Evaluating the professional competency of university librarians in the digital intelligence era: a survey from China

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Abstract

Introduction. In the digital intelligence era, university libraries are confronted with multiple challenges of an urgent need for transformation and upgrading, a decrease in the number of personnel, and a reduction in funding. Under these circumstances, librarians must possess strong professional competency to drive the development of university libraries.

Method. This study employed literature research, network research, and the Delphi method to construct a professional competency model for university librarians in the digital intelligence era, which comprises four 4 dimensions, including comprehensive knowledge, digital intelligence skills, professional skills, and comprehensive thinking, with 19 indicators.

Analysis. Based on the competency model, librarians' professional competency levels were dually evaluated from self-evaluation by librarians and evaluation by users.

Results. The results reveal that university librarians demonstrate robust capabilities in information management, resource management and application of digital intelligence products, but significantly weak in areas such as information technology knowledge, intelligent service capability, data management capability, and forefront planning capability. Factors such as academic background, job position, usage of digital tools, and configuration of smart devices within libraries can influence librarians' professional competency. Similarly, users' academic background and usage of library resources and services also affect their evaluations of librarians' professional competency.

Introduction

With the rapid advancement of information technology, we have entered a new era widely referred to as the '*digital intelligence era*' (Gao & Ma, 2024). The era of digital intelligence, also known as the digital intelligence era, represents an evolution from the information age, the digital age and into the intelligent age, and is a conceptualisation of a new era, where university libraries have entered a new development stage. The function orientation, service mode, and user demands are undergoing significant transformations. The integration of artificial intelligence (AI) and advanced technologies represents a major trend in academic libraries worldwide (IFLA, 2025). Over 60% of libraries are actively planning to integrate AI into their services (Clarivate, 2025), necessitating that librarians possess a certain level of professional competency. Despite distinct requirements for professional competency in different job positions, all librarians must adapt to the ongoing trend toward digital intelligent transformation.

Numerous domestic and international studies on the competency model for librarians primarily focus on traditional library environments and tend to be rather general in nature, which do not adequately respond to the new demands posed by the digital intelligence era. Furthermore, there is also a lack of systematic evaluation regarding the digital and intelligent competency of librarians.

To address this gap, through the systematic summarisation and organisation of extensive research materials, this study constructs a professional competency model for university librarians in the digital intelligence era. Subsequently, the current professional competency levels among Chinese university librarians are evaluated from two perspectives: self-evaluation by librarians and evaluation by users.

Literature review

Research on competency originated in 1973 when McClelland published *Testing for Competence Rather than for 'Intelligence'*, which led to the development of the first competency model and has since been widely applied across various fields. Research on competency within the international library community began in 1993 with an academic paper by Ojala Marydee titled '*Core Competencies for Special Library Managers of the Future*'.

The competency model for academic librarians encompasses several essential capabilities, such as understanding various sources of information, collection management, and conducting a reference interview (Buttlar & Du Mont, 1996). Subsequent studies have further expanded this framework by emphasising research librarians to possess strong skills in interpersonal relationship, management, information communication technology, and research (Kwanya & Underwood, 2012). Numerous scholars have suggested that in order to thrive in the digital intelligence era, librarians must acquire a range of new competencies, including technological competencies, classical competencies, digital key competencies, transformative competencies (Börner et al., 2022), AI literacy (Ali & Richardson, 2025), and data literacy (Igbinovia et al., 2025).

Empirical research has also evaluated the competency of university librarians in different contexts. For example, a study of newly recruited librarians from Bayero University Library School showed that 68.8% have computer skills, and 14% have database management skills (Kabiru, 2021). The digital literacy skills of librarians in university libraries in Nigeria have reached a medium level (Okeji et al., 2020). The competencies of data management and collection opening of librarians in academic libraries in the United States and Canada are relatively weak (Luo & Tang, 2024).

