Post-Print: Analysis of Current Research Status on Privacy Literacy at Home and Abroad

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Abstract

[Purpose/Significance] This paper analyzes the current state of privacy literacy research domestically and internationally, summarizes theoretical recommendations from academia, identifies gaps and deficiencies in existing studies, and provides references for future research. [Method/Process] Through content analysis of literature, this study identifies and summarizes themes that currently receive academic attention and have yielded certain research findings, including: the conceptualization of privacy literacy, measurement of privacy literacy, interactions between privacy literacy and other influencing factors, and the current status of public privacy literacy along with educational strategies. It further analyzes the domestic and international research status according to these four thematic categories. [Results/Conclusions] While privacy literacy research has made some progress, it remains in its infancy overall. Many divergent viewpoints and recommendations require consensus, research contexts and content need to be expanded, and research on privacy literacy education should be strengthened.

Full Text

Analysis of the Current State of Privacy Literacy Research at Home and Abroad

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Abstract:
[Purpose/Significance] This paper analyzes the current state of privacy literacy research both domestically and internationally, summarizes theoretical recommendations from the academic community, identifies gaps and deficiencies in existing research, and provides references for future studies. [Method/Process] Through content analysis of literature, this paper identifies four major themes

that have attracted academic attention and yielded research findings: the meaning of privacy literacy, measurement of privacy literacy, interactions between privacy literacy and other influencing factors, and the current state of public privacy literacy along with educational strategies. The paper further examines the research status from these four thematic perspectives. [Result/Conclusion] While progress has been made in privacy literacy research, it remains in its early stages overall. Many divergent viewpoints and recommendations require consensus, research contexts and content need expansion, and privacy literacy education should be strengthened.

Keywords: privacy literacy; privacy literacy scale; privacy literacy education; personal information
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Frequent personal information leaks and persistent privacy infringement incidents not only facilitate numerous fraud cases but also hinder various services such as online mental health help-seeking [1]. Governments worldwide are currently introducing or revising stricter personal information (privacy) protection laws and regulations, while various organizations and service activities are also strengthening self-discipline. However, in this battle for personal information protection, individual privacy literacy cannot be absent. Especially against the backdrop of continuously strengthening privacy self-management (informed consent) concepts in laws, regulations, and organizational practices, privacy literacy is key for individuals to judge and decide how to protect their own privacy and avoid infringing upon others' privacy. Simultaneously, developing privacy literacy education helps individuals make educated, rational choices beyond the veil of information technology [2] and serves as a foundation for developing information literacy [3]. Nevertheless, privacy literacy is an evolving proposition, and its current connotations, educational content, and evaluation boundaries and standards have not yet reached consensus in either academia or practice, remaining in the exploratory stage. This paper aims to summarize and analyze existing privacy literacy research at home and abroad to understand current academic viewpoints and recommendations and identify issues requiring further research.

1 Literature Acquisition and Overall Analysis

Currently, there is no unified term for the literacy of protecting personal privacy. Some use "privacy literacy," while others use "personal information protection literacy" or "personal information security literacy." This paper uniformly uses "privacy literacy" as the representative term. When collecting literature, the author adopted the broader 上位概念 "literacy" combined with "privacy" and its synonymous or similar terms "personal information," "personal data," and "personal profile" for retrieval. CNKI and WoS were selected as sources for Chinese and foreign literature respectively. As of February 29, 2020, over 200 relevant documents were retrieved from both systems.

Analysis using the respective citation analysis tools of CNKI and WoS revealed: (1) The growth curves of Chinese and English literature are remarkably similar, both emphasizing the study of personal privacy protection from a literacy perspective since the early 2000s, with publication volumes beginning to increase rapidly from 2014. In particular, publications from 2018 and 2019 accounted for approximately 35% of the total literature, with domestic and international research progressing almost synchronously. (2) Research primarily focuses on contexts such as the internet, social networks, big data, self-media, new media, healthcare, libraries, buildings, and personal knowledge management, with respondents including students of all ages, the elderly, and adults, reflecting that information technology has strongly impacted privacy protection across all groups. (3) Terms such as media literacy, data literacy, smartphone literacy, network literacy, information security literacy, information literacy, or element literacy appear frequently, demonstrating the close relationship between privacy literacy and these other literacies.

