Spectrum of Engineering Sciences
ISSN (e) 3007-3138 (p) 3007-312X Volume 4, Issue 5, 2026

FROM AI TO AGI: THE NEXT EVOLUTION OF LIBRARIES AND INFORMATION SERVICES

[*1]Muhammad Kabir Khan, [2]Tahir Yasmin
[*1]Effat Library & Cultural Museum, University, Kingdom of Saudi Arabia
[2]Faculty of Management (FOM), Multimedia University, Cyberjaya, Malaysia
[3]Prince Sultan University, Kingdom of Saudi Arabia
[*1]mkabir@effatuniversity.edu.sa
[2]tyasmin@psu.edu.sa

DOI:- https://doi.org/10.5281/zenodo.20215131

Keywords
Artificial General Intelligence, AGI, Academic Libraries, Smart Libraries, AI Literacy, Intelligent Information Systems, Agentic AI

Article History
Received: 06 March 2026
Accepted: 09 April 2026
Published: 11 May 2026

Copyright @Author

Corresponding Author:
*Muhammad Kabir Khan

Abstract
Artificial Intelligence (AI) has significantly transformed library and information services by enhancing information retrieval, automating cataloging, improving research support, and enabling intelligent user services. Recently, advancements in Generative AI, Agentic AI, and Artificial General Intelligence (AGI) have opened new possibilities for autonomous, adaptive knowledge systems in libraries. This paper explores the transition from AI to AGI and its implications for libraries and information services. The study discusses the evolution of intelligent library ecosystems, current AI applications, potential AGI-driven services, emerging librarian competencies, and associated ethical and organizational challenges. Furthermore, the paper highlights future research directions and emphasizes the importance of strategic planning, AI literacy, and ethical governance for the sustainable adoption of AGI in libraries. The findings suggest that AGI may redefine libraries from traditional information repositories into intelligent and autonomous ecosystems capable of delivering highly personalized, efficient, and innovative services.

1. Introduction

Libraries have always adapted to technological change, from manual catalogues to digital libraries, discovery systems, institutional repositories, and smart library services. In recent years, artificial intelligence has become one of the most influential technologies affecting academic libraries. AI is being used for virtual reference, metadata generation, recommendation systems, resource discovery, research support, and user education (Makinde et al., 2025; Gupta, 2025). Gupta's study highlights that libraries should move from AI hype toward experimental and strategic adoption, especially through collaboration, knowledge-sharing, and practical implementation models.

The emergence of generative AI has further expanded libraries' roles in supporting teaching, learning, and research. Generative AI tools are increasingly used for summarization, academic writing support, information literacy instruction, and research assistance (Gmiterek & Kotuła, 2025; Narayanan, 2024; Sultan & Uddin, 2025). However, recent literature also indicates that libraries are now entering a new stage where autonomous and agentic AI systems may play a greater role in responding to user queries, supporting decision-making, and improving service quality (Wang & Chou, 2025; Ayinde et al., 2026b). Wang and Chou's 2025 study specifically examined agentic AI for improving the effectiveness, accuracy, and efficiency of academic library responses to student queries.

Artificial general intelligence, commonly known as AGI, represents a further step beyond narrow AI and generative AI. AGI refers to systems capable of broader reasoning, adaptive learning, and problem-solving across different domains. Wu (2024) argues that the rise of AGI will significantly affect information professions by changing professional competencies, educational requirements, and the future roles of information workers. Therefore, understanding the transition from AI to AGI is essential for libraries seeking to remain relevant in the future knowledge economy.

Specific Objectives

1. To explore the current applications of AI, generative AI, and agentic AI in libraries as a foundation for understanding the transition toward AGI.
2. To identify the potential roles of AGI in library operations, user services, research support, knowledge discovery, and decision-making.
3. To analyze the opportunities and benefits of AGI for automation, personalization, intelligent assistance, and improved library service delivery.
4. To examine the ethical, legal, professional, and organizational challenges associated with the adoption of AGI in libraries.
5. To assess the competencies, AI literacy, and institutional readiness required for librarians and information professionals to work effectively with AGI.
6. To propose strategic recommendations and future research directions for the responsible integration of AGI in libraries and information services.

