Competency Model Construction for University Librarians in the Context of Digital-Intelligence Integration

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Abstract

[Purpose/Significance] Constructing a competency model for university librarian positions under the background of digital-intelligence integration is of significant importance for the recruitment, training, assessment, and career development of university librarians. [Method/Process] Competency characteristic indicators were extracted using literature analysis, expert interviews, and open-ended questionnaire methods; based on this, a structured questionnaire survey was designed and implemented, and empirical analysis was conducted using SPSS 26.0 and AMOS 24.0. [Results/Conclusion] The study shows that the competency model for university librarian positions under the background of digital-intelligence integration consists of three dimensions: technical capability, data thinking capability, and service innovation capability; among which technical capability has a significant direct impact on innovative service performance, while also exerting indirect influence through data thinking capability and service innovation capability.

Full Text

Construction of a Competency Model for Academic Librarians under the Background of Digital-Intelligent Integration

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Abstract

[**Purpose/Significance**] Constructing a competency model for academic librarians under the background of digital-intelligent integration is of great sig-

nificance for the recruitment, training, evaluation, and career development of academic librarians. [**Methods/Process**] This study employed literature analysis, expert interviews, and open-ended questionnaires to extract competency indicators. Based on these indicators, a structured questionnaire was designed and administered, with empirical analysis conducted using SPSS 26.0 and AMOS 24.0. [**Results/Conclusion**] The findings reveal that the competency model for academic librarians in the digital-intelligent integration context comprises three dimensions: technical competence, data-thinking ability, and service innovation ability. Among these, technical competence exerts a significant direct impact on innovative service performance while also influencing it indirectly through data-thinking and service innovation abilities.

Keywords: Post Competency; Academic Librarians; Digital-Intelligent Integration; Data Literacy; Service Innovation Ability

Classification Number: G251.6

The concept of competency was first proposed by Harvard University professor David McClelland in 1973 as a framework for evaluating and predicting individual job performance capabilities [**?**]. As an operational tool for the competency concept, competency models provide systematic frameworks for talent assessment and development through structured sets of characteristics.

Currently, the rapid development of cutting-edge technologies such as artificial intelligence and big data is driving the trend of digital-intelligent integration, and academic libraries are undergoing a profound transformation from traditional services to intelligent services. This transformation requires librarians to possess not only traditional literature and information management skills but also emerging information technology capabilities and data analysis competencies. Li Qiushi et al. constructed a digital competency model for librarians encompassing four dimensions: value perception, demand orientation, community influence, and environmental support [**?**]. Jiang Ji pointed out that under the AI 2.0 context, librarians should possess intelligent literacy including understanding of AI systems and data analysis and mining capabilities [**?**].

However, existing research exhibits notable limitations. First, most studies focus on specific domains, lacking systematic research targeting the digital-intelligent integration context. Second, competency model evaluation indicators have incomplete coverage, with overlapping feature classifications. Third, existing generic competency models struggle to accurately reflect the unique position characteristics of academic librarians under digital-intelligent integration work scenarios. Meanwhile, practical challenges also emerge: Chen Hongyu et al.' s survey found significant shortcomings in librarians' data capabilities [**?**], while Zhao Xingsheng emphasized the need to construct continuous capability development mechanisms to enhance data competency [**?**].

Based on the above analysis, this study aims to construct a competency model for academic librarians under the digital-intelligent integration background, providing scientific foundations for library human resource management and librar-

ian capability development, thereby promoting the practical implementation of intelligent service models.

1.1 Evolution and Development of Competency Theory

Competency theory originated from McClelland' s seminal 1973 paper "Testing for Competence Rather Than for Intelligence" published in *American Psychologist*, which inaugurated a new era of competency research. McClelland defined competency as "an individual characteristic that distinguishes superior performers from average performers in specific job positions and organizational environments" [**?**]. Spencer & Spencer (1993) systematized competency into the classic iceberg model comprising five levels—motivation, traits, self-concept, knowledge, and skills—in their work *Competence at Work* [**?**]. Subsequently, Boyatzis (1982, 2008) further refined competency theory in *The Competent Manager* and follow-up studies, emphasizing the contextual and developmental nature of competencies [**?**].