Through rapid reading of abstracts and full texts of the collected literature, although many studies address privacy protection awareness and capabilities, systematic research from a literacy perspective remains limited and incomplete. Based on these documents and supplemented by citation backtracking, over 60 in-depth Chinese and foreign literature sources on privacy literacy were ultimately obtained, primarily representing achievements from the past decade. The research content mainly concentrates on the meaning of privacy literacy, its measurement, interactions with other factors, the current state of public privacy literacy, and educational development strategies.

2 Definition of Privacy Literacy

In 2009, foreign scholars began explaining and using the term "privacy literacy." For instance, D. Rotman recognized privacy literacy as a subclass or supplement of digital literacy and considered it an educational framework aimed at cultivating users with privacy protection awareness and positive attitudes [4]. In the same year, J. Langenderfer et al., from economic and modern privacy rights perspectives emphasizing personal information control, proposed that "privacy literacy refers to consumers' understanding of the information environment they interact with and their responsibilities within that environment" [5]. Subsequently, B. Debatins noted that privacy literacy includes informed concern for privacy and strategies for protecting it [2]. C. Veghes et al. defined privacy literacy as the methods and abilities to evaluate the collection, processing, distribution, and use of personal data in digital environments [6]. These explanations of privacy literacy meaning involve privacy awareness and protection methods and capabilities but lack specific interpretation. Y.J. Park proposed that digital privacy literacy, as a form of user awareness, could be examined from three dimensions: familiarity with internet technology, awareness of institutional practices, and understanding of policies and regulations [7]. S. Trepte et al. considered online privacy literacy to primarily refer to knowledge

of personal data protection and strategies for personal data protection [8]. According to C.L. Wissinger, in 2015 C.L. Givens proposed that "privacy literacy is an individual's level of understanding and awareness of how information is tracked and used in online environments and how information retains or loses its private nature" [9-10]. Most recently, S. Rosenthal et al. suggested that privacy literacy includes understanding task-based information use, with the conceptual definition focusing on understanding responsibilities and risks associated with online information sharing, meaning privacy literacy is closely integrated with critical thinking [10].

In terms of explaining privacy literacy capabilities, there is increasing emphasis on understanding privacy protection knowledge and data institution privacy policies, with more specific descriptions of strategies and abilities for managing personal data. Overall, understanding of privacy literacy connotations continues to enrich but requires further exploration to form authoritative, consensus-reaching conceptual explanations.

3 Measurement of Privacy Literacy

Current literature on privacy literacy measurement primarily comes from foreign sources, with some proposing privacy literacy measurement scales and others providing only measurement items.

3.1 Construction of Privacy Literacy Measurement Scales

M. Kezer, L. Baruh, and S. Rosenthal et al. provided measurement items expressing privacy literacy content in their privacy protection research. M. Kezer et al. listed eight true/false questions about internet and online privacy statement knowledge to measure respondents' online privacy literacy when examining its moderating effect as an intermediate variable [15]. L. Baruh et al. employed meta-analysis to explore privacy literacy's role as a predictor of social network users' privacy protection measures, proposing 21 question items as user privacy literacy measures, including aspects of awareness, knowledge, experience, and practice [16]. S. Rosenthal et al. designed measurement items for privacy literacy when studying its influence on other factors such as trust and privacy concern, covering mobile app personal data sharing, deletion, location tracking, collection, and intrusion [11]. In summary, the items provided in these articles are enumerative without content categorization, focusing on knowledge measurement of privacy literacy with less measurement of capability and awareness, and rarely mentioning legal knowledge.

C. Veghes, B. Morrison, Y.J. Park, S. Trepte, P.K. Masur, and M. Weinberger et al. proposed specialized privacy literacy measurement scales with first-level dimensions and second-level question items, as shown in Table 1 .