Methodology

This study adopts a literature review approach to examine the emerging concept of Artificial General Intelligence (AGI) in libraries and information services. Since AGI is still a developing technology and there is limited or no direct empirical research available on its application in libraries, this paper reviews the existing literature on artificial intelligence, generative AI, agentic AI, and related intelligent technologies in library settings. The purpose is to build a conceptual understanding of how libraries are moving from traditional AI-based automation toward more advanced and potentially autonomous AGI-driven services.

The review focuses on scholarly articles, conference papers, reports, and relevant academic sources related to AI applications in libraries, intelligent information systems, digital transformation, AI literacy, ethical issues, and the future role of librarians (Khan et al., 2026; Masrek & Khan, 2025). The literature was examined to identify key themes, including current uses of AI in libraries, the transition from AI to AGI, potential applications of

AGI, expected benefits, professional competencies, ethical concerns, and organizational readiness.

As AGI has not yet been widely implemented in libraries, this study does not use primary data collection methods such as surveys, interviews, or experiments. Instead, it presents a conceptual and descriptive review of existing knowledge of AI and emerging discussions about AGI. The reviewed literature describes the possible role of AGI in libraries, including its potential to support intelligent reference services, personalized learning, autonomous research assistance, knowledge discovery, decision-making, collection management, and user-centered library services.

The study also analyzes possible challenges associated with AGI adoption in libraries, such as ethical concerns, data privacy, algorithmic bias, professional skill gaps, institutional readiness, technological infrastructure, and the changing role of librarians. Based on the reviewed literature, the paper proposes future directions and recommendations for responsible AGI integration in libraries and information services.

Literature Review

AI, Generative AI, Agentic AI, and AGI in Libraries

AI in libraries usually refers to task-specific technologies designed to automate or enhance particular services. These include chatbots, search recommendation tools, automated cataloguing, plagiarism detection, and analytics-based decision-making (Ayinde et al., 2026a; Haris et al., 2025; Sardar et al., 2026). A systematic review by Ayinde, Ebiefung, and Oladokun (2026) found that AI applications in academic libraries are commonly grouped into reference and information services, technical services, administration, circulation, collection development, information literacy, user education, and professional development.

Generative AI extends these capabilities by producing new content such as text, summaries, explanations, research support documents, and learning materials. Narayanan (2024) explains that generative AI is transforming academic libraries, education, and research by supporting new forms of knowledge creation and user engagement. Similarly, Sultan and Uddin (2025) emphasize that generative AI may influence student learning outcomes, user perceptions, and ethical decision-making in academic library contexts.

Agentic AI represents a more advanced stage because it can perform autonomous tasks, plan actions, interact with tools, and respond to user needs with reduced human intervention. Recent studies argue that agentic AI has important implications for academic libraries, particularly in reference services, personalized assistance, and automated user support (Ayinde et al., 2026b; Oladokun, 2026; Wang & Chou, 2025). Ayinde, Ebiefung, and Oladokun (2026) critically examine agentic AI use cases and future research implications in academic libraries.

AGI goes beyond these forms of AI by aiming to achieve human-like reasoning across multiple domains. In libraries, AGI could support complex research consultations, identify research gaps, evaluate scholarly literature, design search strategies, and provide intelligent academic guidance. Wu (2024) notes that AGI may reshape the future of information professions by demanding new competencies and redefining professional roles.

Current Applications of AI in Libraries

AI is already being applied in academic libraries for reference services, information retrieval, user education, and technical services. AI-powered chatbots can answer frequently asked questions, guide users to resources, and provide 24/7 support (Haris et al., 2025; Makinde et al., 2025; Sardar et al., 2026). Generative AI can assist students and researchers in understanding complex topics, preparing summaries, improving search terms, and developing research ideas (Narayanan, 2024; Oladokun et al., 2026).

AI also supports resource discovery. Zhang et al. (2025) discuss generative AI-driven resource discovery in public libraries and suggest that dynamic evaluation models can optimize library services. In academic settings, AI-based discovery tools can improve search relevance, personalize

recommendations, and help users navigate complex digital collections.

Another important area is research support. Libraries can use AI to assist with literature searching, citation support, systematic reviews, and research data services. Ayinde et al. (2026a) found that reference and information services are among the most prominent areas of AI adoption in academic libraries. This indicates that AI is not only a technical tool but also a service innovation mechanism.

