AJMKI
American Journal of Multidisciplinary Knowledge Insights

VOLUME 05	ISSUE 01
2026	BI-ANNUAL

Artificial Intelligence for Science and the Changing Role of University Libraries in China: A Systematic Review of Research Support Services, User Requirements, and Institutional Practice

Author Name & Affiliations

*Huang Tao Jun
Information Management Department, St. Catherine University, Minnesota
htjun@stkate.edu

Zhao Ming
Information Management Department, St. Catherine University, Minnesota
zming@stkate.edu

Article Processing History:

Received: 27 Jan 2026

Revised: 24 Mar 2026

Published: 06 Apr 2026

Index Terms:

Artificial intelligence for science, AI4S, university library, research support services, fifth paradigm, China, digital scholarship, knowledge services, systematic review

Abstract

Artificial Intelligence for Science (AI4S), often referred to as the 'fifth paradigm' of scientific research, is changing the way hypotheses are formulated, experiments are designed, and knowledge is generated in any field. In the era of scientific and technological self-reliance, Chinese universities are also transforming themselves from the traditional role of providing documents to a new role of providing reference services, and their libraries are also changing their functions from document provision to specialized, AI-based Research Support Services (RSS) that are integrated into the research process. This paper reviews and summarizes the recent academic and institutional papers on AI4S and the changing role of Chinese university libraries. This paper summarizes and reviews the academic and institutional literature on AI4S and the changing role of university libraries in China. Through literature review on library and information science journals, science-policy papers from different nations, and case studies of major libraries such as Peking University Library and the Beijing Institute of Technology Library, the review chronicles the development of academic library services in China; explores the user requirements for AI oriented RSS; summarizes the AI-enabled library services currently available, covering intelligent literature retrieval, research data management, AI assisted writing and publishing support, conversational agents, and research evaluation; and reviews key challenges facing libraries, including technical limitations of AI algorithms, ethical and data-property issues for AI, dependency upon AI, and institutional constraints related to funding, training, and strategic alignment. The review also examines the practice in China with reference to international developments and presents a model of competencies and services to help further transform university libraries from a passive service provider to an active partner of scientific discovery. Finally, the paper raises some questions for further research, such as the longitudinal assessment of the effectiveness of RSS, the standardization across institutions, and the governance of generative AI for scholarly workflows.

INTRODUCTION

The potential of AI as a tool for scientific research is not restricted to a supporting role, but is seen as a key player in the field of scientific discovery. It is commonly defined as Artificial Intelligence for Science (AI4S) and involves the extensive application of AI across the entire research process, ranging from hypothesis generation and experimental design to data analysis, simulation and knowledge synthesis [2] [4] [5] and is often referred to in the science-policy literature as the fifth paradigm of science, complementing the empirical, theoretical, computational, and data-intensive discovery paradigms. Empirical evidence from advances like AI-driven protein structure prediction, geometric deep learning for molecular property prediction and autonomous experimentation platforms have shown AI's ability to speed up discovery in biology, chemistry, and materials science, lending credence to the paradigm shift story [1] and [2].

The Ministry of Science and Technology has introduced AI4S as a strategic national priority, and has incorporated the AI4S program into national policies for scientific and technological self-reliancy and the Digital China and Education Informatization 2.0 programs [6]. Recognising the pivotal role of information infrastructure and the library, the National Science Library of Chinese Academy of Sciences has organised specific symposia on AI-empowered knowledge management and knowledge services, to reflect this. It is, therefore, increasingly critical to transform the notion of the university library, traditionally seen as a passive repository of scholarly works, into an active participant in the research process [1], [6].

This change is not automatic, nor easy. While Chinese university libraries are trying to build up their own AI4S, the empirical knowledge of what AI researchers need from libraries, and what problems hinder the provision of AI services, is still not well known — at least until recently [1]. The most direct empirical evidence so far comes from a case study by Wang and Zhou (2026) that surveyed 25 library managers, librarians, and researchers to pinpoint ten specific user requirements, grouped into five thematic categories covering the research lifecycle, and three major challenges that libraries face in achieving these requirements [1]. This review not only provides a summary of the evidence but also contextualizes it in the wider literature on Chinese academic library development, AI-empowered library services globally, and the national AI4S policy, in order to paint a full picture of how university libraries in China are—and should be—changing to accommodate the AI4S era.

This review has four contributions: (i) a historical synthesis of the role of Chinese university libraries over time, from the provision of documents to providing AI research support services; (ii) a structured analysis based on the empirical results of the research on the requirements of library users in the age of AI; (iii) a collection of service technology for AI that has been observed in institutional practice, explained in the context of case studies; and (iv) an analysis of technical, ethical, and institutional challenges, leading to a proposed competency and service framework. Background concepts and methodology are reviewed in Section II. In Section III, the user requirements for AI4S research support services are explored. The institutional case studies are included in Section IV. In Section V, AI-based service technologies are listed. International comparison is provided in Section VI. In section VII challenges are analyzed. The issue of changing librarian

skills is discussed in Section VIII. A framework is proposed in Section IX. The future research directions are outlined in Section X and the conclusion follows in Section XI.

