Development and Empirical Study of the Personal Archiving Dilemma Scale: Postprint

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Abstract

[Purpose/Significance] The personal archiving dilemma refers to an emotional state of confusion, indecision, or anxiety experienced by individuals when confronting how to effectively preserve personal archives. Scientifically measuring the main dimensions and their degrees of this dilemma contributes to improving personal archiving rules, tools, and environments, enhancing personal archiving efficiency, and alleviating the sense of predicament. [Method/Process] Drawing upon relevant research findings in domains such as personal archiving challenges and dilemmas, and based on the "Challenges and Relationship Model for Personal Archiving" established in prior research, this study constructs a measurement scale for personal archiving dilemma. The scale, after optimization and revision, demonstrates satisfactory reliability and validity, and serves as an assessment tool for personal archiving dilemma. The assessment of the public's personal archiving dilemma is conducted across five dimensions: insufficient motivation, digital anxiety, tool scarcity, rule absence, and archival ocean. [Results/Conclusion] The research indicates that the public's personal archiving dilemma is at a moderate level, exhibiting characteristics such as: the sense of dilemma intensifies with age; the sense of insufficient motivation strengthens with lower education levels; digital anxiety intensifies with higher education levels; and individuals with an archival science background experience a lower sense of rule absence than those without. The study proposes alleviating the degree of personal archiving dilemma through approaches including improving personal archiving rules, developing personal archiving tools, enhancing public archival literacy, and conducting personal archiving research.

Full Text

Development and Empirical Study of a Personal Archiving Dilemma Scale

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Abstract

[**Purpose/Significance**] Personal archiving dilemma refers to a state of confusion, being overwhelmed, or anxiety that individuals experience when facing how to effectively preserve personal archives. Scientific measurement of the main dimensions and extent of personal archiving dilemma can help improve the rules, tools, and environment for personal archiving, enhance personal archiving efficiency, and alleviate the sense of dilemma. [**Method/Process**] Drawing upon relevant research findings in the fields of personal archiving challenges and dilemmas, and based on the "Challenge and Relationship Model of Personal Archiving" developed in previous research, this study constructs a measurement scale for personal archiving dilemma. The optimized and revised scale demonstrates good reliability and validity, serving as an evaluation tool for personal archiving dilemma. The scale assesses the public's personal archiving dilemma from five dimensions: lack of motivation, digital anxiety, lack of tools, lack of rules, and archive ocean. [**Result/Conclusion**] The research indicates that the public's personal archiving dilemma is at a moderate level, showing characteristics such as: the older the age, the stronger the sense of dilemma; the lower the education level, the stronger the sense of lack of motivation; the higher the education level, the stronger the sense of digital anxiety; and those with an archival science background have a lower sense of rule deficiency than those without such background. The study proposes alleviating personal archiving dilemma by improving personal archiving rules, developing personal archiving tools, enhancing public archival literacy, and conducting personal archiving research.

Keywords: personal archiving; archiving dilemma; measurement scale
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The phenomenon of individuals preserving certificates, photographs, diaries, manuscripts, documents, audio-visual materials, and other file materials related to themselves is very common, though it has not attracted researchers' attention for a long time. It was not until humanity entered the information society, when the generation, storage, and dissemination of personal file materials became exceptionally convenient and various types of personally valuable file materials grew exponentially, that the challenge of how to effectively store and conveniently retrieve personal archives gradually became a difficult issue to handle, attracting attention from scholars in information management, library and information science, and archival science. Recent studies have found that personal

archiving faces numerous dilemmas such as "benign neglect" [?], digital management, distributed storage, convenient storage and appraisal, rapid retrieval and location, software and hardware obsolescence, and carrier degradation [?]. However, specialized research is rarely seen on whether this dilemma is universal and how the public perceives it, and no measurement tools have been designed for this topic. The public's understanding, feelings, and expectations regarding personal archiving behavior are important foundations for studying personal archiving behavior, developing personal archiving tools, and providing professional guidance. Therefore, this study draws upon relevant research findings in the fields of personal archiving challenges and dilemmas, and based on the "Challenge and Relationship Model of Personal Archiving" formed in previous research [?], adopts quantitative research methods to construct a personal archiving dilemma measurement scale and measure the public, aiming to identify the main dimensions and extent of public personal archiving dilemma, and provide necessary theoretical and empirical basis for understanding public personal archiving behavior mechanisms and developing personal archiving tools and professional guidance.

