on privacy breaches among the elderly population, forming a questionnaire scale on the information literacy ability and privacy security of the elderly population [5,6].

This study further adjusted the content of the questions based on the characteristics of the elderly population. The questionnaire consists of four parts. The first part of the questionnaire is a privacy

statement and basic information survey, collecting age options from respondents for the selection of subsequent valid questionnaires; The second part is a survey on the information literacy ability of the elderly population, consisting of four questions; The third part is a survey on the frequency of social media usage (such as WeChat) among the elderly population, consisting of three questions; The fourth part is a related investigation on privacy leakage issues, including leakage risks and protection awareness, with a total of 6 questions.

Referring to the scale design of Kuss, D.J. et al., this study proposes research hypothesis H1: the information literacy ability of the elderly population is negatively correlated with the risk of privacy breaches. Referring to the scale design by Van Deursen, A. J. A. M. et al., hypothesis H2 was proposed: the information literacy ability of the elderly population is positively correlated with their awareness of privacy protection. Referring to the scale design of B é langer, F. et al., research hypothesis H3: H3: The frequency of social media use among the elderly population is positively correlated with their awareness of privacy protection [8-10].

2.2. Distribution and collection of data

This study used both online and offline methods to distribute questionnaires and identified the research subjects as elderly people aged 60 and above, ensuring that the elderly population, regardless of whether they use social media or not, can receive the survey, enriching the scope of the survey, and ensuring the accuracy and scientificity of the data. Based on the characteristics of the elderly, the main methods of distribution and collection are offline collection, with personnel assisting online but not providing guidance, ensuring the autonomy and scientificity of the data.

The research questionnaire first used a pre-test method to evaluate the quality and accuracy of the survey questionnaire and made revisions and improvements based on the pre-test results. A total of 47 questionnaires were distributed, and 30 valid questionnaires were collected. The pre-test results showed that the results were consistent with the hypothesis. During the formal investigation, 202 questionnaires were distributed, and 138 valid questionnaires were collected.

2.3. Results

2.3.1 Reliability and validity analysis

The questionnaire survey results of this study were analyzed for validity and reliability using SPSS 26.0, and the composite reliability (CR) and Cronbach's Alpha test were used for consistency and reliability within the scale. When the value of the alpha coefficient is higher than 0.8, the data reliability is high; When the value of the alpha coefficient is between 0.7 and 0.8, it indicates good data reliability; When the value is between 0.6 and 0.7, the reliability is within an acceptable range; When the value is less than 0.6, the data lacks credibility.

Firstly, the survey results showed that the alpha coefficient obtained from the analysis of information literacy ability data was 0.719, indicating that the survey results have good credibility. The alpha coefficient of social media usage frequency (such as WeChat) is 0.633, indicating the credibility of the survey results. The alpha coefficient of privacy leakage risk is 0.815, which means that the data quality is very good. Indicating that the survey results have high credibility. The alpha coefficient of privacy protection awareness is 0.799, indicating a high level of credibility in the survey results.

Secondly, validity studies can be used to analyze whether research projects are reasonable, KMO values are used to determine the applicability of information extraction, and common values are used to exclude unreasonable research projects. When the commonality values of the research projects are all above 0.4, it indicates that the information on the research projects can be effectively extracted.

The KMO value of information literacy ability is 0.702, which is greater than 0.6, and the common values corresponding to all research projects are higher than 0.4, indicating that information can be effectively extracted. The KMO value of social media usage frequency (such as WeChat) is 0.589, ranging from 0.5 to 0.6, but the common values are all greater than 0.4, indicating moderate validity. The KMO value for privacy leakage risk is 0.692, ranging from 0.6 to 0.7, and the project

commonality values are all above 0.4, indicating high validity. The KMO value of privacy protection awareness is 0.695, which is greater than 0.6. The common values of the projects are all higher than 0.4, indicating that the data can be effectively extracted.

2.3.2 Relevant analysis

When studying the relationship between quantitative data, correlation analysis can be used to determine whether there is a relationship between dimensions and the degree of intimacy of the relationship.

Correlation analysis can be used to investigate whether there is a relationship between the research data and the degree of intimacy in the relationship.

As shown in Table 1, the information literacy and social media usage frequency of the elderly population are related to the risk of privacy breaches. Information literacy plays a crucial role in safeguarding the privacy of the elderly. Older people with strong information processing abilities can more effectively distinguish between false information and fraudulent network links and know how to use various technological means to manage their privacy settings, thereby significantly reducing the possibility of personal privacy being violated. In contrast, the elderly with weak information skills find it difficult to realize the privacy risks they may face and are more likely to leak personal information due to operational errors when using the Internet daily. Therefore, enhancing the information literacy of the elderly is not only crucial for maintaining their digital security but also particularly urgent.