BACKGROUND AND REVIEW METHODOLOGY

AI FOR SCIENCE: CONCEPT AND NATIONAL CONTEXT

AI4S is usually presented as a generalization of Jim Gray's data intensive "fourth paradigm" of scientific discovery, which has been extended to the case where AI contributes actively and agentively in the generation of hypotheses, design of experiments and synthesis of results, as opposed to just processing pre-collected data [4, 5]. In a recent systematic survey, AI4S has been recognized as the fifth scientific paradigm and a network of new applications has been identified that ranges from knowledge discovery to scientific reasoning and autonomous experiments in different areas of science [5]. This conceptual turn towards AI4S has been mirrored by concrete national actions in China, such as the strategic evaluation of the global landscape of AI4S conducted by the government and academic institutions, including the AI for Science Institute, Beijing [4] and panel discussions organized by top scientific journals on the opportunities, challenges, and reflections AI4S brings to the research community [6].

A national focus has a direct impact on the function of university libraries. With the fifth paradigm quickening the pace of knowledge creation and iteration, libraries are expected to be a smart layer in the infrastructure; not only as a source of literature and data, but as an active enabler of the AI-assisted research process as an operational manifestation of the AI4S paradigm within institutional knowledge management [6].

This national focus is complemented by a wider range of intersecting policies for higher education digitalization. The Education Informatization 2.0 initiative and the Digital China strategy have both been contributing to the transformation of Chinese universities from the traditional, document-centric service mode to intelligent knowledge services based on big data and artificial intelligence, by clearly pointing out a new and intelligent service mode for the future: proactive, accurate and personalized resource delivery, instead of delayed and limited coverage service mode as in the past when merely user-centric service was provided. These policy frameworks are in addition to various discipline-specific and institution-specific initiatives, including China's "Double First-Class" policy for building world-class universities and disciplines, which offers extra incentive for the libraries at the top-tier research universities to prove measurable impact on research competitiveness via service innovation using AI technologies [6].

EVOLVING ROLE OF CHINESE UNIVERSITY LIBRARIES

Chinese university libraries' function of supporting research has gone through several identifiable stages, briefly summarized as follows (see Fig. 1 for details). The original role of an academic library was that of a keeper of print resources and a middleman between libraries for the acquisition of physical resources and interlibrary loan requests. The 2010s ushered in a new era of digital scholarship and libraries started to create institutional repositories, increase electronic resources collections, and begin to define digital scholarship services for the context of Chinese higher education [7]. This was followed by the era of knowledge innovation and subject embedded services, where libraries like Peking University

Library created structured research services that covered the research life cycle and research evaluation services (including bibliometric analysis and research impact assessment), became a regular function of Chinese academic libraries [8,9]. During this time, domain-specific adaptations also surfaced; for instance, research support services for traditional medicine libraries were found within the universities in China, whose focus was on traditional Chinese medicine, and which had developed services specific to this domain, based on the specific data, publishing, and disciplinary norms of traditional Chinese medicine [10].

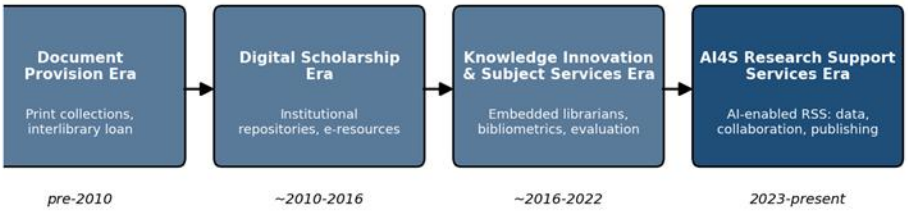

Fig. 1: Evolution of research-oriented services in Chinese university libraries toward AI-enabled Research Support Services [1], [7], [8], [9].

REVIEW METHODOLOGY

The review synthesizes evidence from four types of sources: (1) main empirical case study of the user demands for AI research support services in Chinese university libraries [1]; (2) academic literature on the historical and conceptual development of academic library research services in China [7]–[10]; (3) general international and comparative literature on AI-supported academic library services and changing librarian skills [11]–[21]; and (4) national AI4S policy and conceptual literature about how the Chinese scientific strategy impacts library transformation [2], [4]–[6]. All sources were directly relevant to the university library research support functions, were valid and had been published in peer-review journals, or were of recognized status in a university or policy setting, with special emphasis on those published or recognized in the 2019-2026 time frame when AI4S became a distinct policy and research agenda. Findings were presented in a thematic structure, corresponding to the one of the main case study, but also including supporting and comparative evidence as in [1].

Several limitations common in all kinds of narrative syntheses of an emerging field are notable here. First, the empirical basis specific to research support services for AI is still limited, with most of the case studies focusing on a single institution-based qualitative sample of 25 participants, which is methodologically sound but is far too small for meaningful statistical generalizability, and should therefore be interpreted as analytically rather than statistically generalizable [1]. Second, although the structural themes of being ready, ideating, collaborating, conducting research, and publishing will likely serve as landmarks to refer to and work within, the specific tools and platforms that are mentioned in the practitioner literature may change rapidly as the technology evolves. Third, a significant amount of the Chinese practitioner literature is published in Chinese-language library and information science journals, so this review also uses English-language abstracts and

secondarily summarized materials for some practitioner sources, which may not fully do justice to the methodological nuances found in the full texts in Chinese.