The Next Evolution from AI to AGI

The transition from AI to AGI represents a major shift in the future of libraries. Current AI systems are powerful but limited. They usually perform specific tasks based on training data and predefined models. AGI, however, may be capable of broader understanding, reasoning, and autonomous learning. This could allow future library systems to move from simple automation toward intelligent decision-making and adaptive knowledge support.

In an AGI-enabled library, users may interact with intelligent systems that understand their academic background, research interests, learning style, and information needs. Such systems could recommend books, articles, databases, research methods, and even possible research collaborators. They could also help users identify research gaps, develop literature review strategies, and evaluate the credibility of scholarly sources.

However, AGI should not be viewed only as a replacement for human librarians. Rather, it should be understood as a tool for strengthening human-AI collaboration. Cox (2026) emphasizes the importance of information professional competencies in the agentic AI loop, suggesting that librarians will continue to play a valuable role in guiding, evaluating, and ethically managing intelligent systems. This means the future library will depend on both advanced technologies, such as blockchain, IoT, and AI, as well as human professional judgment (Khan & Lokman, 2026; Khan, 2025). Additionally, AGI-powered systems may facilitate multilingual communication, support accessibility for visually impaired users, and enable immersive educational experiences through VR and metaverse environments (Khan et al., 2025; Sardar & Khan, 2026).

The transformation of libraries from traditional information repositories to intelligent knowledge ecosystems is illustrated in Figure 1, which highlights the core capabilities of AGI in modern library environments.



Figure 1. AGI in libraries: The next evolution of intelligent information services. (Source: author created)

IEER
Institute for Excellence in Education & Research

Figure 3 demonstrates the major areas of AGI application in libraries through an interconnected intelligent library ecosystem. The framework highlights how AGI can support information services, technical services, research support, learning and teaching, collection development, library administration, and user engagement. It demonstrates AGI's role in enhancing automation, personalization, research analytics, knowledge organization, and intelligent decision-making in modern library environments.



Figure 3. Major application areas of AGI in libraries. (Source: Author self-created)

Benefits of AGI in Libraries

AGI has the potential to provide several benefits for libraries and information services. First, it may enhance user experience by providing highly personalized support. Instead of offering the same search results to every user, AGI-based systems could adapt responses according to user needs, academic level, discipline, and research purpose.

Second, AGI may improve research productivity. It could support systematic literature reviews, bibliometric analysis, research proposal development, citation checking, and scholarly communication. This would allow librarians to provide more advanced research support services.

Third, AGI may strengthen accessibility and inclusion. It could provide multilingual support, voice-based assistance, simplified explanations, and adaptive services for users with disabilities. Enakpowoke and Joshua (2026) highlight both the challenges and prospects of AI integration in libraries, showing that AI can improve services if implemented with proper planning and infrastructure.

Fourth, AGI may improve strategic decision-making. It could analyze usage data, predict collection needs, identify service gaps, and support evidence-based library management. Gupta (2025) emphasizes that AI adoption should be strategic rather than driven by hype. Figure 4 illustrates the continuous and adaptive

AGI implementation process within library environments.