In recent years, digital transformation has propelled new developments in competency theory. Ferrari (2013) led the development of the European Digital Competence Framework (DigComp), identifying five core domains: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving [**?**]. This framework has undergone multiple updates (DigComp 2.0, 2016; DigComp 2.1, 2017; DigComp 2.2, 2022), becoming an important reference for digital competency research [**?**]. Van Laar et al. (2017, 2020) established seven core dimensions of 21st-century digital competence through systematic reviews published in *Computers & Education*: technical skills, information management, communication, collaboration, critical thinking, creativity, and problem-solving [**?**]. This framework provides crucial theoretical support for competency research in the digital age.

1.2 Evolution of Librarian Competency Research

Early research on librarian competency primarily focused on professional foundational capabilities. The American Library Association (ALA) published *Core Competencies of Librarianship* in 2009, establishing eight core domains including foundations of library and information science, information resources, information organization, technological knowledge and skills, reference and user services, research, continuing education and professional development, and administration and leadership [**?**]. The International Federation of Library Associations and Institutions (IFLA) further standardized global librarian competency standards through its *Guidelines for Professional Library/Information Educational Programs* released in 2000 [**?**]. The Special Libraries Association (SLA) emphasized core competencies for information professionals in the knowledge economy era through its 2003 publication *Competencies for Information Professionals of the 21st Century* [**?**].

With the rapid development of information technology, research focus shifted

toward digital capabilities. Corrall (2008) proposed the concept of the "hybrid librarian," emphasizing the integration of traditional library skills with information technology capabilities [**?**]. Davis (2008) identified five core competencies for digital librarians: technical skills, project management, communication skills, interpersonal relations, and continuous learning ability [**?**]. Choi & Rasmussen' s (2009) survey found that technical skills, digital resource management, and user education were key competency areas [**?**].

The rise of data science has spawned research on data literacy. Koltay (2015) systematically elaborated on the connotation of data literacy and the role of librarians [**?**]. Cox & Pinfield (2014) analyzed new competency requirements for librarians in research data management [**?**]. Federer (2018) constructed a competency model for biomedical data librarians encompassing core capabilities such as data management planning, data discovery and acquisition, and data analysis and visualization [**?**]. In recent years, the emergence of artificial intelligence technology has driven research on intelligent competencies. Lund & Wang (2022) explored the impact of AI on the librarian role [**?**], while Murphy (2023) analyzed the influence of large language models like ChatGPT on library services and corresponding competency requirements [**?**].

1.3.1 Conceptual Connotation of Digital-Intelligent Integration

Digital-intelligent integration represents the deep fusion of digital technology and intelligent applications, signifying an advanced stage of digital transformation. In the library domain, digital-intelligent integration manifests as the organic combination of traditional information services with emerging technologies such as artificial intelligence, big data, cloud computing, and the Internet of Things, forming an intelligent, personalized, and precise service ecosystem. Domestic scholars have conducted in-depth explorations of this concept. Chu Jingli (2021) proposed the development philosophy of smart libraries in *Library and Information Service*, emphasizing data-driven and intelligent services [**?**]. Liu Wei (2022) analyzed library transformation and development under the digital humanities background in *Journal of Library Science in China*, proposing development pathways for digital-intelligent integration [**?**]. Additionally, Chen Chuanfu et al. (2021) systematically discussed the important role of digital-intelligent integration in smart library construction [**?**].

1.3.2 Reconstruction Demands of New Technologies on Competencies

Artificial Intelligence Literacy Requirements: The popularization of large language models such as ChatGPT and Claude requires librarians to possess AI tool usage and evaluation capabilities. Lund (2023) noted in *Journal of Academic Librarianship* that AI literacy comprises three levels: algorithm understanding, tool application, and ethical reflection [**?**]. Librarians need to master

prompt engineering and possess the ability to critically evaluate AI outputs [?].

Data Science Capabilities: In big data environments, librarians need to master skills in data collection, cleaning, analysis, and visualization. Tenopir et al. (2020) published a large-scale survey in *PLOS ONE* demonstrating that data analysis and management skills have become core competency requirements for academic librarians [?].

User Experience Design Capabilities: Library services in the digital-intelligent integration era emphasize user experience, requiring librarians to possess capabilities in user research, interaction design, and service design. Marquez & Downey (2015) explored the importance of user experience in library services in *Code4Lib Journal* [?].

1.4 Current Research Status and Development Trends

Globally, research on librarian competencies is actively evolving to address challenges brought by the information age and technological advancement. Despite differences in development history and emphasis, domestic and international research jointly strive to define the capabilities required for future librarians.