USER REQUIREMENTS FOR AI4S RESEARCH SUPPORT SERVICES

The most obvious empirical information concerning what Chinese university library users want from AI4S-based research support comes from the 2026 thematic analysis of interviews with 25 librarians, researchers and library managers [1]. The study used a coding approach and concept mapping to visualize the analytic process, identifying ten distinct user requirements that were grouped into five themes each corresponding to a particular stage on the research lifecycle: AI4S readiness, research idea development, building a collaborative network, research execution and publication of the findings [1]. This 5-theme model is shown in Fig. 2 as a circular format which focuses on the library's dynamic Research Support Service function.

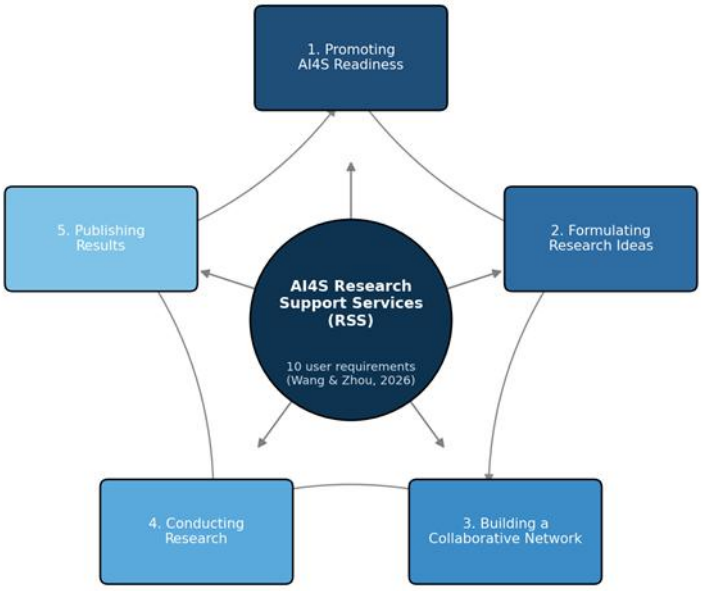

Fig. 2: The five thematic categories of user requirements for AI4S research support services, derived from case-study interviews with 25 participants [1]

The first theme, AI4S readiness, underscores the foundational need for libraries to create a baseline of understanding for AI4S concepts, tools, and implications for disciplinary practice, which aligns with the literature and the broader international findings that AI literacy and training are a priority across all populations of academic library users [1], [11]. The second theme, Formulating research ideas, identifies user needs for AI supported assistance at the earliest and most creative stages of the research process when AI tools can help identify new research hypotheses, map existing knowledge gaps or bring up under-explored research directions. The third theme is building a collaborative network, which captures how increasingly interdisciplinary and team-based AI4S research will be: building connections between domain scientists, data scientists, and AI specialists within and across the home institution.

The fourth theme, conducting research, is the most technically demanding of the requirements, involving support for research data management, access to computational resources, and guidance on the use of AI tools during the active research process, which are all common academic library research data management functions taken to an AI4S context [1]. The fifth theme, publishing results, captures the need for support in writing with AI, adherence to the changing disclosure expectations for AI-generated content in scholarly communication, and the ethical and editorial dilemmas posed by the large language model in scholarly communication [1]. All five themes highlight that the research support requirements of AI4S are not limited to literature access, but cover the entire research process, further supporting the need for a broader role for the library in research support.

To help libraries use the five themes to guide concrete service design decisions, Table 2 extends this five-theme structure, presenting examples of underlying user requirements associated with each theme that are representative and consistent with literature.

Theme	Representative User Requirement	Ref.
Promoting AI4S readiness	Structured training on AI4S concepts and tools; discipline-specific AI literacy guidance	[1], [11]
Formulating research ideas	AI-assisted literature mapping and gap analysis to support hypothesis generation	[1]
Building a collaborative network	Facilitated connections with data scientists and cross-disciplinary AI4S collaborators	[1], [16]
Conducting research	Research data management support; guidance on appropriate AI tool use during analysis	[1], [23]
Publishing results	AI-assisted writing support; guidance on AI-content disclosure and publication ethics	[1], [14], [15]

Table 1: Illustrative User Requirements Mapped to the Five AI4S Research Support Service Themes

PEKING UNIVERSITY LIBRARY RESEARCH SUPPORT SERVICES

Peking University Library has been reported as an early and influential research support service development institution in China, providing support services for the research process at various stages, such as literature searching, research data services, publication, and impact assessment [8]. It serves as a case study of the institutional trends of the development of elite research universities attempting to develop new service models which, in a simplified form, are then copied by a greater number of institutions.

THE BEIJING INSTITUTE OF TECHNOLOGY "FIVE CENTERS" MODEL

The Beijing Institute of Technology Library has recently developed an AI-based institutional model with its service architecture designed around five service centers: Resource Collaboration Center, Cultural Heritage Center, Knowledge Innovation Center, Future Learning Center, and International Research Center. In this framework, AI-enabled projects help deliver the provision, cultural communication, decision support, research and learning support, and enhance the global academic influence of the institution, demonstrating the different functional domains of a comprehensive AI-enabled service

architecture. This case exemplifies a larger theoretical proposition that has been expressed in the recent literature: AI technology is refashioning the entire process of knowledge production and dissemination in the context of university libraries to become an active research innovation agent and a direct participant in national development initiatives like China's "Double First-Class" higher-education development program.

