

THE LIBRARIAN AS A RESEARCH CO-PILOT: EVOLVING PROFESSIONAL ROLES, COMPETENCIES, AND COLLABORATIVE PARTNERSHIPS IN THE AI-DRIVEN ACADEMIC EDUCATION ECOSYSTEM

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Abstract:

The rapid advancement of Artificial Intelligence (AI) is transforming the academic education ecosystem by reshaping teaching, learning, scholarly communication, research discovery, information management, and knowledge production. Technologies including Generative Artificial Intelligence (GenAI), Large Language Models (LLMs), Natural Language Processing (NLP), Machine Learning (ML), semantic search, knowledge graphs, Retrieval-Augmented Generation (RAG), recommendation systems, intelligent agents, vector databases, and Application Programming Interfaces (APIs) are increasingly being incorporated into academic information environments. These developments present significant opportunities for academic libraries while simultaneously demanding substantial transformation in professional competencies, service models, technological infrastructure, and ethical governance.

This paper examines the emerging concept of the librarian as a Research Co-Pilot, conceptualizing the librarian as an active human partner who collaborates with researchers, students, faculty members, educational technologists, information-system specialists, and AI-enabled information environments throughout the research lifecycle. The study adopts a conceptual, literature-based methodology and synthesizes scholarly literature, professional competency frameworks, and institutional guidance concerning AI in academic libraries, AI literacy, information literacy, generative AI, research support, and professional competency development.

The paper argues that increasing AI sophistication does not diminish the relevance of professional librarianship. Rather, it elevates the importance of human expertise in information evaluation, source verification, provenance assessment, research methodology, contextual interpretation, scholarly communication, copyright, privacy, research integrity, and ethical decision-making. On this basis, the paper proposes a Librarian-as-Research-Co-Pilot Technical Competency Framework comprising six interrelated dimensions: AI literacy; information and research expertise; computational and data literacy; AI-assisted discovery and retrieval; critical evaluation and verification; and ethical AI governance. The paper further examines the relevance of LLMs, prompt engineering, RAG, semantic search, embeddings, vector databases, knowledge graphs, APIs, and AI evaluation to contemporary academic library services.

The paper concludes that the future academic librarian is likely to function increasingly as an AI-enabled research strategist, information architect, research-data advisor, AI-literacy educator, evidence validator, technology evaluator, and ethical intermediary between researchers and intelligent information systems. The Research Co-Pilot model should therefore be understood not merely as a technological extension of existing library services, but as an emerging professional paradigm for human-centred, evidence-based, and ethically governed academic research.

Keywords: Artificial Intelligence; Academic Libraries; Research Co-Pilot; Generative AI; Large Language Models; Retrieval-Augmented Generation; Semantic Search; AI Literacy; Information Literacy; Research Support; Digital Scholarship; Human-AI Collaboration; Librarian Competencies

1. INTRODUCTION

Artificial Intelligence has emerged as one of the most influential technological developments shaping contemporary higher education. Its impact extends across teaching, learning, research, scholarly communication, knowledge production, information retrieval, research-data management, and academic support services. The emergence of Generative AI and Large Language Models has accelerated this transformation by enabling users to interact with information systems through natural-language dialogue rather than relying exclusively on conventional keyword-based search interfaces.

Academic libraries are consequently operating within an increasingly sophisticated technological ecosystem. AI technologies are being incorporated into discovery platforms, recommendation engines, reference services, metadata generation, text analysis, repository management, information retrieval, research support, and educational programmes. Earlier forms of AI adoption were primarily associated with automation and information retrieval; contemporary applications increasingly involve generative systems capable of producing, transforming, summarising, classifying, and interpreting information.

Gasparini and Kautonen (2022) demonstrated that AI has implications not only for library technologies but also for research services, research data, users, and professional roles. Similarly, Asemi et al. (2021) identified applications of AI in reference

services, cataloguing, classification, recommendation systems, and information retrieval. Cox (2022) further argued that AI may alter professional competencies and the boundaries of academic library work.

The emergence of GenAI introduces both opportunities and risks. AI systems can assist users in generating summaries, identifying patterns, and translating information, developing preliminary research questions, discovering relevant literature, and supporting academic writing. However, AI-generated outputs can also contain factual inaccuracies, fabricated citations, biased interpretations, incomplete explanations, and unsupported claims. Consequently, the availability of AI-generated information does not reduce the importance of professional information expertise. Instead, it increases the need for critical evaluation, verification, contextual interpretation, and evidence-based research practices.