In summary, the competency models in existing research are predominantly formulated based on specific job positions or digital intelligence capabilities, enabling the evaluation of certain librarian competencies, but limited in the evaluation of all positions. Furthermore, although librarians' digital literacy has been extensively assessed before, professional competency in the digital intelligence era encompasses a more nuanced and comprehensive connotation. The American

Library Association (2013) defines digital literacy as the ability to use information and communication technologies to find, understand, evaluate, create, and communicate digital information. In contrast, the DQ Institute (2019) conceptualises digital intelligence as the sum of social, emotional, and cognitive abilities enabling individuals to face challenges and adapt to the demands of life in the digital world. Consequently, professional competency in the digital intelligence era comprises not only digital literacy but also multidimensional capability elements that have yet to be comprehensively evaluated in existing literature. In particular, systematic evaluation for competency levels among university librarians on different positions in the digital intelligence era, especially technical application and data management, remains absent.

Method

Model construction

This study comprehensively employed literature research, network research, and content analysis to systematically collect professional competency indicators across multiple dimensions, including indicators in foundational models, smart librarians (technical/data management librarians required for smart library development), digital intelligence business, international organisations, and recruitment requirements. Guided by the principles of scientificity, comprehensiveness, innovation, operability, and development, the collected indicators underwent thorough analysis, not only frequently occurring classical indicators extracted but also new characteristic indicators emerged in the digital intelligence era identified. Subsequently, a preliminary dimensions and indicators system for university librarians' professional competency in the digital intelligence era was developed. To ensure its authority and practicability, by utilising the Delphi method through two rounds of expert consultation, the dimensions and indicators within the competency model have been confirmed. Finally, the professional competency model for university librarians in the digital intelligence era was constructed.

Collection and analysis of evaluation data

Based on the professional competency model for university librarians in the digital intelligence era, this study empirically evaluated university librarians' professional competency from dual perspectives: self-evaluation by librarians and evaluation by users. Questionnaires measured on five-point Likert scales (1 = 'strongly disagree' to 5 = 'strongly agree') were used to evaluate 19 competency indicators in the model.

Data were collected between March 1st to March 20th, 2025. (1) a questionnaire for librarian self-evaluation was distributed online to Chinese university librarians, yielding 328 valid responses; and (2) a questionnaire for evaluation by users was distributed via snowball sampling among university library patrons who frequently interacted with librarians, resulting in 214 responses.

Descriptive statistical analysis, multiple linear regression analysis, independent samples t-test, and one-way ANOVA were performed using SPSS 27.0 to analyse data collected. Scores of librarians in each professional competency dimension and indicator were dually evaluated and factors affecting librarians' professional competency were deeply analysed.

Construction of professional competency model for university librarians in the digital intelligence era

Obtaining indicators

Based on existing research, elements of librarians' professional competency were systematically summarised and analysed as the following 5 dimensions:

Foundational model indicators. 15 basic and general competency models for librarians in various types of libraries were collected.

Smart librarian indicators. 15 competency models specifically designed for smart librarians such as data analysis librarians, technical librarians, and knowledge management librarians were collected.

Digital intelligence business indicators. Requirements regarding librarians' knowledge and skills necessary for developing digital intelligence services within libraries were comprehensively collected.

International organisation indicators. Since 1997, international organisations such as American Library Association (ALA) and International Federation of Library Associations and Institutions (IFLA) have been consistently developing and updating documents pertaining to the core competencies required for librarians.