SUBJECT-EMBEDDED AND KNOWLEDGE INNOVATION SERVICES

In addition to the flagship institutional models, there is also a considerable amount of Chinese practitioner literature that describes the gradual integration of AI into the current subject-librarian or knowledge-innovation service system. Research services in the era of big data have been studied to illustrate how the role of the subject librarian is more and more integrated in the research process, providing literature analysis, data support, and consultation services, without being detached from the research process [16]. Practitioner accounts of more recent developments indicate that in university libraries, new service models are being developed that involve AI, ranging from intelligent knowledge discovery services to automated analysis of literature and AI supported reference consultation [17, 18]; AI for libraries is thus a means of rapid knowledge iteration and a vehicle through which the delivery of subject services is being gradually revolutionized.

DOMAIN-SPECIFIC ADAPTATION: TRADITIONAL CHINESE MEDICINE UNIVERSITIES

One example of research support services' adaptation to the disciplinary context is the study of library services in China's traditional medicine universities, which found that user needs were different from those in comprehensive research universities due to the unique data structure, publication venues and research methods used in traditional medicine [10]. This discovery is consistent with the overall literature, which suggests that AI4S research needs, as they share a similar structure, should be understood and implemented differently in different disciplines than a single, generic service template [1], [10].

SCALE AND PACE OF ADOPTION ACROSS THE SECTOR

In addition to a few select flagship cases, there are some signs of progress in the sector as a whole, with the use of AI in libraries in China gaining momentum but remaining uneven. However, in the context of the survey on the use of AI in 154 public and private libraries, even when the use of AI in libraries is discussed at the policy level, many institutions primarily focus on automation and search-enhancement functions, which are more basic and less research-oriented than the functions outlined in Sections III and V [11]. This discrepancy between strategic vision and execution is not unprecedented: more closely examined, the international picture shows that a few resourcestrong institutionally oriented research centers develop more complicated service models, which spread relatively slowly to the rest of the institutions [12, 21]. This heterogeneity is crucial for policy and practice, as documents for national AI4S policy and landmark case studies like Peking University and Beijing Institute of Technology by no means represent typical practice across China's several thousand university libraries, but are rather at the vanguard of the transformation that is still in its early and uneven diffusion stage.

AI-ENABLED SERVICE TECHNOLOGIES AND CAPABILITIES

The reviewed institutional and practitioner literature can be grouped into a few common categories of AI tools that support various steps or activities in the research lifecycle, as shown in Fig. 3.

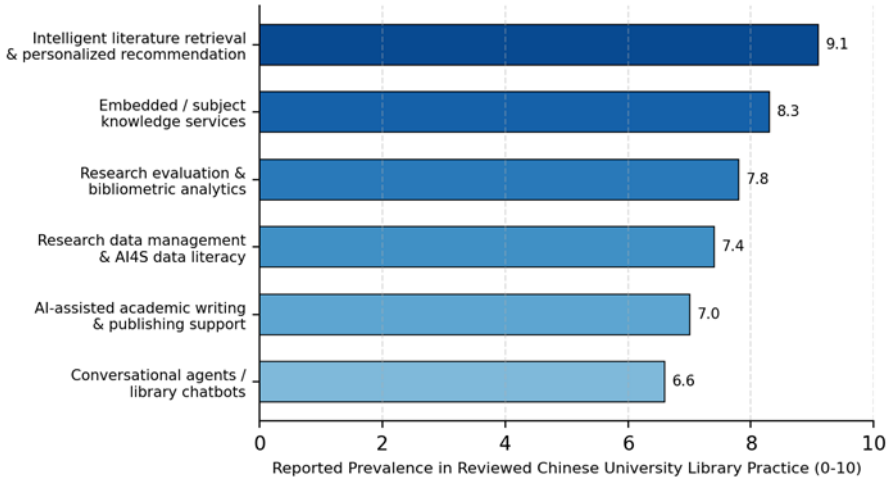

Fig. 3: AI-enabled service categories reported in Chinese university library practice, synthesized from the reviewed literature [1], [8], [16]–[19].

INTELLIGENT LITERATURE RETRIEVAL AND PERSONALIZED RECOMMENDATION

Among the most advanced service types enabled by AI, precision, AI-driven resource delivery (big data and machine learning to model user behaviour and context, and therefore serve resources proactively and in a personalised way), solves some of the key pain points of previous "user-driven" delivery models such as delayed response and limited personalisation.

RESEARCH DATA MANAGEMENT AND AI4S DATA LITERACY

As AI4S research continues to rely on large, well-structured datasets, libraries are extending existing research data management features to meet AI-specific data literacy requirements, such as metadata standards that are compatible for machine learning workflows and data readiness for AI applications, consistent with international efforts that investigate the transformation of metadata for AI readiness in library data infrastructures [1].