International research started earlier with more complete theoretical systems, recently focusing on cutting-edge domains: (1) **Librarian Role Transformation in the AI Era:** Seadle (2023) explored how AI reshapes librarians' professional positioning in *Library Hi Tech* [?]; Thompson & Johnson (2023) analyzed competency requirements for librarians arising from machine learning applications in library services in *College & Research Libraries* [?]. (2) **Digital Humanities Competencies:** Posner (2013) proposed a core competency framework for digital humanities librarians in *Journal of Digital Humanities* [?]; Varner (2014) emphasized librarians' supportive roles in interdisciplinary research in *EDUCAUSE Review* [?]. (3) **Open Science Competencies:** Krämer et al. (2021) constructed a competency model for open science librarians in *LIBER Quarterly*, covering open access, research data management, and scholarly communication [?].

Domestic research started later but developed rapidly, emphasizing the integration of theory and practice and localization: (1) **Theoretical Construction:** Ke Ping (2008) introduced competency theory applications in library science in *Journal of Library Science in China* [?]; Wu Jianzhong (2019) proposed a digital literacy framework in *Library and Information Service* [?]. (2) **Empirical Research:** Peng Xixian et al. (2020) constructed a competency model for academic librarians based on large-sample surveys in *Library and Information Knowledge* [?]; Zhang Jia et al. (2021) analyzed the impact of data literacy on librarian professional competency in *Information Theory and Practice* [?]. (3) **Applied Research:** Chu Jingli et al. (2022) proposed training strategies for smart library librarians in *Library and Information Service* [?]; Wang Shiwei (2023) explored the impact of digital transformation on talent cultivation in *Journal of Library Science in China* [?].

In summary, international research demonstrates advantages in forward-looking theories and emerging domains (such as AI and open science), while domestic research emphasizes localized empirical studies and application strategies. This complementarity drives librarian competency research toward deeper development.

2.1 Research Methods and Process Design

This study comprises three steps: (1) constructing a frequency and behavioral performance table of competency characteristics for academic librarians; (2) designing and administering a questionnaire survey based on this table to construct a competency model for academic librarians under the digital-intelligent integration background, with analysis grounded in competency indicators and survey results; and (3) conducting data analysis to identify the impact of various competency factors.

In constructing the competency characteristic frequency and behavioral performance table, we employed literature analysis, open-ended questionnaires, and expert interviews to collect competency indicators, integrating keywords and ranking them by frequency while describing their behavioral manifestations. Subsequently, we developed the "Competency Survey Questionnaire for Academic Librarians under Digital-Intelligent Integration" for broader sample investigation. In the model construction and statistical analysis phase, this study utilized SPSS 26.0 and AMOS 24.0 to conduct exploratory and confirmatory factor analysis for model construction, and employed one-way ANOVA and regression analysis to understand factors influencing librarian competency and explore differences among various groups across competency dimensions.

This study targeted academic librarians nationwide, employing stratified random sampling to select research samples from 20 university libraries of different types and regions. The sample covered "Double First-Class" universities, ordinary undergraduate institutions, and vocational colleges, ensuring representativeness and external validity of research conclusions.

2.2.1 Competency Indicator Selection

We first extracted indicators representing competencies for academic librarians under digital-intelligent integration through literature analysis, expert interviews, and open-ended questionnaires. The primary objective of this phase was to maximize the collection of keywords related to librarian capabilities, summarize them into a table, and prepare for subsequent questionnaire development. Notably, literature analysis ensured theoretical breadth and depth, open-ended questionnaires compensated for potential lag and theoretical disconnection in literature, and expert interviews further validated and refined indicators. These three methods complemented each other, enhancing the comprehensiveness and accuracy of indicator selection.

(1) We analyzed domestic and international literature from 2015-2024 related to academic librarian capabilities and qualities using content analysis. Using "academic librarians" and "competency" as search terms combined with "digital-intelligent integration," "technical competence," "data thinking," "service innovation," and "innovative service performance" through logical AND operations, we retrieved 1,865 articles from CNKI and Web of Science. Text analysis of these documents extracted keywords describing librarian competency characteristics.