2 Literature Review

In the information and network era, the issue of personal archiving has gradually attracted academic attention. Researchers in information management tend to study personal archives from a technical perspective, focusing on acquisition, classification, management, and retrieval [?] to serve product and service development [?], believing that tools and technology can save time and improve accuracy in personal archiving [?]. Researchers in library and information science and archival science, on the other hand, explore personal archiving more from the perspectives of motivation and value [?], intention [?], behavioral characteristics [?], influencing factors [?], and the responsibilities of libraries, archival institutions, and experts [?, ?], while also paying attention to the dilemmas and challenges faced by personal archiving, which can be roughly summarized in the following three aspects.

2.1 Personal Archiving Cognition and Behavior Capability

Researchers have found that personal archiving generally faces problems such as lack of knowledge and skills, insufficient awareness [?], and "benign neglect" that lacks practical action [?]. People are unwilling to invest time and energy in managing personal digital archives [?], and even when they realize that personal digital archives stored on the internet will be lost, they will not take any measures to preserve them [?]. For example, D. Becker and C. Nogues found that writers' personal digital archives were in a state of neglect, highly dispersed, and unsystematic [?]. Other studies have found that although some individuals designed their own backup and preservation strategies, they often found it difficult to persist in implementation [?], and due to lack of professional knowledge and unfamiliarity with preservation methods [?], they were very prone to digital

archive loss [?]. In short, existing research indicates that the public is generally in an awkward situation of being conscious but lacking capability and action regarding personal archiving.

2.2 Digital Personal Archives Preservation and Access

Existing research suggests that the dispersed preservation, multi-source and heterogeneous characteristics, and low sustainability of digital storage media have brought enormous difficulties and challenges to personal archiving, with long-term access being the most urgent issue to solve [?]. Some studies have found that while informatization and networking have made personal digital archives easier to store and access, they have also made them more prone to loss [?], and either operational errors or poor preservation can cause irreversible loss [?]. Additionally, software and hardware obsolescence and carrier degradation pose external challenges to the long-term preservation of digital materials [?]. Therefore, some researchers have summarized the challenges facing personal digital archiving into four aspects: effective digital management, distributed storage, convenient access and appraisal, and rapid retrieval and location [?].

2.3 Networked Personal Archives Security and Inheritance

Researchers believe that a large number of personal digital files stored on network platforms are usually beyond the control of the archiving individuals [?], and the protection of personal privacy and information security in archive content faces challenges [?]. Worse still, existing social media, network cloud storage, email, and literature management software platforms more or less have some functions for storing or organizing personal archives, but they are not archival institutions [?] and are not responsible for consequences such as information loss or distortion [?]. Network service providers have not yet developed fully functional personal archiving network platforms [?]. In addition, researchers have also paid attention to the issue of how to inherit personal archives stored in cyberspace after an individual's death [?]. In other words, existing research shows that the public is still not reassured and is full of anxiety about personal archives stored on the internet.

Although no specialized scales or other measurement tools have been found in existing literature for personal archiving dilemma and related topics, the rich research on dilemmas or challenges faced by personal archiving provides important reference value for constructing the dimensions and item design of the personal archiving dilemma scale in this study.

3 Scale Construction

3.1 Scale Item Development

Based on existing research findings and the four challenges of personal archiving (lack of motivation, lack of norms and tools, archive ocean, and digital anxiety)

identified in our previous research [?], the scale was initially designed with four dimensions:

(1) **Lack of Motivation** refers to individuals' lack of incentives or motivation to actively implement personal archiving. Existing research has found phenomena such as unwillingness to invest time and energy in management [?, ?], lack of initiative in action [?], lack of motivation [?], difficulty in persisting with backup and preservation [?], lack of time and professional skills [?], and absence of institutional drivers such as economic value creation or supervision and assessment [?]. Therefore, this dimension mainly designs items around action motivation, institutional drivers, time and energy investment, and professional skills.