Table 1 Summary of Privacy Literacy Measurement Scale Content Items from Existing Literature

Scale	Content Items Description
C. Veghes et al. [6] Privacy Literacy Measurement Scale	5 dimensions with 49 question items: weight of personal data protection; weight of relational data protection; weight of personal data protection rights; weight of major risks; weight of public institutions providing appropriate protection
B. Morrison [17] Privacy Knowledge Scale	2 dimensions with 13 question items: Subjective privacy knowledge scale: 3 questions evaluating organizations' collection and management of personal information and users' mastery of their own information collection and management; Objective privacy knowledge scale: 10 true/false questions examining users' judgments about the correctness of organizations' collection, access, and use of personal information and their awareness of their own rights
Y.J. Park [7] Digital Privacy Literacy Dimensions	3 dimensions with 16 question items: Technical familiarity (1 subjective rating item on a 6-point scale): including internet basics, privacy risks, privacy protection awareness (P3P); Institutional practice awareness (8 true/false knowledge items); Privacy policy understanding (7 true/false knowledge items)
S. Trepte et al. [8] Online Privacy Literacy Scale (OPLIS)	5 dimensions with 113 question items: knowledge about organizations, institutions, and online service providers' practices; knowledge about online privacy and data protection technologies; knowledge about German online data protection laws and legislation; knowledge about European directives on privacy and data protection; knowledge of users' personal privacy management strategies
P.K. Masur et al. [18] Online Privacy Literacy	4 dimensions with 20 question items: institutional practices; data protection technologies; data protection laws; data protection strategies
M. Weinberger et al. [19] Online Privacy Literacy Level Measurement	2 dimensions with 26 question items: Technical online privacy literacy level: knowledge level and usage level of privacy-enhancing tools; Social network privacy literacy level: reflecting trends of not submitting personal details or submitting false information when accessing websites

3.2 Analysis of Privacy Literacy Measurement Research

Analysis of the privacy literacy measurement scale content from the literature referenced in Table 1 reveals three characteristics: (1) Different perspectives and measurement methods have emerged, indicating scholars recognize that privacy literacy measurement requires multi-dimensional examination covering

subjective, objective, technical, social, legal, and institutional aspects. However, academic research has not yet formed authoritative conclusions and requires further discussion to reach consensus. (2) Earlier scales, such as those by C. Veghes, Y.J. Park, and B. Morrison, emphasized subjective self-assessment [6-7,17]. Later scales by S. Trepte and P.K. Masur drew on these perspectives and added measurements of legal knowledge and users' personal privacy management strategies. P.K. Masur and S. Trepte belong to the same research team, with their measurement scales being essentially identical, though P.K. Masur's terminology is more general and broader in coverage, merging the third and fourth items from S. Trepte's scale into one: data protection laws [8,18]. (3) All privacy literacy measurement scales proposed since 2013 focus on internet contexts, highlighting the importance of privacy literacy online and scholars' emphasis on this area. Compared to earlier scales, they added measurements of users' mastery of internet technologies and online privacy management strategies, which can supplement general privacy literacy measurement scales.

Examining the research contexts of scholars' design and investigation reveals they primarily survey internet users in Europe, America, Canada, Israel, Romania, and other developed countries, focusing on business environments, new media usage, and social environments. C. Veghes et al. defined and designed privacy literacy measurement scales within a marketing application environment, using "personal data" terminology, surveying young and middle-aged Romanian citizens, calculating weights for each dimension and question item, and measuring respondents' privacy literacy status [6]. B. Morrison also conducted research from consumer and market relationship perspectives, where subjective knowledge (SK) items adopted economist Carlson's 2007 proposed content items for measuring subjective knowledge in market relationships, and objective knowledge (OK) items were constructed by modifying privacy test items published on the website of the Office of the Privacy Commissioner of Canada (OPC), with Canadian citizens as survey subjects [17]. Y.J. Park examined users' skills and abilities to control personal information in new media usage (technical and social aspects), with American adult internet users as survey subjects [7]. S. Trepte et al. and P.K. Masur et al., as a research team, examined differences between online privacy attitudes and behaviors in various network environments. Their scale design included the most dimensions and question items, arguing that a comprehensive online privacy literacy scale should include objective knowledge questions (declarative knowledge) and questions considering online data protection capabilities and strategies (procedural knowledge). When constructing measurement scales, this research team conducted content analysis using five types of texts: relevant articles, project results, news, EU and German regulations, and online service provider privacy policies, considering issues very comprehensively. Their research spanned three years, so when publishing in 2017, they revised and validated the scale from their 2015 publication, noting that continuous internet innovation requires users to constantly understand new data flow methods and new online privacy control strategies, necessitating periodic review and further development of online privacy literacy