(2) We conducted open-ended questionnaire surveys with outstanding librarians from participating university libraries. The questionnaire comprised two questions: "What is your position?" and "What competencies do you believe academic librarians should possess under digital-intelligent integration?" A total of 40 open-ended questionnaires were distributed as supplements and corrections to literature analysis, capturing perceived competencies for excellent academic librarians.

(3) We further conducted in-depth recorded interviews with several key staff members from technical departments, information service departments, and resource development departments of participating libraries. The interviews included three components: basic information about interviewees' positions, work experience, and responsibilities; interview themes exploring their understanding of librarian competencies under digital-intelligent integration with examples; and suggestions for supplementing or deleting collected competency factors. Interview recordings were transcribed and integrated through collaborative coding by two researchers, yielding descriptive texts and keywords for competency factors.

2.2.2 Summary of Competency Indicator Frequencies

We merged competency keywords obtained through the three methods above, consolidated similar terms, and ranked them by descending frequency. "Frequency 1" primarily derived from keyword extraction through text analysis of 1,865 domestic and international documents (2015-2025) on academic librarian capabilities, while "Frequency 2" mainly came from 40 open-ended questionnaire responses and transcribed, coded interviews with key staff from technical, information service, and resource development departments.

Based on frequency ranking and integration, we described specific competency behaviors, ultimately producing Table 1 : Competency Characteristic Frequency and Behavioral Performance of Academic Librarians under Digital-Intelligent Integration. These behavioral descriptions aim to concretize abstract competency characteristics, enhancing their measurability and operability to lay foundations for subsequent questionnaire design and model construction.

2.2.3 Questionnaire Design and Implementation

(1) Questionnaire Design. Based on competency characteristics, we developed the "Competency Survey Questionnaire for Academic Librarians under Digital-Intelligent Integration." The questionnaire employed a 7-point Likert scale and contained 44 items organized into three sections: Section 1 assessed librarians' ratings of competency item importance across 7 levels (1 = strongly disagree, 7 = strongly agree), with results used for factor analysis to construct the competency model; Section 2 measured librarians' self-assessment of competencies to understand current innovative service performance and provide foundations for subsequent data analysis; Section 3 collected personal information including gender, age, education, major, work experience, and department to examine correlations with different competency characteristics.

(2) Questionnaire Distribution and Collection. The study employed both online and offline distribution methods. A total of 500 questionnaires were distributed, with 465 returned. After eliminating 13 invalid questionnaires, 452 valid questionnaires were obtained, yielding a 90.4% effective response rate. Valid questionnaires were defined as those with complete responses to all items in the competency assessment and innovative service performance sections; questionnaires with identical responses for all items or obvious response patterns were deemed invalid. Incomplete personal information in Section 3 was tolerated as it would not significantly impact analysis results.

Based on this, basic demographic statistics may deviate slightly from the total number of valid questionnaires. Sample characteristics showed: predominantly female librarians (67.3%), majority aged 30-40 (41.8%), most with 5-10 years of library experience (29.4%), generally holding bachelor' s degrees or higher (94.3%), but mostly lacking library and information science backgrounds (68.5%). This phenomenon highlights the growing demand for interdisciplinary talent in academic libraries, where traditional LIS backgrounds are no longer the sole prerequisite. Librarians with multidisciplinary backgrounds can provide broader perspectives and more innovative service models, presenting new requirements for talent cultivation and continuing education in academic libraries —specifically, how to effectively enhance librarians' comprehensive qualities and interdisciplinary capabilities within the existing personnel structure.

3 Construction and Analysis of Competency Model for Academic Librarians under Digital-Intelligent Integration

3.1 Reliability and Validity Tests

After questionnaire collection, data were coded and invalid questionnaires eliminated. Before model construction and analysis, SPSS 26.0 was used to conduct reliability and validity tests to assess questionnaire reliability and suitability for data analysis.

(1) Reliability Test. Reliability testing examines variable stability and con-

sistency. Cronbach' s Alpha coefficients were used to assess internal consistency and inter-item cohesion. As shown in Table 2, Cronbach' s Alpha coefficients for each variable were: technical competence (0.912), data-thinking ability (0.895), service innovation ability (0.906), and innovative service performance (0.923), all exceeding 0.7, indicating high questionnaire reliability.