Table 1. Correlation Analysis Results

variable	1 Information literacy ability	2 Social media usage frequency	3 Privacy leakage risk	4 Privacy awareness
1	1			
2		1		
3	0.520**		1	
4	0.521**	0.275**		1

3. Reasons and suggestions

3.1. Reasons for the impact of social media usage frequency on privacy protection awareness

The reason why elderly people's awareness of privacy protection is significantly affected when using social media is mainly due to the following reasons. Firstly, frequent participation in social media activities allows them to have more exposure to guidance on privacy settings and security protection. These pieces of information cover knowledge on how to adjust account privacy options to prevent unauthorized access to personal information, as well as how to identify and stay away from risky behaviors that may lead to data breaches, gradually establishing an understanding of the importance of privacy. Secondly, through social media, the elderly are also more likely to learn about real examples of privacy violations suffered by other users due to negligence. Such stories often leave a deep impression on them and prompt them to pay more attention to the security management of personal data. For example, once they discover that friends around them have had their personal information stolen and suffered economic losses due to clicking on insecure links, they will increase their vigilance and take proactive measures to ensure their online security.

3.2. Suggestions for enhancing information literacy capability to reduce privacy risks

In order to reduce the risk of privacy breaches for the elderly in the digital environment and improve their information processing skills, this article suggests starting from the following perspectives.

3.2.1 Conduct targeted training

Given the widespread problem of low information literacy and difficulty in identifying potential privacy risks among the elderly population, it is necessary for community organizations, elderly activity centers, and related institutions to offer specialized digital skills enhancement courses. These courses should cover knowledge points on how to identify false information and fraudulent links, such as introducing common fraud techniques and the characteristics of fraudulent links, to enhance the awareness of the elderly. In addition, they should be taught the correct methods of operating smart devices, including safe browsing of the internet, reasonable use of social media platforms, and other skills, so that they can not only master modern technology but also strengthen their self-protection ability in the digital environment.

3.2.2 Strengthen family and social support

In the process of improving the digital skills of the elderly, families play a crucial role. Family members, especially the younger generation, should actively and patiently impart knowledge on how to operate electronic devices to their elders and share best practices on personal data security maintenance to enhance their self-protection awareness. In addition, at the community level, volunteers can be mobilized to initiate support programs, provide personalized technical support services for the elderly, solve specific problems they encounter in daily use, and motivate them to actively integrate into the digital society, gradually improving their information processing abilities through practical experiences.

3.2.3 Measures to reduce the risk of privacy breaches

A series of preventive measures can be taken to address the privacy leakage risks faced by the elderly, especially those related to personal behavior habits and platform design characteristics.

Firstly, elderly people should cultivate effective habits of personal privacy protection. Regularly check the privacy settings of the account to ensure that personal information is limited to the necessary visible range, to prevent the leakage of sensitive information due to negligence. The Elderly should maintain a vigilant attitude towards information from unknown sources and not easily click on any suspicious links or reply to messages sent by strangers, to avoid personal information leakage due to improper operation. For example, when receiving an unknown link, it is recommended to confirm with family or trusted friends first and only take action after confirming that there is no risk. In addition, it is necessary to enhance awareness of privacy protection, actively pay attention to relevant security warnings, and actively learn relevant knowledge to improve self-protection capabilities.

Secondly, the design of social media platforms should prioritize user privacy protection. The primary measure is to set more reasonable and secure default privacy options to prevent sensitive information from being disclosed without consent, thereby reducing the risk of users accidentally leaking personal information [4]. For example, by default, key information such as the user's residential address and contact phone number are hidden and only made public when the user explicitly gives permission. In addition, it is necessary to enhance the platform's security protection mechanism by adopting advanced encryption technology and security systems to ensure the security of user data during transmission and storage. At the same time, the platform should regularly send notifications and educational materials on privacy protection to users, to enhance their awareness of privacy protection, guide them to use platform functions correctly and reduce the risk of privacy leakage.

4. Conclusion

In today's society, with the increasingly significant phenomenon of the digital divide, this study pays special attention to the elderly population and explores the relationship between information literacy and personal privacy protection. Research has found that the level of activity of elderly people on social media has a significant impact on their awareness of privacy protection. Elderly users who frequently participate in social media activities pay more attention to the security protection of

personal data because they are often exposed to reminders about privacy protection and real cases of others experiencing privacy breaches. This phenomenon indicates that actively participating in social media interactions can help enhance the awareness of privacy and security among the elderly, enabling them to better recognize potential threats to personal information in the digital environment.

In addition, this study reveals that the risk of privacy breaches among the elderly is caused by the mutual influence of personal behavior habits and platform design characteristics. On an individual level, developing the habit of regularly checking account privacy settings and staying alert to information from unknown sources is one of the key measures to effectively prevent privacy breaches. From the perspective of the platform, providing secure and reasonable default privacy settings, strengthening overall security protection mechanisms, and disseminating privacy protection knowledge to users also play an important role in reducing the risk of privacy breaches.

The significance of this study is to explore the relationship between information literacy ability and privacy protection in the context of the silver digital divide and to provide theoretical and data references for subsequent research in related fields. However, this study also has certain limitations, such as the limited sample size, which may not fully reflect the characteristics of elderly people. Future work could consider increasing the sample size and covering a wider range of regions and backgrounds for the elderly population while delving deeper into other potential influencing factors to provide support for developing more comprehensive and effective strategies, thereby enhancing the privacy protection awareness and skills of the elderly in the digital society and helping them participate in digital life more safely and confidently.

Authors Contribution

All the authors contributed equally, and their names were listed in alphabetical order.

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