Recruitment requirement indicators. Recruitment information for university librarians in China over the past 5 years was collected to extract actual requirements for librarians from university libraries.
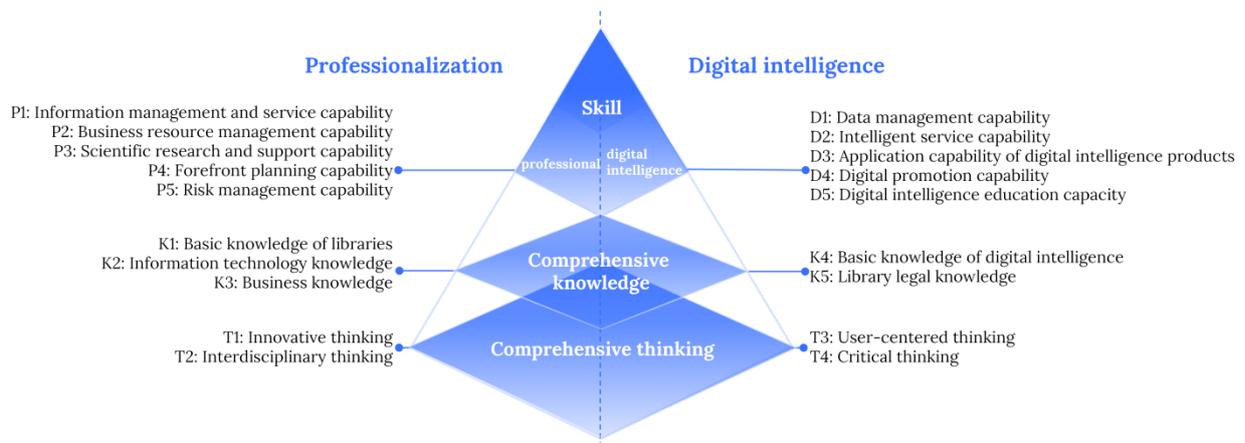
Model construction

This study aims to delineate a professional competency model for university librarians in the digital intelligence era by summarising, generalising, comparing, and analysing the above 5 dimensions of indicators. Preliminary professional competency indicators across multiple dimensions were developed and subsequently refined through a Delphi process.

Two rounds of expert consultation were conducted using a questionnaire titled '*Dimensions and Indicators System for University librarians' Professional Competency in the digital intelligence era*'. 8 experts with more than 10 years of experience in university library business and research participated in the consultation. The importance of each indicator was assessed by a five-point Likert scale in both rounds of consultation.

The expert authority coefficients in both rounds exceed 0.7, indicating a high level of reliability. In the first round, Kendall's coefficient is 0.318, with a chi-square value of 53.493 and a P-value below 0.001. In the second round of consultation, Kendall's coefficient is 0.531, with a chi-square value of 76.433 and a P-value below 0.001, demonstrating satisfied and reliable results from consultation.

The mean, variance, coefficient of variation, and related statistical measurements for each indicator were computed using Excel and SPSS. Indicators meeting the dual criteria of interquartile range (IQR) ≤ 1 and mean score ≥ 4 were retained. Other indicators failing to meet the criteria were refined, eliminated, or substituted based on expert feedback. Finally, a professional competency model for university librarians in the digital intelligence era consisting of 4 dimensions and 19 indicators was constructed.

Building on the above construction process, the iceberg model was used as the foundational framework. Comprehensive knowledge, digital intelligence skills and professional skills were designated as explicit competencies above the waterline, comprehensive thinking as an implicit internal quality beneath the waterline. From the dual perspectives of professionalisation and digital intelligence, the indicators across different dimensions were systematically integrated. The professional competency model for university librarians in the digital intelligence era is depicted in Figure 1-2.

Professionalization

P1: Information management and service capability
P2: Business resource management capability
P3: Scientific research and support capability
P4: Forefront planning capability
P5: Risk management capability

K1: Basic knowledge of libraries
K2: Information technology knowledge
K3: Business knowledge

T1: Innovative thinking
T2: Interdisciplinary thinking

Digital intelligence

D1: Data management capability
D2: Intelligent service capability
D3: Application capability of digital intelligence products
D4: Digital promotion capability
D5: Digital intelligence education capacity