(2) **Lack of Norms and Tools** refers to the absence of standardized personal archiving business rules or standards for public reference, as well as the lack of tools that can assist in managing personal archives. Existing research has found that the public lacks personal archiving methods [?], is unfamiliar with preservation approaches [?], that network service providers have not yet developed fully functional network platforms [?], and that there is a lack but urgent need for business rules or guidelines that can provide guidance [?]. Therefore, this dimension mainly designs items around archiving business rules and methods, personal archiving network platforms, and automated personal archive management.

(3) **Archive Ocean** refers to the difficulties in preservation, retrieval, and location caused by the massive growth of various types of personally valuable files in the information society. Existing research has found that highly dispersed and unsystematic marking has become a difficulty in personal digital archive management [?, ?], that organizing too many personal archives wastes time and energy [?], and that as personal archive scale grows, the public generally encounters dilemmas such as limited space, insufficient time and energy, and retrieval difficulties [?]. Therefore, this dimension mainly designs items from perspectives of storage space, massive quantity, and retrieval and location.

(4) **Digital Anxiety** refers to the distrust and anxiety caused by uncertainty about the integrity, security, and inheritance of personal digital archives. Existing research has found that personal privacy and information security protection face challenges [?], that personal archives stored on network platforms have information leakage risks [?], and that there are concerns about inheritance of personal archives on network platforms [?, ?]. Therefore, this dimension mainly designs items around synchronization and backup difficulties, privacy leakage, archive security, and inheritance.

To ensure scale reliability [?], a certain degree of redundancy was maintained when developing initial items, resulting in a pool of 34 items. Five experts in the field were then invited to provide suggestions on the clarity of expression and appropriateness of dimensions for the items in the pool. Based on expert

feedback, items were modified, deleted, merged, or added. The scale was finally preliminarily developed with 26 items across four dimensions.

3.2 Initial Scale Testing and Item Analysis

3.2.1 Initial Questionnaire Distribution and Recovery The items to be tested were compiled into a questionnaire using a 7-point Likert scale format. According to the principle that "the number of pretest subjects should be 3-5 times the number of items in the subscale with the most questions" [**?**], this study used the Wenjuanxing platform to randomly distribute questionnaires to the public via WeChat starting on April 17, 2020. Distribution stopped when 200 responses were collected on April 26. All 200 recovered questionnaires were valid, and the data were analyzed using SPSS.

3.2.2 Item Analysis The main purpose of item analysis is to test the appropriateness and reliability of the developed scale, explore differences between high and low scorers on each item, and conduct homogeneity tests among items. This study referenced general item analysis standards in scale development to analyze all predicted items [**?**].

First is the extreme groups comparison, using the top 27% (54 participants) and bottom 27% (54 participants) of total scores to form high and low groups, followed by independent samples t-tests. In scale item analysis, the critical t-statistic value is generally set at 3, with a stricter standard of 3.5. Results showed all items met the criteria (see).

Second is the "item-total correlation" analysis, which includes "item-total correlation" and "corrected item-total correlation" values. If the correlation coefficient between an individual item and the total score is not significant or shows low correlation (correlation coefficient less than .4000), it indicates low homogeneity between the item and the overall scale, and the item should preferably be deleted. Analysis results showed all items met the criteria (see).

Finally, homogeneity tests include three main indicators. The first is the internal consistency coefficient alpha value after item deletion, which examines changes in the scale's reliability coefficient after deleting an item. If the true reliability coefficient after deleting an item is much higher than the original reliability coefficient (the scale's α is .954), the item may measure a different attribute than the remaining items and should be considered for deletion. The second is communality, which represents the amount of variance in the common attribute that an item can explain. Higher communality values indicate greater measurement of this attribute; generally, if the communality value is below 0.20, the item's relationship with the common factor is not close and can be considered for deletion. The third is factor loading, equivalent to regression weights in regression analysis, where larger values indicate closer relationships between items and common factors. In item analysis, items with factor loadings below 0.45 can be considered for deletion. Results showed all items met the criteria

(see). Therefore, no items were deleted in the initial item analysis.