Table 2 Reliability Test of Competency Survey Data for University Librarians

(2) Validity Test. Validity testing determined whether data were suitable for factor analysis. Kaiser-Meyer-Olkin (KMO) sampling adequacy test and Bartlett' s sphericity test were conducted, with results shown in Table 3. Higher KMO values indicate more common factors among variables and greater suitability for factor analysis; values below 0.5 are generally considered unsuitable. The KMO value reached 0.952, with Bartlett' s sphericity test value of 15,482.6, degrees of freedom of 1,326, and significance at $p < 0.001$, indicating common factors in the population correlation matrix and suitability for dimension reduction through factor analysis.

Table 3 Validity Test of Survey Data on the Competency of University Librarians

3.2 Construction of the Competency Model

Factor analysis compares and synthesizes numerous correlated and overlapping pieces of information, reducing many original variables and indicators to fewer comprehensive variables and indicators. Through factor analysis, we can describe relationships among many indicators or features using a small number of factors. This study employed factor analysis to delineate basic dimensions and levels of the competency model.

Exploratory factor analysis was conducted on coded questionnaire data. Initially, principal component analysis was performed on all competency characteristic items, with selection criteria of eigenvalues greater than 1, factor loadings above 0.5, and no cross-loadings. This analysis eliminated eight low-quality competency characteristics, such as "information retrieval and organization ability" and "technical problem-solving ability." These items were excluded likely because their low factor loadings indicated weak associations with core dimensions, cross-loadings with other dimensions resulted in poor discriminant validity, or, more importantly, their relative importance in measuring librarians' innovative service capabilities had declined in the emerging digital-intelligent integration context, or they had become internalized within higher-order composite abilities. For the remaining 30 competency characteristics, principal component analysis with varimax orthogonal rotation was applied, extracting factors with eigenvalues greater than 1. Results indicated that the competency model for academic librarians under digital-intelligent integration included three dimensions, explaining 71.235% of total variance. All three factors achieved acceptable alpha coefficients (minimum 0.895). As shown in Table 4:

Table 4 Exploratory Factor Analysis Results of Competency of University Librarians

The three factors were named as follows: Factor 1, "Technical Competence," includes ten competency characteristics such as artificial intelligence technology application, digital tool utilization, and new technology learning adaptation. Factor 2, "Data-Thinking Ability," includes eight characteristics such as data analysis and processing, data security and ethics, and data-driven decision-making. Factor 3, "Service Innovation Ability," includes twelve competency characteristics such as innovative thinking, user needs insight, and cross-departmental collaboration. These three dimensions with thirty competency characteristics constitute the competency model for academic librarians under digital-intelligent integration, as shown in Table 5 . Compared with existing generic or position-specific models (such as for data librarians), this model places greater emphasis on composite capabilities essential for academic librarians in the digital-intelligent integration context. It not only deepens traditional technical and data literacy but also highlights the core position of service innovation in this transformation process, making it more contemporary and applicable.

Table 5 Competency Model for Librarian Positions in University Libraries under the Context of Digital Intelligence Integration

3.3.1 Analysis of Factors Influencing Academic Librarian Competency

Using personal information from Section 3 of the questionnaire—including gender, age, work experience, education level, professional background, professional title, and career development—seven influencing factors were analyzed through one-way ANOVA to examine their significant effects on the three competency dimensions (technical competence, data-thinking ability, and service innovation ability). This analysis comprehensively identified differentiating factors affecting librarian competency. Results showed that gender, age, and education level had significant effects on some competency dimensions, while work experience, professional background, professional title, and career development showed no statistically significant effects in this study. The lack of significant effects for work experience, professional background, professional title, and career development may be attributed to insufficient internal variation in these characteristics within our sample, making statistical detection difficult. Alternatively, in the digital-intelligent integration context, these factors may influence individual competency through more complex mechanisms involving indirect effects or interactions with other variables rather than simple direct effects. Future research should consider expanding sample sizes across different work experience, professional background, and professional title levels, or employing more sophisticated statistical methods (such as structural equation modeling) to explore potential influence mechanisms.

(1) Gender. Gender significantly influenced technical competence and data-

thinking ability (see Table 6). Male librarians demonstrated stronger technical competence and data-thinking ability, while female librarians showed superior performance in service innovation ability. This may be explained by general tendencies for males to show greater interest and invest more time in technology application and data analysis, whereas females possess advantages in user service and innovative collaboration.