K4: Basic knowledge of digital intelligence
K5: Library legal knowledge

T3: User-centered thinking
T4: Critical thinking

Skill — professional / digital intelligence
Comprehensive knowledge
Comprehensive thinking

Indicator Abbreviation	Indicator Name	Indicator Definition
P1	Information management and service capability	Be capable of retrieving, filtering, using, rating and managing different types of information, meeting users' information needs and providing information services.
P2	Business resource management capability	Be capable of integrating various internal and external resources of the library related to business.
P3	Scientific research and support capability	Be capable of conducting academic exchanges and scientific research through multiple channels, and providing teaching and research support such as open science and subject services.
P4	Forefront planning capability	Be capable of continuously tracking the cutting-edge of the library industry and planning and developing future business.
P5	Risk management capability	Be capable of predicting and avoiding the risks that libraries face in the digital intelligence era.
D1	Data management capability	Be capable of collecting, analyzing, managing, storing, evaluating and sharing various types of data such as academic data and user data based on the data life cycle.
D2	Intelligent service capability	Be capable of developing business segments of smart libraries through various means, understanding user needs, and providing innovative and intelligent services to users.
D3	Application capability of digital intelligence products	Be capable of embedding appropriate digital and intelligent products into business operations and supporting business development.
D4	Digital promotion capability	Be capable of using digital products to edit digital content, promote and showcase library business.
D5	Digital intelligence education capacity	Be capable of conducting digital and intelligent education for users.
K1	Basic knowledge of libraries	Master the relevant knowledge of libraries.
K2	Information technology knowledge	Master the knowledge of computers, mobile terminal systems, networks and software and hardware.
K3	Business knowledge	Master the professional knowledge required for the business.
K4	Basic knowledge of digital intelligence	Master the basic knowledge of digital intelligence, including its connotation, characteristics, application fields, and digital intelligence technologies.
K5	Library legal knowledge	Master the legal knowledge related to libraries.
T1	Innovative thinking	Be capable of flexibly solving various problems by applying innovative thinking.
T2	Interdisciplinary thinking	Be capable of proactively integrating interdisciplinary knowledge and analyzing problems from multiple perspectives.
T3	User-centered thinking	Be capable of handling various types of business from the user's perspective and innovating user services.
T4	Critical thinking	Use critical thinking to analyze the sources, contents and conclusions of information.

Figure 1–2. Dimensions and indicators in professional competency model for university librarians in the digital intelligence era.

Dual evaluation of university librarians' professional competency based on the competency model

Self-evaluation by librarians

Demographics of librarians

A total number of 328 university librarians participated in this survey, of whom 67.07% are female. In terms of age difference, 50.61% of librarians are aged 35 years or below, 26.22% between 36 and 45, 18.60% between 46 and 55, and 4.57% are aged 56 or above. Regarding professional experience, 57.01% of librarians have worked for 10 years or less, 28.66% for 11 to 20 years, 12.50% for 21 to 30 years, and 1.83% for more than 31 years.

In term of job positions, librarians responded include leaders (2.74%), middle managers (21.65%), and staff members (75.61%). Academic backgrounds of librarians include library and information science (54.27%), non-LIS humanities & social sciences (31.10%), natural sciences (8.54%), engineering/technical sciences (12.50%), and medical sciences (4.27%).

This study also investigated the library business librarians engaged in, their participation in related training of 8 hours or more in the past 5 years, the frequency of using AI products, access, or deployment of large language models in the libraries, and configuration of smart devices within libraries.

Results of self-evaluation by librarians

The self-evaluation questionnaire comprises 19 items rated on a 5-point Likert scale, yielding a potential total score ranging from 19 to 95. The results of overall scores span from 28 to 95, with a mean score of 67.59 (SD=12.828), indicating the baseline of librarians' professional competency across the sample. According to the scale level, this aggregate score corresponds to a 'Neutral' level.