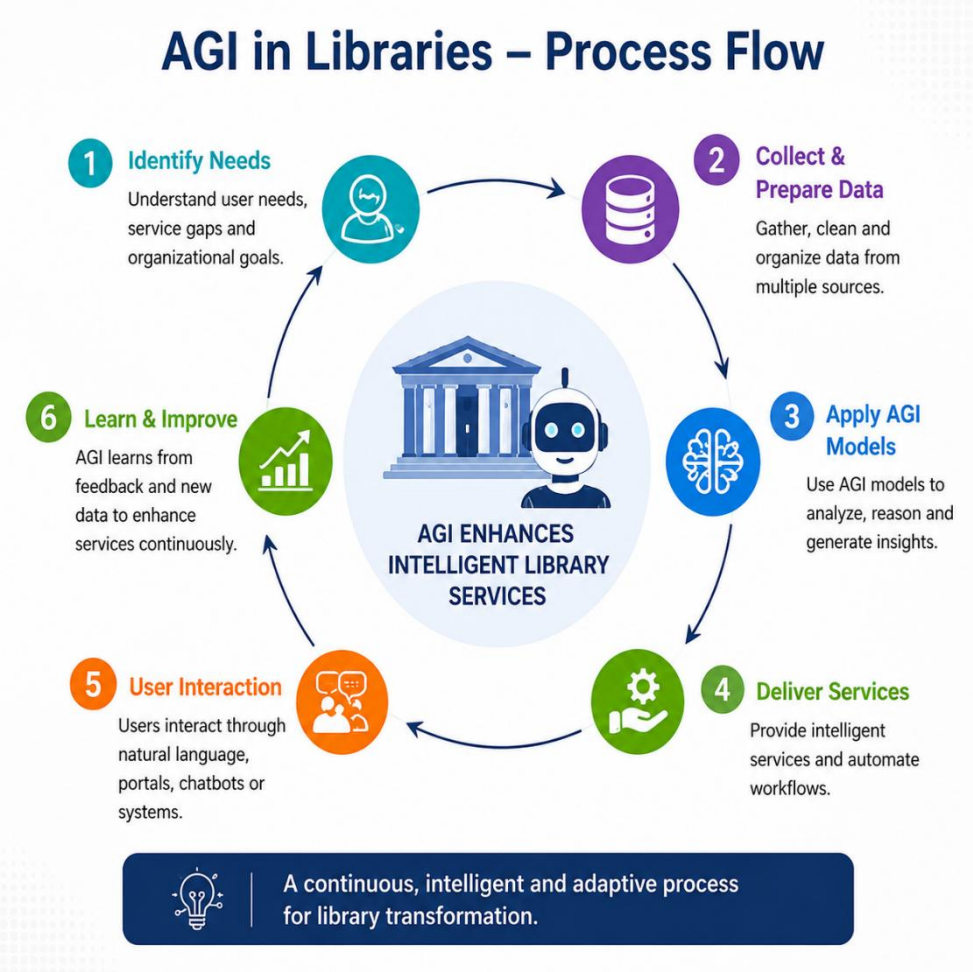


Figure 4. Process flow of AGI-enabled intelligent library services (Source: Author self-created)

Ethical and Organizational Challenges

Despite its potential, AGI adoption in libraries raises serious ethical and organizational concerns. One major concern is privacy. AGI systems may require access to large amounts of user data to provide personalized services. Libraries must ensure that user data is protected and that AI systems follow ethical data governance principles.

Bias and misinformation are also major challenges. AI systems can produce inaccurate, biased, or misleading information. Panda et al. (2024) argue that ethical intelligence is necessary for guiding AI integration in modern libraries. Similarly, Sultan and

Uddin (2025) identify ethical challenges as a key issue in the adoption of generative AI in academic libraries.

Another challenge is the digital divide. Not all libraries have equal access to infrastructure, funding, skilled staff, or advanced AI tools. Makinde et al. (2025) and Enakpowoke and Joshua (2026) suggest that successful AI integration depends on staff training, institutional readiness, and clear implementation strategies.

Job displacement is another concern. However, the literature suggests that AI is more likely to transform library roles than eliminate them completely. Appedu and Tacheva (2025) show that librarians' understanding of AI agency is complex and shaped by professional discourse. Therefore, libraries should focus on reskilling, upskilling, and redefining professional roles instead of viewing AI as a direct threat.

Emerging Roles of Librarians in the AGI Era

The rise of AGI will require librarians to develop new skills and professional identities. Future librarians will need competencies in AI literacy, data literacy, prompt engineering, ethical AI governance, digital scholarship, research analytics, and human-AI collaboration (Khan et al., 2026).

Possible future roles include AI librarian, AI literacy specialist, digital scholarship librarian, research data librarian, agentic AI coordinator, and intelligent systems librarian (Khan & Ullah, 2024). Narayanan (2025) argues that autonomous AI agents are moving libraries beyond basic chatbot services. Similarly, Oladokun (2026) highlights that agentic AI may influence the future of library services by enabling more autonomous and proactive support.

Cox (2026) further suggests that information professionals will remain important in the agentic AI loop because they possess critical competencies in information evaluation, user support, ethics, and knowledge organization. Therefore, librarians must not only learn how to use AI but also how to critically evaluate and govern it.

Future Research Directions

Future studies should examine AGI readiness in academic libraries, especially in relation to infrastructure, policy, staff competencies, and user acceptance. More empirical research is needed to explore how users perceive AI, generative AI, agentic AI, and AGI-based services (Haris et al., 2025; Oladokun et al., 2026).