AI-ASSISTED ACADEMIC WRITING AND PUBLISHING SUPPORT

The use of generative AI tools to assist academic writing, summarization, and preparation of manuscripts has added opportunity and complexity to the role of libraries in publishing support, where they are now challenged by shifting ethical norms concerning the use of AI to create academic content and must advise their users to follow journal editorial rules and policies [1], [14]. The scope of publishing-related support libraries that may be expected to be provided can be expanded by complementary developments in the field of AI-assisted peer review [15].

CONVERSATIONAL AGENTS AND LIBRARY CHATBOTS

Conversational agents, particularly custom-built using application programming interfaces for the large language models, are being used to respond to routine reference and consultation requests, pushing the boundaries of what should and shouldn't

be included in automated reference service systems, while freeing up time for librarians to engage in more value-added research support functions.

RESEARCH EVALUATION AND BIBLIOMETRIC ANALYTICS

AI-powered bibliometric and altmetric analysis tools are a continuation of the traditional role of the Chinese academic library research evaluation service, providing more in-depth research impact assessment, collaborative research analysis, and discipline trend research, thereby helping the institutions make scientific decisions [9].

COMPARATIVE INTERNATIONAL CONTEXT

To place Chinese practice in the global literature provides some areas of convergence and also some areas of emphasis. Based on this, a bibliometric and systematic literature review with a long-term perspective of the usage of AI-driven innovations and services in academic libraries around the world reveals that the three categories of service most mature in terms of AI service development and usage in academic libraries worldwide are literature discovery, personalized library recommendation, and reference service automation, which are also present in Chinese academic libraries, as is documented in Section V [12]. Similar trends are seen in comparative studies conducted in Türkiye, where academics are more likely to perceive the advantages of AI adoption as automation and enhancement of discovery services, and the challenges as funding and staff training, which is also reflected in a comprehensive survey of 154 public and private academic libraries in China, in which funding, training, and institutional alignment were identified as the most significant barriers to the use of AI, with automation and discovery service enhancement being the most common perceived benefits [11, 21]. The contributions also identify the importance of the need for knowledge organization which can be sustainable as mentioned by the research from South African academic libraries [21] and the need for structured digital-literacy curricula specific to AI, which is similarly identified in the Chinese case study [1], [19] and [20]. This comparative perspective is summarized in Table I for four national or regional contexts.

This comparative governance is applied to generative AI, too. The findings from a global survey of library and information science journal editors revealed that the editorial approach to AI-assisted and AI-generated submissions remains largely unevenly developed across different publishing outlets, and publishers' concerns regarding the current disclosure norms are directly analogous to the publishing-related concerns and ethical issues raised in the Chinese case study [1], [14]. Combined, it seems the institutional language is varied, with some (RSS and knowledge innovation centers in China) looking for ways to utilize AI to improve research assistance, and others (digital literacy curricula in South Africa and automation-oriented adoption in Türkiye) focusing on capability development and governance norms to enable the adoption of AI into research support, rather than the lack of available technology [1], [11], [14] and [21].

Region	Dominant AI Service Emphasis	Principal Reported Barrier	Ref.
China	AI4S-aligned RSS across research lifecycle; knowledge innovation centers	Technical limitations, ethics/data property, over-reliance	[1], [11]
Türkiye	Automation and discovery enhancement	Funding and staff training	[21]
South Africa	Sustainable knowledge organization; digital literacy	Lack of structured AI literacy curricula	[19], [20]
Global (bibliometric)	Literature discovery, recommendation, reference automation	Uneven institutional maturity	[12]

Table 2: Comparative Overview of AI Adoption Themes in University Libraries Across Regions

CHALLENGES TO AI4S RESEARCH SUPPORT SERVICE DEVELOPMENT

Three important categories of issues that library should address to support the development of RSS were identified by the primary case study of AI research support services in Chinese university libraries, which are the technical limitations of AI algorithms, AI ethics and data-property issues, and concerns about user over-reliance on AI tools [1]. In addition to the institutional barriers, such as funding, staff training, and organizational alignment, identified in a separate large-scale survey of Chinese libraries, the challenges of AI4S library transformation can be seen both at the technical/service level and the organizational level, which is shown in Fig. 4 [1], [11].

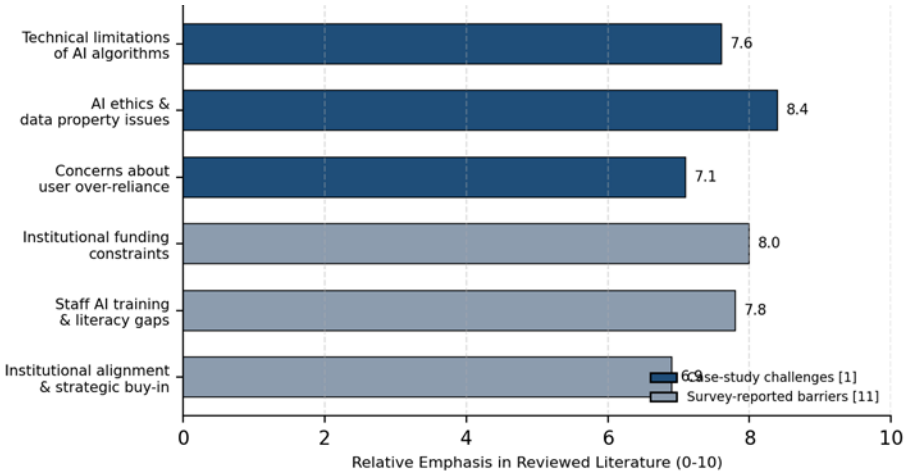

Fig. 4: Reported challenges to AI4S research support service development in Chinese university libraries, combining case-study and survey evidence [1], [11].