measurement scales. Their survey subjects were German internet users [8,18]. M. Weinberger et al. examined gender differences in attitudes toward online privacy and anonymity among Israeli students, with relatively specialized research contexts and subjects—a methodology that subsequent research can 借鉴 to design different privacy literacy measurement scales for different contexts and user groups [19].

4 Interaction Between Privacy Literacy and Other Influencing Factors

Deng Shengli et al. summarized influencing factors of online privacy literacy including individual knowledge level, internet usage experience, socioeconomic status, motivational factors, interest factors, and privacy concern [12]. This paper's summarized influencing factors partially overlap but differ in specifics, including privacy protection facility usage, privacy concern, online surveillance awareness, privacy self-efficacy, online service acceptance, personalized service acceptance, internet experience, learning (privacy knowledge level and learning effort), and sociodemographic characteristics. Research on interactions between privacy literacy and other factors includes its role as independent or moderating variables affecting other factors, and as a dependent variable influenced by other factors.

4.1 Privacy Literacy as Independent or Moderating Variable

Current research shows different results regarding privacy literacy as an independent variable affecting security perception factors. For example, M. Bartsch et al. and S. Rosenthal et al. both studied Facebook and its users but reached different conclusions: the former found that online privacy literacy positively affects security perception on social networking sites like Facebook [20], while the latter concluded that individuals with higher privacy literacy better understand the limitations of privacy protection and thus have lower trust in Facebook and data institutions [11].

Existing research agrees that privacy literacy as an independent or moderating variable positively affects privacy protection setting usage, privacy concern, online surveillance awareness, and privacy self-efficacy. For instance, Y.J. Park, L. Baruh, and M. Bartsch et al. all demonstrated that privacy literacy positively affects privacy protection measure usage [7,16,20]. Zhang Xuebo et al. also proposed that individuals who are concerned and have clear awareness of social network security will be stricter about privacy protection and personal information disclosure [21]. L. Baruh et al., M. Weinberger et al., and J. Bernadas et al. all confirmed positive correlations between privacy literacy and privacy concern. Additionally, J. Bernadas et al. found that as a moderating variable, higher privacy literacy reduces the negative impact of privacy concern on trust variables (trust in Facebook and trust in data institutions) and Facebook information personalization acceptance variables [16,19,22]. M. Weinberger et

al. also found that privacy literacy positively correlates with online surveillance awareness and privacy self-efficacy [19].

Research shows that privacy literacy has opposite effects on online service acceptance and personalized service acceptance. For example, L. Baruh et al. through meta-analysis demonstrated that privacy literacy significantly positively affects intention to use online services [16], while S. Rosenthal et al. argued that privacy literacy negatively affects personalized services [11]. This indicates that improved privacy literacy helps users accept online services but reduces acceptance of personalized services, posing challenges for the development of personalized services (both online and offline).

4.2 Privacy Literacy as Dependent Variable Influenced by Other Factors

Existing research agrees that internet experience and learning positively affect privacy literacy. For example, Y.J. Park, M. Bartsch, and J. Bernadas et al. all demonstrated that internet experience significantly positively affects online (digital) privacy literacy, believing that online experience and practice can cultivate cautious online privacy behavior [7,20,22]. J.M. Urban et al. conversely argued that low privacy knowledge levels relate to lack of effort in protecting privacy [23].