The mean scores of indicators in each dimension are as follows: comprehensive knowledge (M=3.60), digital intelligence skills (M=3.49), professional skills (M=3.55), and comprehensive thinking (M=3.60). Among all professional competency dimensions, digital intelligence skills scores the lowest, suggesting a relative weakness in this area.

Specifically, the top three highest-scoring indicators are business knowledge (M=3.87), basic knowledge of libraries (M=3.77), and information management and service capability (M=3.76). In contrast, risk management capability (M=3.37), intelligent service capability (M=3.39), and forefront planning capability (M=3.40) receive the lowest scores. It reveals librarians' pronounced competency in traditional knowledge and business, with significant weakness in emerging digital intelligence competencies, such as intelligent service and digital intelligence education, as well as in risk management and forefront planning, which may impede long-term development of libraries in the digital intelligence era.

In terms of influencing factors, several variables affect librarians' professional competency. Librarians with academic background in library and information science (LIS) demonstrate significantly higher total scores, comprehensive knowledge, digital intelligence skills and professional skills compared to counterparts from other backgrounds. Librarians working in data management position score higher in digital intelligence skills and professional skills compared to others. Participation in training is positively associated with competency scores, as is the frequency of using digital intelligence tools. More comprehensive configurations and higher usage frequencies of smart devices within libraries are positively associated to total scores, digital intelligence skills, and professional skills.

Evaluation by users

Demographics of users

A total number of 214 valid responses from users were collected. In terms of educational level, 5.14% of users have an associate degree, 35.51% a bachelor's degree, 49.53% a master's degree, 8.88% a doctor's degree, while 0.93% are faculty members. Academic backgrounds are distributed across humanities & social sciences (55.61%), natural sciences (19.16%), engineering/technical sciences (15.89%), and medical Sciences (14.02%). Notably, 68.69% are from universities in the 'double world-class project'.

Results of evaluation by users

The mean score of users' evaluation on librarians' overall professional competency is 74.53 (SD=13.687), higher than self-evaluation by librarians. The mean scores of indicators in each dimension are: professional skills (M=4.02), comprehensive knowledge (M=3.95), digital intelligence skills (M=3.94), and comprehensive thinking (M=3.94), indicating significantly higher users' recognition of librarians' professional skills compared to other dimensions.

Regarding specific competency indicators, the three highest-rated indicators are: information management and service capability (M=4.13), business resource management capability (M=4.13), and business knowledge (M=4.11). The three lowest-rated indicators are: intelligent service capability (M=3.81), basic knowledge of digital intelligence (M=3.82), and critical thinking (M=3.84). These results indicate users' evaluation of librarians' stronger competency in library business work, information management, scientific research, and user services, but their capabilities in emerging fields such as digitisation and intelligent services (for instance, library chatbots, personalised recommendations for submissions and bibliographies) need to be further enhanced.

Factors significantly influencing users' evaluation on librarians' professional competency include academic background, use of library resources, configuration of smart devices, and experience in providing feedback. Users with a background in engineering/technical sciences tend to give lower evaluations, while those frequently utilising paper literature resources have higher evaluations on librarians' professional skills and comprehensive thinking. More comprehensive configurations and higher usage frequencies of smart devices are positively correlated with users' evaluation. Users who have made suggestions and had them adopted by libraries report the highest scores.

The comprehensive results of scores and differences of dual evaluation of university librarians' professional competency in all four dimensions are presented in Figure 3, 4, 5, and 6.