Some of the technical limitations of AI algorithms involve the potential errors of these algorithms, their domain-specific nature, and the lack of interpretability of AI tools, which also resonate with the current limitations of AI in the field of autonomous hypothesis generation and novel discovery in the broader AI4S literature [1], [5]. The ethics and data-property questions are questions that remain unresolved when there is the use of AI tools in the idea generation, analysis or writing process in scholarly communication, and they have grown in significance with the increasing use of the LLM in scholarly communication and changing, although not yet consistent, policies of publishers and journals on disclosure of AI-generated

content [1], [14], [15]. Anxiety around over-reliance echoes the pedagogical and epistemic anxiety that over-reliance on AI tools could diminish researchers' independent critical-thinking and methodological expertise, as expressed in the wider AI-in-education literature on the balance of using AI tools and developing core research skills [1].

The study also reveals that, on an institutional level, the major reason for the slower and shallower adoption of AI4S is funding, training, and institutional alignment seen in a large sample of 154 Chinese libraries, suggesting that resource restrictions and institutional readiness are often the primary barriers to the adoption of AI4S by library staff and leadership [11]. The system of technical and institutional barriers is two-fold, and coordinated investments in AI tool capability and institutional change management are needed for successful AI4S transformation, as explored in Section IX.

EVOLVING LIBRARIAN ROLES AND COMPETENCY REQUIREMENTS

AI4S research support changes the competency profile for university librarians. The role of a subject librarian in the context of AI4S has traditionally focused on the skills of literature and reference expertise, collection development, and discipline-specific bibliographic knowledge, but the AI4S-ready subject librarian needs to be steadily supplemented with data science and analytics skills, domain science skills that are adequate for engaging with the content of AI4S research, fluency with AI tools and prompt-based interaction, research ethics and knowledge of AI governance, and systems- or service-design thinking able to create AI-enabled service programs rather than just operate discrete AI tools. A subject-librarian competency profile is shown as Fig. 5, alongside a profile that is growing for the AI4S-ready research support librarian.

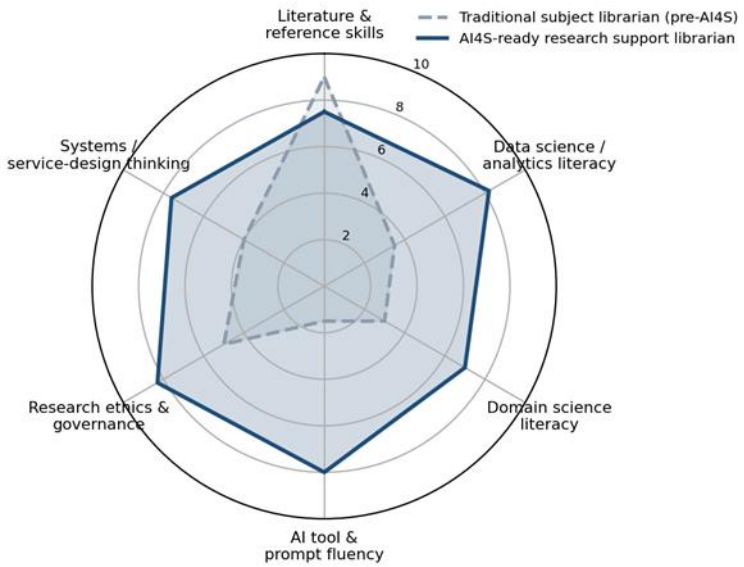

Fig. 5: Shifting competency profile of university librarians under AI for Science, synthesized from the reviewed literature [1], [13], [14], [16].

Analyses applying professional-competencies frameworks to academic library work under AI conclude that the most durable librarian roles will be those emphasizing judgment, ethical oversight, and the human-centered design of AI-augmented services rather than roles vulnerable to straightforward automation, a finding consistent with the systems-

thinking and governance competencies emphasized in Fig. 5 [13], [14]. Realizing this competency shift at scale represents a significant professional-development challenge for Chinese university libraries, directly connected to the staff training barrier identified in Section VII [11].

Operationalizing this competency shift requires more than one-off training workshops. Institutions that have progressed furthest — such as those adopting the multi-center organizational model described in Section IV-B — appear to embed competency development structurally, through cross-functional teams that pair traditional subject librarians with data specialists, rotational assignments that expose staff to live AI4S research projects, and formal recognition pathways that reward staff for developing and deploying new AI-enabled service offerings rather than solely for traditional reference and collection-development metrics. Without such structural embedding, competency-development investments risk remaining superficial, addressing awareness without building the deeper, sustained fluency that AI4S-ready research support roles require [11], [13].