Research on how privacy literacy is affected by sociodemographic characteristics shows diverse results. For example, Y.J. Park found that gender only affects the technical dimension of privacy literacy with minimal impact on the social dimension, with male users having higher technical online privacy literacy than female users. Age significantly affects privacy literacy, with older adults being less proficient in privacy control than younger people, while income and education level have minimal impact on personal information control capabilities and behaviors [7]. M. Weinberger et al. also studied gender characteristics, reaching the same conclusion as Y.J. Park [19]. M. Kezer et al. studied age characteristics, reaching a different conclusion from Y.J. Park, finding no significant differences in online privacy literacy across age groups [15].

Overall, improved privacy literacy significantly positively affects individuals' privacy protection capabilities and efficacy perception, while internet experience and learning help improve personal privacy literacy. Based on existing research findings, special attention should be paid to enhancing privacy literacy among women and older adults. Additionally, some studies show different or varying results that require further verification. Some conclusions are only mentioned in single articles and need more research for validation. Examining the research subjects in these studies, which include developed countries like the United States and Israel, developing countries like the Philippines, and cross-national user surveys, results do not differ by country. However, due to the limited literature volume, whether and to what extent national environments affect privacy literacy requires comparative analysis of future research findings from

citizens of different countries.

5 Public Privacy Literacy Status and Privacy Literacy Education

5.1 Investigation and Analysis of Public Privacy Literacy Status

Many collected relevant documents contain analysis of public or specific users' privacy literacy status. These analyses show that while users have some privacy protection awareness and capabilities, overall privacy literacy remains insufficient. For example, in 2006, American users self-reported more personal information when using Facebook [11]. In 2012, Canadian users' subjective privacy knowledge scores were generally low, with only 26% of users rating their knowledge highly, and many users scoring zero on objective privacy knowledge [17]. In 2013, most American internet users had low familiarity with basic technical terminology, over 40% misunderstood the most basic aspects of institutional data practices, and only 1.9% of respondents answered all policy-related knowledge points correctly [7]. In 2019, nearly 29% of young parents in China avoided disclosing personal real information when using websites [26]. Comparatively, the elderly, women, and young parents have weaker privacy literacy. Both the elderly and women have strong privacy protection awareness but lack privacy protection capabilities, directly leading to their rejection of information services like mobile healthcare and women's tendency to report false information [7,11,17,24-26]. Additionally, many articles on media literacy argue that media users, especially students, lack understanding of modern information media, particularly new media and self-media, and have insufficient awareness and precaution against media dissemination and privacy leakage. However, among collected documents, interview survey results of German citizens showed: "Most participants managed privacy on social networking sites by minimizing data, blocking others, being unfriendly, and reducing friend requests, reflecting increasing awareness of privacy issues in digital technology" [3]. Moreover, before conducting interviews, the authors submitted their interview outlines and activities to the university ethics committee for review and approval. Both the survey results and researchers' behavior demonstrate relatively high overall privacy literacy among German citizens. Whether this phenomenon relates to Germany's emphasis on individual rights and its strict privacy protection laws requires comparative case studies across different national legal environments.

5.2 Strengthening Privacy Literacy Education

In response to low user privacy literacy, scholars have proposed two main categories of privacy literacy education recommendations:

5.2.1 Strengthening Specialized Privacy Literacy Education Current scholars' recommendations for strengthening specialized privacy literacy education can be divided into two major categories: (1) Collaboration between