3.3 Exploratory Factor Analysis of the Scale

KMO test and Bartlett's test were used to explore the feasibility of factor analysis. According to the evaluation criteria for KMO indicators proposed by H.F. Kaiser and J. Rice, KMO values above 0.80 are suitable for factor analysis [**?**]. The larger the Bartlett's test statistic, the lower the significance level, indicating greater possibility of factor structure existence. The scale's KMO statistic value was 0.930, and Bartlett's test value was 4936.306, with significance level <0.001, indicating the data were suitable for factor analysis.

Exploratory factor analysis was conducted on 26 items using principal component analysis to extract common factors and form a factor loading matrix. With the goal of retaining 3-6 measurement items per construct and controlling the total number of scale items around 20, repeated attempts were made, finally retaining 16 items. Factor analysis of these 16 items showed a KMO statistic of 0.894 and Bartlett's test value of 2829.867, with significance level <0.001, indicating these 16 items had common factors and the data were suitable for factor analysis.

A scree plot test was conducted on the items. In scree plots, if the factor variance graph shows a transition from slope to flat, the common factors after the flat state can be removed [**?**]. In [Figure 1: see original paper], five factors lie on the slope, and from the sixth factor onward, the slope becomes flat, thus retaining five factors is appropriate.

Principal component analysis extracted five key factors with cumulative explained variance reaching 83.964%, indicating good factor analysis results (see).

Maximum variance method was used for factor rotation. The rotated component matrix is shown in , revealing that the scale contains five factors with clear factor structure and relatively even item distribution. All item factor loadings were greater than 0.8, with 14 items having factor loadings above 0.75. Compared with the initially formed scale dimensions, one dimension was added, with the original "lack of norms and tools" splitting into "lack of tools" and "lack of rules." The final formal scale consists of five dimensions (lack of motivation, digital anxiety, lack of tools, lack of rules, and archive ocean) with 16 items (see).

4 Scale Validation

The 16 measurement items were compiled into a questionnaire using a 7-point Likert scale (strongly disagree, disagree, somewhat disagree, neutral, somewhat agree, agree, strongly agree). Random sampling was conducted from May 15-29, 2020, through a Wenjuanxing questionnaire distributed mainly through the

researchers' WeChat Moments, QQ groups, and Wenjuanxing's paid recommendation service. A total of 687 valid questionnaires were recovered.

4.1 Reliability Analysis

Reliability refers to the stability and consistency of results measured by the scale tool. The commonly used reliability test method in Likert attitude scales is Cronbach's alpha coefficient. The higher the reliability of a scale, the more stable it is. According to DeVellis, alpha coefficients below 0.60 are unacceptable; 0.60-0.65 are not good enough; 0.65-0.70 are minimally acceptable; 0.70-0.80 are good; 0.80-0.90 are very good; and much above 0.90 should consider shortening the scale [**?**]. The alpha coefficient for the entire scale was 0.912, indicating excellent reliability. The lack of motivation dimension was 0.841, digital anxiety 0.798, lack of tools 0.839, lack of rules 0.896, and archive ocean 0.739, all within good coefficient ranges.

4.2 Validity Analysis

Validity refers to the degree to which a test can measure the intended psychological or behavioral traits [**?**]. This study used correlation analysis and confirmatory factor analysis for examination. Correlation analysis results are shown in and . Each item had a significant correlation with the total scale score, and correlations among scale dimensions and between dimensions and total scale were all significant. This shows close relationships between each item and the total scale, among dimensions, and between dimensions and total scale, indicating good construct validity.

This study used AMOS 24.0 to construct a model and test the fit between data and hypothesized factor structure. As shown in [Figure 2: see original paper], the model is identifiable, with positive residual variances in the standardized estimated measurement model, indicating no improper parameter estimates. The model fit chi-square value was 280.921 (p=.000) with 94 degrees of freedom, and the chi-square to degrees of freedom ratio (CMIN/DF) was 2.989, meeting the absolute fit criterion of less than 3.00. The goodness-of-fit index (GFI) and adjusted goodness-of-fit index (AGFI) were 0.949 and 0.926 respectively, meeting the absolute fit criterion of greater than 0.90. The root mean square error of approximation (RMSEA) was 0.054, indicating reasonable model fit. The root mean square residual (RMR) was 0.110, indicating average model fit. Thus, the hypothesized factor structure is within acceptable range with basic structural validity, and this structure can be used for further analysis.