PROPOSED FRAMEWORK FOR AI4S-READY RESEARCH SUPPORT SERVICES

Synthesizing the user requirements, institutional practice, and challenges reviewed above, this paper proposes a four-component framework to guide the continued development of AI4S research support services in Chinese university libraries.

COMPONENT 1. READINESS AND LITERACY INFRASTRUCTURE

Libraries should develop structured AI4S literacy programmes for both researchers and library staff, responding directly to the theme of promoting AI4S readiness, and the staff training barrier mentioned in literature reviewed [1] [11].

COMPONENT 2. LIFECYCLE-EMBEDDED SERVICE ARCHITECTURE

Service design should be organized around the entire research lifecycle—not just the discrete, siloed aspects of research, but the idea formulation, collaborative network building, active research conduct, and publication—and should be based on the five themes identified in the empirical user-requirement analysis [1].

COMPONENT 3. ETHICS, GOVERNANCE, AND QUALITY ASSURANCE

In the context of the importance of AI ethics and data-property issues, it is important to have a clear guidance to use AI in research and publishing within the library that is in line with the changing policies of journals and various funders, and that it is not an afterthought, but a fundamental and integral part of library governance [1], [14], [15].

COMPONENT 4. INSTITUTIONAL INVESTMENT AND ORGANIZATIONAL CHANGE

To facilitate sustained progress, it will be necessary to provide funding streams, to design professional-development pathways that are correlated with the shift in competency as outlined in Section VIII, and to demonstrate a clear institutional leadership commitment that explicitly addresses the barriers to funding and pathway alignment identified throughout the evidence from the reviewed surveys [11, 13].

OPEN RESEARCH DIRECTIONS

There are several research gaps which warrant further research. First, despite some promising experiments and exploratory evidence of the impacts of AI4S RSS adoption, the current evidence base for assessing the downstream impacts of using

AI4S RSS is largely cross-sectional and exploratory, and has not yet quantified the research productivity or quality impacts of this adoption. There are currently few examples of longitudinal, outcome-based evaluation of AI4S research support services. The primary case study used to inform this review is such a case study. Second, there is not yet a high degree of cross-institutional standardization of AI4S service models; in the case studies of Peking University and the Beijing Institute of Technology, the institutional models are still very different, and comparative and multi-institutional studies could identify transferable best practices [8]. Third, the governance of generative AI in scholarly workflows is still highly uncharted and rapidly developing, and library policy must continue to engage with contentious questions concerning authorship, disclosure rules, and data-property rights, which are developing concurrently as generative AI is applied to peer review and publishing ethics [14] and [15]. Lastly, comparative international studies on the generalizability of the Chinese experience to other national settings and vice versa, would bolster existing evidence on AI4S library transformation, as the main case study invited for the generalization of its experience elsewhere [1].

CONCLUSION

The use of Artificial Intelligence (AI) in Science is transforming the very nature of research, and so too is the contribution that university libraries can make to the research enterprise. This review has highlighted the development of Chinese university libraries from a document-provision service to active AI capable partners in scientific discovery, summarized empirical evidence on the specific requirements of library users that should be considered in the design of service support based on AI in university libraries, cataloged the emerging technical and service types of AI technologies currently used in the practice of university libraries, and discussed the technical, ethical and institutional issues that remain to restrict the library's transformation. The evidence presented suggests that AI4S research support needs are integral to the research process and cross the entire research lifecycle ranging from readiness and ideation, to collaboration and active research, to publication, and that addressing these needs will require libraries to make investments in their technical capabilities, staff competency development, and ethical governance infrastructure. This review has been conducted specifically on the Chinese context, as China has a unique emphasis on AI4S in its national policy, however, the identified patterns of user needs, institutional adaptation, and the identified challenges of implementation provide useful reference points for university libraries making similar transitions across the globe. As AI4S evolves as a scientific paradigm and a policy priority, continued empirical research around the effectiveness of research support services in the library will be critical to making sure that these services contribute to and help shape the future of scientific discovery, not only as technology adapters, but as active and trusted partners in the infrastructures of scientific discovery.

REFERENCES

[1] Z. Wang and L. Zhou, "Developing university library services for supporting 'AI for Science' research: Understanding the requirements of users," Journal of Librarianship and Information Science, 2026. doi: 10.1177/09610006261462964.

[2] H. Wang, T. Fu, Y. Du, et al., "Scientific discovery in the age of artificial intelligence," Nature, vol. 620, pp. 47–60, 2023.

[3] R. Van Noorden and J. M. Perkel, "AI and science: What 1,600 researchers think," Nature, vol. 621, no. 7980, pp. 672–675, 2023.

[4] W. Zhao, "A panel discussion on AI for science: The opportunities, challenges and reflections," National Science Review, vol. 11, no. 8, Art. no. nwae119, 2024.

[5] Y. Zhao, Y. Liu, Y. Han, H. Zhang, Y. Zhou, Z. Wang, Y. Huang, Y. Zhang, and Y. Tian, "AI for Science: A systematic survey of architectures, autonomy, and open challenges," Preprints.org, 2026. doi: 10.20944/preprints202607.0102.v1.

[6] Gong Ke, "Promoting the Artificial Intelligence for Science Approach: China," International Science Council, Paris, France, 2025.