education departments and cybersecurity, informatization, and other relevant departments, or utilizing National Cybersecurity Awareness Week for multi-departmental coordination to conduct privacy literacy education. Simultaneously, users should actively learn privacy literacy and information security knowledge and change their internet usage habits, particularly young parents and other guardians who should change privacy disclosure habits when displaying children's images and exercise restraint in information sharing [26-28]. (2) Increasing privacy literacy education content in school library information literacy education. For years, university libraries have universally offered information literacy courses for the entire school, with increased personal privacy protection content in recent years. For example, in 2015, the Association of College & Research Libraries (ACRL) newly promulgated the *Framework for Information Literacy for Higher Education*, which integrates information literacy with various emerging literacies such as media literacy and digital literacy, endowing it with element literacy connotations and emphasizing capability cultivation. It proposes cultivating information-literate learners who are fully aware of issues related to privacy and personal information commodification and make wise choices about their online behavior [29-30]. Many corresponding information literacy textbooks or monographs published in China in recent years have added or enriched privacy protection content. For example, Pan Yantao et al.'s 2019 *Information Literacy General Course* includes a dedicated section on "Personal Information Protection" [31], which is used for a national quality course of the same name also offered on China's University MOOC platform, making it highly influential. (3) Developing privacy literacy education content. Literacy education content typically includes awareness, knowledge, and capability aspects, and privacy literacy education is no exception. Many papers discuss this, but few provide specific educational content. Currently, D. Rotman proposed a privacy literacy education framework for social network site users, including understanding privacy contexts, identifying information disclosure platforms, understanding sharing implications, evaluating privacy risks, and deciding on sharing behaviors [4]. Pan Yantao et al. set personal information protection course content including: preventing personal information leakage, cautious use of public devices, secure use of mobile phone apps, and password hierarchy management [31]. (4) Strengthening teachers' personal information literacy. For example, librarians producing information literacy courses on MOOCs should strengthen their own personal information literacy and respect teachers' and students' personal privacy [32]; cultivating primary school teachers' big data ethics and privacy protection literacy [33].

5.2.2 Network Products Should Be Simplified and Include Privacy Setting Help Functions Product help functions inherently possess educational and teaching capabilities. Privacy setting help functions are practical privacy literacy education tools for most users, especially the elderly or other non-school personnel. Scholars point out that designers of network products, especially mobile applications, should investigate and master the "privacy knowl-

edge gap" among users of different age groups, demonstrate good inclusiveness, promote standardization of privacy setting functions to reduce users' understanding costs, provide detailed explanatory functions in privacy settings that are easily accessible, and ensure privacy devices are convenient for users to adjust [24-25].

6 Conclusions and Implications

Overall, with the continuous development and widespread application of information technology and various media, and with increasingly serious personal information and privacy leakage phenomena, higher requirements are placed on individual privacy literacy. While certain research has been conducted on privacy literacy itself and privacy literacy education both domestically and internationally, authoritative conclusions or consensus remain lacking, and research content scope needs further expansion.

6.1 Privacy Literacy Connotations Should Also Emphasize Awareness and Capability to Protect Others' Privacy

For example, in early February 2020 during China's fight against COVID-19, some individuals disseminated personal information of people returning from Wuhan across multiple WeChat groups. Although this behavior was quickly stopped, it raised a critical question: how to improve public privacy literacy so that the public has the awareness and capability to protect public safety and their own safety without infringing on others' privacy.

6.2 In-Depth Research on the Relationship Between Privacy Protection Laws and Privacy Literacy Content and Measurement

Current privacy literacy measurement content emphasizes individuals' understanding of privacy protection laws and regulations. Whether and how this understanding should consider impacts from different national laws requires researchers' answers. Additionally, the relationship between privacy literacy connotations and measurement standards and laws' requirements for individual privacy self-management and constraints on personal information processors requires in-depth investigation.

6.3 In-Depth Research on Strengthening Privacy Literacy Education in Information Literacy Education

In educational practice, privacy literacy education can take multiple forms, among which school information literacy public courses are important platforms. The author examined various information literacy textbooks published in recent years and interviewed some library instructors. Currently, many information literacy courses include privacy protection content in information ethics and morality chapters, but some phenomena remain underemphasized, with relatively thin content. For example, on China's University MOOC platform, there

are approximately 25 information literacy courses, and examining these courses' teaching catalogs or outlines reveals that only the "Information Literacy General Course" mentions privacy protection content as a complete section.

6.4 Strengthening Privacy Literacy Research in All Scenarios

Currently, researchers focus primarily on social networking scenarios and e-commerce scenarios. Regardless of the scenario, privacy leakage may occur and privacy protection is needed. Moreover, many information activities now involve online-offline 联动 operations. Therefore, research on privacy literacy and its improvement strategies across various scenarios should be strengthened.

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Note: Figure translations are in progress. See original paper for figures.