Researchers should also investigate ethical governance frameworks for AGI in libraries. This includes privacy protection, algorithmic transparency, bias reduction, copyright, intellectual property, and responsible AI use. Panda et al. (2024) and Sultan and Uddin (2025) provide useful foundations for examining ethical concerns in AI-enabled library environments.

Another future research area is human-AGI collaboration. Studies may explore how librarians and intelligent systems can work together to support research, teaching, learning, and information literacy. Theoretical frameworks such as UTAUT, Diffusion of Innovation, Technology Readiness, and Human-AI Collaboration models may be useful for examining adoption behavior and institutional readiness.

Conclusion

The movement from AI to AGI marks an important turning point in the evolution of libraries and information services. AI is already transforming library operations through automation, reference support, resource discovery, and research assistance. Generative AI and agentic AI are expanding these possibilities by enabling content creation, autonomous task execution, and intelligent user support. AGI may further transform libraries into adaptive, intelligent, and human-centered knowledge ecosystems.

However, AGI adoption must be guided by ethical governance, professional competencies, strategic planning, and institutional readiness. Librarians will remain central to this transformation because their roles will evolve toward AI literacy, ethical guidance, digital scholarship, research support, and human-AI collaboration. The future of libraries will not be defined by technology alone, but by how effectively

librarians use intelligent systems to advance knowledge, inclusion, and learning.

References

Akin-Fakorede, O. O., Ajani, Y. A., Adigun, O. M., & Malik, F. O. (2026). Agentic AI solution and the promise of Industry 5.0 in the library sector: Policy implications and strategic considerations. *Business Information Review, 43*(1), 20–25.

Appedu, S., & Tacheva, J. (2025). Transcending binaries of agency through librarians' discursive constructions of AI. *Library Trends, 73*(3), 116–140.

Asemi, A., Safari, A., & Zavareh, A. A. (2011). The role of management information system (MIS) and decision support system (DSS) for manager's decision-making process. *International Journal of Business and Management, 6*(7), 164–173.

Ayinde, L., Ebiefung, R., & Oladokun, B. D. (2026). Adoption of artificial intelligence in academic libraries: A systematic review of current practices, challenges, and research opportunities. *The Journal of Academic Librarianship, 52*(1), 103185.

Ayinde, L., Ebiefung, R., & Oladokun, B. D. (2026). Agentic artificial intelligence in libraries: Implications for academic libraries and future research. *Library Hi Tech News, 43*(3), 52–55.

Cox, A. (2026). Our place in the agentic AI loop: The value of information professional competencies. *Library Hi Tech News, 43*(2), 18–20.

Cox, A. M., Pinfield, S., & Rutter, S. (2019). The intelligent library: Thought leaders' views on the likely impact of AI on academic libraries. *Library Hi Tech, 37*(3), 418–435.

Dwivedi, Y. K., Kshetri, N., Hughes, L., et al. (2023). "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges, and implications of generative conversational AI for research, practice, and policy. *International Journal of Information Management, 71*, 102642.

Enakpowoke, A. H., & Joshua, U. O. (2026). Integration of artificial intelligence (AI) in libraries: Challenges and prospects. *Bayero Journal of Library and Information Science, 6*(1), 117–129.

Floridi, L., & Cowls, J. (2019). A unified framework of five principles for AI in society. *Harvard Data Science Review, 1*(1).

Gmiterek, G., & Kotuła, S. (2025). Generative artificial intelligence in the activities of academic libraries of public universities in Poland. *The Journal of Academic Librarianship*.

Goertzel, B. (2014). Artificial general intelligence: Concept, state of the art, and future prospects. *Journal of Artificial General Intelligence, 5*(1), 1–48.

Goertzel, B., & Pennachin, C. (2007). *Artificial general intelligence*. Springer.

Gupta, V. (2025). From hype to strategy: Navigating the reality of experimental strategic adoption of AI technologies in libraries. *Reference Services Review, 53*(1), 1–14. https://doi.org/10.1108/RSR-08-2024-0042

Haris, M., Ansari, A. J., Malik, B. A., Lund, B. D., & Ali, N. (2025). Artificial intelligence in academic libraries: A survey of users' perception and adoption. *Global Knowledge, Memory and Communication*.