[7] L. Zhou, R. Huang, and T. Zijlstra, "Towards digital scholarship services in China's university libraries: Establishing a guiding framework from literature," Electronic Library, vol. 37, no. 1, pp. 108–126, 2019.

[8] M. R. Islam, M. M. Islam, I. A. Badhan, and M. N. Hasnain, "The role of artificial intelligence in carbon pricing policies: Economic and environmental implications," *Journal of Engineering and Computational Intelligence Review*, vol. 3, no. 2, pp. 1–19, 2025.

[9] L. Ye, "Chinese academic library research evaluation services," Journal of Library Administration, vol. 59, no. 1, pp. 97–128, 2019.

[10] Y. Chen and L. Zhou, "Library research support services in China's universities of traditional medicine: Understanding user requirements," Health Information and Libraries Journal, vol. 38, pp. 313–318, 2021.

[11] D. Li, "Adoption of artificial intelligence in public and private libraries of China: Determinants, challenges, and perceived benefits," Profesional de la Información, vol. 33, no. 4, Art. no. e330416, 2024.

[12] M. M. Islam, "AI-driven fraud detection and prevention using human behavior analysis to enhance U.S. social and financial security," *International Journal of Applied Mathematics*, vol. 38, no. 8S, pp. 861–871, 2025.

[13] A. Cox, "How artificial intelligence might change academic library work: Applying the competencies literature and the theory of the professions," Journal of the Association for Information Science and Technology, vol. 74, no. 3, pp. 367–380, 2023.

[14] A. S. Anwar, S. K. Bhowmik, R. B. Kadir, M. U. Haque, S. Rahman, and I. A. Badhan, "Challenges in implementing machine learning-driven IoT solutions in semiconductor design and wireless communication system," *International Journal on Recent and Innovation Trends in Computing and Communication*, vol. 12, no. 2, pp. 872–889, 2024.

[15] M. Z. Islam, I. Ahmed, R. Parveen, S. T. H. Rimon, and J. I. Janjua, "Revolutionizing healthcare for critical diseases with AI and enhancing security via low-latency edge intelligence," in *Proc. 2025 Int. Conf. AI-Driven STEM Education and Learning Technologies (AISTEMEDU)*. Piscataway, NJ, USA: IEEE, Dec. 2025, pp. 1–6.

[16] K. Kousha and M. Thelwall, "Artificial intelligence to support publishing and peer review: A summary and review," Learned Publishing, vol. 37, no. 1, pp. 4–12, 2024.

[17] Ullah, A., Usman , M., & Baber , M. (2023). Role Of Libraries In Enhancing Research Support Services In Islamabad Universities: Role Of Libraries In Enhancing Research Support Services .Journal Of Social Sciences,14(1), 40-55. Retrieved from https://jss.gcuf.edu.pk/index.php/jss/article/view/94/51

[18] Y. Huang, T. Sun, R. Zhao, G. Xian, J. Li, and T. Luo, "Research and practice of new knowledge service in the context of big data and artificial intelligence," Library and Information Service, vol. 66, no. 19, pp. 36–46, 2022.

[19] X. Lin, D. Zhao, and L. Li, "Exploration and reflection on the new service mode of artificial intelligence in university library," Library Research, vol. 50, no. 5, pp. 103–109, 2020.

[20] M. Monyela and A. Tella, "Leveraging artificial intelligence for sustainable knowledge organisation in academic libraries," South African Journal of Libraries and Information Science, vol. 90, no. 2, Art. no. 96, 2024.

[21] A. Gupta et al., "A facile approach to recycling used facemasks for high-performance energy-storage devices," in Specialty Polymers, CRC Press, 2023, pp. 427–443.

[22] T. Çakmak and Ş. Eroğlu, "The use of artificial intelligence in university libraries in Türkiye: Practices, and perspectives of library directors," Information Development, vol. 41, no. 3, pp. 642–655, 2025.

[23] A. Ullah, "Social media integration for modern library and information service promotion," Journal of Digital Scholarship in Archives and Information, vol. 2, no. 1, pp. 37–51, 2026.

[24] A. Hussain and M. Rafiq, "Provision of research support services across the research lifecycle in university libraries," Journal of Librarianship and Information Science, vol. 57, no. 1, pp. 223–239, 2025.

[25] M. Chaudhari, "Vapor-Phase Thin-Film Polymerization for Microbial-Resistant Surface Functionalization," in Proceedings of the International Conference on Sustainable Micro-Nano Materials & Innovative Technology (ICSUMMIT 2026), Vadodara, India, Feb. 2026, doi: 10.2991/978-94-6239-727-9_27.

[26] A. Ullah, S. Ahmed, and G. Li, "Artificial intelligence in library services: Advancing quality education through smart information support," Inverge Journal of Social Sciences, vol. 5, no. 3, pp. 453–468, 2026.

[27] S. A. Jimenez, J. Berbegal-Mirabent, and R. De La Torre, "How do university libraries contribute to the research process?," Journal of Academic Librarianship, vol. 50, no. 5, Art. no. 102930, 2024.

[28] National Science Library, Chinese Academy of Sciences, "2025 Symposium on AI-Empowered Knowledge Management and Knowledge Services," Library and Information Service, Urumqi, China, Jul. 2025.