Indicator	Self-evaluation Score	Difference	Indicator	User Evaluation Score
Business knowledge	3.87	+0.24	Business knowledge	4.11
Basic knowledge of libraries	3.77	+0.23	Basic knowledge of libraries	4
Information technology knowledge	3.46	+0.42	Library legal knowledge	3.89
Basic knowledge of digital intelligence	3.45	+0.45	Information technology knowledge	3.88
Library legal knowledge	3.44	+0.37	Basic knowledge of digital intelligence	3.82

Indicator	Self-evaluation Score	Difference	Indicator	User Evaluation Score
Digital promotion capability	3.57	+0.43	Data management capability	4
Application capability of digital intelligence products	3.55	+0.47	Digital promotion capability	4
Data management capability	3.53	+0.38	Digital intelligence education capacity	3.97
Digital intelligence education capacity	3.41	+0.56	Application capability of digital intelligence products	3.93
Intelligent service capability	3.39	+0.42	Intelligent service capability	3.81

Indicator	Self-evaluation Score	Difference	Indicator	User Evaluation Score
Information management and service capability	3.76	+0.37	Information management and service capability	4.13
Business resource management capability	3.74	+0.39	Business resource management capability	4.13
Scientific research and support capability	3.47	+0.60	Scientific research and support capability	4.07
Forefront planning capability	3.40	+0.52	Forefront planning capability	3.92
Risk management capability	3.37	+0.47	Risk management capability	3.84

Indicator	Self-evaluation Score	Difference	Indicator	User Evaluation Score
User-centered thinking	3.75	+0.28	User-centered thinking	4.03
Critical Thinking	3.60	+0.46	Interdisciplinary thinking	3.98
Interdisciplinary thinking	3.52	+0.24	Innovative thinking	3.91
Innovative thinking	3.52	+0.39	Critical Thinking	3.84

Figure 3–6. Scores and differences of dual evaluation of university librarians' professional competency.

Comparison of dual evaluation

Significant perceptual discrepancies are observed between librarians and users regarding digital intelligence skills. Users' assign higher scores to data management capability and digital intelligence education capability, whereas librarians self-evaluate themselves more highly in digital promotion capability and application capability of digital intelligence products stronger, highlighting users' pronounced recognition of data management and digital intelligence education in libraries.

The three indicators exhibiting the largest score gaps are scientific research and support capability ($|\Delta|$=0.60), digital intelligence education capacity ($|\Delta|$=0.52), and forefront planning capability ($|\Delta|$=0.52), reflecting users' positive feedback of advanced services, including scientific research support, digital intelligence education, and special collection digitisation.

In contrast, minimal gaps are observed in basic knowledge of libraries ($|\Delta|$=0.23), business knowledge ($|\Delta|$=0.24), and critical thinking ($|\Delta|$=0.24), demonstrating librarians' robust foundational competencies.

Conclusion

This study constructs a professional competency model for university librarians in the digital intelligence era, comprising 4 dimensions of comprehensive knowledge, professional skills, digital intelligence skills, and comprehensive thinking with 19 indicators. Based on this model, the professional competency levels of Chinese university librarians are evaluated through both self-evaluation by librarians and evaluation by users. Results indicate that university librarians demonstrate strong competency in traditional business domains such as information management and services, resource management, and research support, but relatively weaker in emerging areas, including intelligent services, data management, and digital promotion.

Libraries are undergoing a wave of transformation globally, prompting extensive discourse on the evolving role of librarians to develop libraries better in meeting user needs and more valuable. Focusing on the novel demands of the digital intelligence era, the competency model constructed in this study integrates horizontal general skills with vertical professional depth. Nevertheless, investigation shows that the digital intelligence competency of Chinese librarians notably lags behind technological advancements currently, which stems not only from disparities in technical resource investment but also encompasses practical challenges such as shortages of technical talents, insufficient provision of digital intelligence training, limited resources support, and difficulties in implementing digital intelligence initiatives.

Furthermore, the results suggest that the organisational structure within Chinese university libraries may constrain the autonomy of librarians in capability development. Besides, limitations in terms of the scarcity of teacher data in the user evaluation data exist, which may constrain the broader applicability and implementation of the findings. Future model optimisation can incorporate internationally recognised digital intelligence competency standards and align with the discipline construction needs of Chinese universities to establish a more locally adaptable, dynamic evaluation system.

Acknowledgements

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