5 Measurement Results Analysis

5.1 Overall Status of Personal Archiving Dilemma

Statistical results (see) show that the mean score for personal archiving dilemma among the study participants was 4.902, indicating the overall personal archiv-

ing dilemma is at a moderate level (M=4.656). Across dimensions, personal archiving dilemma varied, with digital anxiety showing the strongest sense of dilemma (M=5.560) at a moderately high level; lack of tools and lack of rules followed, distributed around the "somewhat agree" value (5 points), representing moderate anxiety levels; while archive ocean and lack of motivation showed lower dilemma levels, with lack of motivation particularly close to the "neutral" value (4 points).

5.2 Influencing Variables of Personal Archiving Dilemma

5.2.1 Gender Variable Analysis Independent samples t-tests showed that gender variables did not reach significant differences in total scores or any dimensions (P>0.05), as shown in .

5.2.2 Age Variable Analysis This study divided age into six stages: under 18, 18-29, 30-39, 40-49, 50-59, and over 60. Analysis found that age variables reached significant differences in overall scores and in three dimensions: digital anxiety, lack of tools, and lack of rules (P<0.05), showing that participants' overall personal archiving dilemma strengthens with age, as shown in .

5.2.3 Education Variable Analysis This study divided education into five stages: junior high school and below, high school or technical secondary school, college or undergraduate, master's, and doctoral degrees. Analysis found that education variables did not reach significance in overall scores but showed significant differences in lack of motivation and digital anxiety dimensions (P<0.05), as shown in . Excluding the "junior high school and below" category, the pattern shows that the lower the education level, the stronger the sense of lack of motivation, and the higher the education level, the stronger the sense of digital anxiety.

5.2.4 Professional Background Variable Analysis This study divided participants' education into archival science background (any education level) and non-archival science background. Independent samples t-tests showed (see) that there was no significant difference in total scores between archival science and non-archival science backgrounds; however, the lack of rules dimension reached significance, with participants having archival science background showing lower sense of rule deficiency than those without archival science background.

6 Conclusions and Recommendations

6.1 Research Conclusions

Based on previous research, this study designed measurement items for the personal archiving dilemma scale. Through item analysis and exploratory factor analysis of 200 initial testing samples, a preliminary personal archiving dilemma

scale was constructed containing five dimensions (lack of motivation, digital anxiety, lack of tools, lack of rules, and archive ocean) with 16 measurement items. Using data from 687 formal survey samples to validate the scale, the results showed good reliability and validity, making it suitable for measuring personal archiving dilemma levels.

Empirical data show that the public's personal archiving dilemma is at a moderate level (M=4.656). Specifically across dimensions, digital anxiety shows the strongest dilemma (M=5.560), followed by lack of tools and lack of rules, while archive ocean and lack of motivation show lower dilemma levels. Personal archiving dilemma shows no significant differences between genders but shows significant differences across age, education, and professional background: (1) In overall scores and in digital anxiety, lack of tools, and lack of rules dimensions, older age correlates with stronger personal archiving dilemma; (2) In lack of motivation and digital anxiety dimensions, lower education correlates with stronger lack of motivation, while higher education correlates with stronger digital anxiety; (3) In the lack of rules dimension, those with archival science background show lower rule deficiency than those without.