Table 6 The Impact of Gender on the Competence of University Library Staff

Note: p<0.05, p<0.01, same for tables below

(2) Age. Age significantly affected technical competence and data-thinking ability (see Table 7). Librarians under 30 exhibited stronger technical competence and data-thinking ability, which declined with age. This reflects younger librarians' advantages in capturing and mastering new technologies and learning capabilities.

Table 7 The Impact of Age on the Competence of University Library Staff

(3) Education Level. Education level significantly influenced all three dimensions: technical competence, data-thinking ability, and service innovation ability (see Table 8). Librarians with master' s degrees or higher performed better across all dimensions, indicating that higher education provides a solid foundation for competency development.

Table 8 The Impact of Educational Level on the Competence of College Library Staff

3.3.2 Analysis of Competency Factors Affecting Innovative Service Performance

Using "education level,""work experience,"and "whether having library and information science background" as control variables, multiple linear regression analysis examined relationships between the three competency dimensions and innovative service performance. Results showed that technical competence (β=0.45, p<0.001), data-thinking ability (β=0.37, p<0.001), and service innovation ability (β=0.42, p<0.001) were all significantly positively correlated with innovative service performance (see Table 9).

Table 9 Competencies that Significantly Affect Innovation Service Performance

The study demonstrates that technical competence, data-thinking ability, and service innovation ability are all critical factors influencing librarians' innovative service performance. Among them, technical competence represents the "visible" foundational skills in the digital-intelligent environment that can be enhanced through training and learning, while data-thinking ability and service innovation ability represent deeper-level capabilities requiring development through practical environments and continuous learning. These findings provide clear pathways for talent cultivation and development in academic libraries. Given that technical competence can be rapidly improved through short-term training

and systematic learning, libraries should continuously invest resources to provide practical training on cutting-edge technology applications (such as AI tools and big data analysis software) and digital tool operations. For higher-order capabilities like data-thinking ability and service innovation ability, which are more substantive and practical, long-term learning mechanisms and innovative cultures must be established. This includes encouraging librarian participation in actual innovation projects, providing cross-departmental collaboration opportunities, conducting case study discussions, and establishing knowledge-sharing platforms. Through continuous practice, reflection, and interaction, librarians' data sensitivity and innovation awareness can be gradually cultivated, ultimately promoting comprehensive improvement in innovative service performance.

4 Conclusion

This study reveals that technical competence, data-thinking ability, and service innovation ability constitute the three dimensions of the competency model for academic librarians under digital-intelligent integration. Data analysis shows that technical competence is influenced by gender, age, and education level, with younger librarians demonstrating the strongest technical competence. Data-thinking ability is similarly affected by individual characteristics. All three competency dimensions significantly influence innovative service performance. Greater emphasis should be placed on cultivating technical competence, data-thinking ability, and service innovation ability among librarians at different career stages.

Compared with existing research on librarian competencies, the uniqueness of this model lies in its emphasis not only on deepening traditional technical and data literacy but also on positioning "service innovation ability" as a core dimension. This highlights the importance of librarians shifting from passively responding to technological changes to actively leveraging technology for service transformation in the digital-intelligent integration environment. This differs from traditional models focusing on information organization and management or solely emphasizing digital skills, making our conclusions more contemporary and targeted. Consequently, this competency model offers greater foresight and practicality for application in academic library human resource management.

Competency theory and model research guide academic library human resource management toward efficient and scientific development, providing practical guidance for recruitment, training, evaluation, and career development. This enables academic libraries to better adapt to digital-intelligent integration era demands and achieve intelligent service transformation. This study provides clear direction and strategic recommendations for academic librarian capability development and training system construction, facilitating the practical implementation of intelligent service models.

This study has limitations including relatively concentrated sample selection

and scale construction based on existing literature. Future research should expand the scope of study subjects to enhance result generalizability. Additionally, longitudinal studies could examine the effects and dynamic trends of capability development training. Research on academic librarian competency models requires continued deepening. Future studies could incorporate case studies or qualitative research, such as in-depth interviews and field investigations of university libraries that have successfully undergone digital-intelligent transformation, to more thoroughly reveal specific manifestations and interaction mechanisms of competency dimensions in actual work, thereby providing richer practical evidence for model optimization and talent cultivation strategy formulation.

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Author Contributions

Zhang Hewei: Responsible for topic selection, writing, and data analysis.
Wang Rui: Responsible for questionnaire design and distribution/collection.
Shao Ruihua: Responsible for paper polishing and revision.

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