Khan, M. K. (2025). Transforming libraries with blockchain technology: An overview of its potential implementation, benefits, and challenges. *Inverge Journal of Social Sciences, 4*(1), 75–86. https://doi.org/10.63544/ijss.v4i1.127

Khan, M. K., & Lokman, F. Z. B. A. (2026). Automation, transparency, and efficiency in library management through blockchain and IoT technologies. *Inverge Journal of Social Sciences, 5*(2), 12–26. https://doi.org/10.63544/ijss.v5i2.238

Khan, M. K., Lokman, F. Z. B. A., & Masrek, M. N. (2026). AI literacy competencies among library professionals in Saudi Arabia: A cognitive, normative, and behavioural perspective. *Inverge Journal of Social Sciences, 5*(3), 16–34. https://doi.org/10.63544/ijss.v5i3.280

Khan, M. K., Amin, R., Ullah, A., & Ali, N. (2025). Digital transformation in libraries: Readiness of Pakistani university librarians for AR, VR, and metaverse. *AVE Trends in Intelligent Social Letters, 2*(2), 81–90. https://doi.org/10.64091/ATISL.2025.000193

Khan, M. K., & Ullah, A. (2024). Assessing AI-powered library professionals: Implications for management in developing essential 21st-century skills. *AVE Trends in Intelligent Technoprise Letters, 1*(4), 184–195.

Makinde, O. B., Obia, S. E., Okoye, M., Gyang, S. V., & Makinde, B. O. (2025). Artificial intelligence and technology-enhanced information services in academic libraries: A literature review. *Informare: The Journal of the Department of Library and Information Science, 1*(2), 1–27.

Massis, B. (2018). Artificial intelligence arrives in the library. *New Library World, 119*(7/8), 456–459.

Masrek, M. N., & Khan, M. K. (2025). Exploring AI applications in libraries: A topic modelling analysis of recent trends and themes. *Journal of Islamic, Social, Economics and Development (JISED), 10*(79), 894–906.

Narayanan, N. (2024). The era of generative AI: Transforming academic libraries, education, and research. In *Empowering minds: Collaborative learning platform for teachers, librarians and researchers* (pp. 282–293).

Narayanan, N. (2025). *Beyond chatbots: The emergence of autonomous AI agents in libraries.*

Okunlaya, R. O., Syed Jaafar Alhabshi, S. M., & Abdullah, N. S. (2022). Artificial intelligence (AI) library services innovative conceptual framework for the digital transformation of university education. *Library Hi Tech.*

Oladokun, B. D. (2026). Agentic AI and the future of library services. *Library Hi Tech News*, 1–4.

Oladokun, B. D., Atuase, D., Tachie-Donkor, G., Mosweu, T. L., & Gaitanou, P. (2026). University libraries in the age of generative AI: Perceptions and usage among students in developing countries. *The Journal of Academic Librarianship, 52*(4), 103253.

Panda, S., Sharma, V., Sati, P. P., & Kaur, D. N. (2024). Ensuring ethical intelligence: Guiding the integration of AI in modern libraries. *SSRN.* https://ssrn.com/abstract=4980190

Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.

Sardar, H., Azam, A., Azam, M., & Ramzan, M. (2026). Adoption of AI chatbots among medical students: Integration of AI literacy and information literacy within the theory of planned behavior. *The Electronic Library.* Advance online publication. https://doi.org/10.1108/EL-10-2025-0435

Sardar, H., & Khan, M. K. (2026). Awareness, competence, and perceptions of augmented reality, virtual reality, and the metaverse among Pakistani university librarians. *Inverge Journal of Social Sciences, 5*(1), 54–72. https://doi.org/10.63544/ijss.v5i1.221

Sultan, J. B., & Uddin, M. M. (2025). Impact of adapting generative AI in academic libraries: Student perceptions, learning outcomes, and ethical challenges. In *Reimagining librarianship: Forging the future with AI technologies* (p. 64).

Wang, N. C., & Chou, Y. C. (2025). Using agentic AI to enhance the quality of academic

libraries' responses for student queries. *Proceedings of the Association for Information Science and Technology, 62*(1), 1714–1716.

Wu, Y. (2024). Future of information professions: Adapting to the AGI era. *Scientific and Technical Information Processing, 51*(3), 273–279.

Zhang, L., Wang, B., Jing, S., & Zhang, Q. (2025). Generative AI-driven resource discovery in public libraries: Service optimization based on a dynamic evaluation model. *Journal of Library & Information Science in Agriculture, 37*(5).

IEER
Institute for Excellence in Education & Research