6.2 Research Recommendations

6.2.1 Improve Personal Archiving Rules and Develop Personal Archiving Tools Empirical research shows that among the five dimensions of personal archiving dilemma, digital anxiety has the strongest dilemma level (M=5.560), which is closely related to the social environment where massive personal digital archives are emerging rapidly in the digital age. People constantly generate and use digital archives but are unfamiliar with storage tools and their functions, easily generating feelings of insecurity and distrust, falling into digital anxiety dilemma. Moreover, as this anxiety increases, it gradually extends to lack of motivation, lack of tools, lack of rules, and archive ocean dimensions, leading to stronger personal archiving dilemma. However, public personal archiving behavior does not require and cannot have economic or institutional motivations, so lack of motivation is a reality that personal archiving must face. In the information society with highly developed networks and informatization, archive ocean and digital anxiety are also realities that humanity must face, requiring self-adjustment and overcoming through improving rules and creating tools [**?**]. In other words, the fundamental solution to personal archiving dilemma lies in addressing lack of tools and lack of rules. Therefore, the way to alleviate personal archiving dilemma also lies in these two aspects: first, strengthening research and development of personal archiving business norms and standards, such as scope of archiving, classification schemes, retention schedules, and archiving guidelines; second, developing personal archiving tools/platforms with integration, synchronization, and automated management functions to address challenges brought by multi-source, heterogeneous, and dispersed characteristics of personal digital archives.

6.2.2 Conduct Public Archival Literacy Education Empirical research found that older age correlates with stronger personal archiving dilemma, possibly because with age, more archives accumulated from life and work increase the difficulty of organization, retrieval, and location, leading to continuously strengthening dilemma. Meanwhile, the study also found that those with archival science background have lower rule deficiency than the general public, which to some extent confirms that archival knowledge and skills help improve personal archiving capability. Fortunately, improving public archival literacy has already attracted attention from the archival community. The newly revised "Archives Law of the People's Republic of China" in 2020 added the statement that "the state shall take measures to strengthen archival publicity and education, and enhance archival awareness throughout society" [**?**]. This study suggests that this should be taken as an opportunity to strengthen education on archival management knowledge and skills, drawing on domestic archival departments' practice of compiling "Family Archiving Work Guidelines" [**?**] and foreign libraries and archival institutions' practice of compiling personal archiving guides [**?**], to develop popular science materials such as readings and videos for personal archiving based on actual conditions, thereby improving public archival literacy capabilities including personal archiving.

6.2.3 Strengthen Personal Archiving Theoretical Research What deserves vigilance is that empirical research results show that individuals with archival science background, except for slightly lower rule deficiency than the general public, do not show significantly lower personal archiving dilemma in other dimensions, which at least indicates that current archival theory, knowledge, skills, and related archival management tools have not adequately addressed personal archiving. Therefore, researching personal archiving needs and behavioral characteristics, exploring personal archiving theories, methods, and tools, and improving personal archiving work norms to serve public personal archiving practice and alleviate personal archiving dilemma are what archival science can and should do.

6.3 Scale Application

In subsequent research, the personal archiving dilemma scale constructed in this paper may have the following applications: (1) As a tool to actually measure personal archiving dilemma, effectively analyzing the real situation of different groups' personal archiving dilemma to provide references for archival literacy education, personal archiving work norms, and management tool development, thereby alleviating personal archiving dilemma; (2) Continuing questionnaire surveys to further understand whether there are significant differences in personal archiving dilemma among publics of different occupations, ages, and education levels, and explaining the reasons behind them; longitudinal measurements can also be conducted to carry out diachronic studies on public or specific groups' personal archiving dilemma, deeply analyzing development patterns; (3)

In research related to personal archiving cognition, behavior, intention, and influencing factors, establishing foundations for designing measurement indicators for personal archiving dilemma variables.

6.4 Research Limitations and Future Directions

Meanwhile, based on empirical data, this study's conclusions still have some limitations: First, among the 687 formal survey samples, the distribution across age and education variables is uneven, especially for those under 18 and over 60, and those with "junior high school and below" education, which are very small in number and likely lack good statistical significance, potentially leading to inaccurate results. Second, combined with existing literature and research team results, we still cannot explain why lower education correlates with stronger lack of motivation and higher education correlates with stronger digital anxiety. In future research, we should further conduct personal archiving dilemma measurements to obtain better and richer data; we should also combine empirical findings with qualitative research methods to explore the real-world logic and mechanisms behind the empirical data. We need to understand not only the overall situation of personal archiving dilemma but also its occurrence mechanisms, fundamentally exploring solutions and mitigation strategies.

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Author Contributions:

Huang Tiyang: Responsible for designing research framework and participating in scale development process.

Zhong Zhilong: Participated in data collection, organization, and analysis during scale development process, and participated in paper writing.

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