This transformation provides the conceptual foundation for the Research Co-Pilot model. A Research Co-Pilot is understood in this paper as a librarian who works collaboratively with researchers and AI systems across multiple stages of the research and learning process. The role extends beyond operating technological tools. It incorporates professional expertise in information retrieval, source evaluation, metadata, scholarly communication, research methodology, digital scholarship, copyright, information ethics, research integrity, and research-data management.

The evolution may therefore be conceptualized as:

Traditional Information Provider → Digital Information Specialist → Research Partner → AI-Enabled Research Co-Pilot

This transformation does not imply the replacement of librarians by AI. Instead, it suggests a redistribution and enrichment of professional responsibilities in which librarians increasingly undertake higher-order activities involving evaluation, interpretation, research strategy, AI literacy, technology assessment, and ethical governance.

The Association of College and Research Libraries (ACRL) further demonstrates the institutionalisation of this transformation through its AI Competencies for Academic Library Workers, approved in October 2025. The framework identifies four broad competency areas: ethical considerations; knowledge and understanding; analysis and evaluation; and use and application. It also recognises technologies and concepts including machine learning, prompting, semantic search, multimodal AI, Retrieval-Augmented Generation, and agentic AI.

The increasing integration of such technologies therefore requires academic librarians to develop a hybrid professional identity combining established library and information-science expertise with technological, computational, analytical, and ethical capabilities.

2. BACKGROUND AND RATIONALE

The integration of AI into library environments is not a recent phenomenon. Machine learning, automated classification, recommendation systems, natural language processing, expert systems, and intelligent retrieval technologies have progressively been incorporated into library and information systems.

Asemi et al. (2021) identified several potential applications of AI within library services, including reference services, information retrieval, cataloguing, classification, and recommendation. Gasparini and Kautonen (2022) subsequently demonstrated that AI has wider implications for research libraries, encompassing services, research data, users, and professional practice.

Cox (2022) approached AI adoption from the perspective of professional competencies and the theory of professions, suggesting that technological change may redistribute professional responsibilities rather than simply eliminate existing work. This distinction is particularly important for understanding the future of academic librarianship.

The central issue is therefore no longer whether academic libraries should engage with AI, but how they should engage with AI strategically, critically, responsibly, and ethically.

The rationale for the Research Co-Pilot model arises from five major developments:

1. the increasing use of AI in academic information environments;
2. the expansion of AI-assisted research and scholarly communication;
3. the growing requirement for AI and information literacy;
4. the need for professional verification of AI-generated information; and
5. the emergence of new technical competencies within academic librarianship.

The librarian's traditional professional strengths—authority control, metadata, information organisation, evidence evaluation, information retrieval, research consultation, and scholarly communication—remain highly relevant. However, these capabilities increasingly need to be applied within AI-mediated environments.

3. LITERATURE REVIEW

3.1 Artificial Intelligence and the Transformation of Academic Libraries

The integration of Artificial Intelligence into academic libraries has progressed from experimental applications in automation and information retrieval towards broader transformation of research, teaching, learning, scholarly communication, and professional practice.

Early AI applications included expert systems, automated cataloguing, classification, recommendation systems, natural language processing, and intelligent reference services. Asemi et al. (2021) argued that AI could support several core library functions and should be considered as an emerging component of intelligent library services rather than solely as an automation mechanism. Gasparini and Kautonen (2022) examined AI in research libraries and identified implications for library services, research data, users, and professional roles. Their work indicates that AI adoption involves organisational and professional transformation in addition to technological implementation.

Cox (2022) similarly argued that AI could alter professional competencies and the boundaries of academic library work. Importantly, technological automation may redistribute responsibilities rather than simply eliminate them. Tasks requiring interpretation, evaluation, research consultation, contextual understanding, and professional judgement may become increasingly significant.

The literature consequently indicates a movement from an **automation-oriented model** towards a **human–AI collaboration model** in which professional expertise remains central.

3.2 Generative Artificial Intelligence and Large Language Models

The emergence of Generative Artificial Intelligence and Large Language Models has substantially altered academic information environments. Unlike conventional information-retrieval systems, LLM-based systems can generate natural-language responses and perform tasks such as summarization, translation, classification, pattern identification, research-question development, and preliminary academic writing.

Adetayo (2023) examined the emergence of ChatGPT within academic library environments and highlighted opportunities for AI-enabled reference and information services while also recognising concerns relating to accuracy and responsible implementation. Lo (2023) similarly emphasised the need for academic librarians to develop appropriate competencies for supporting users in GenAI environments.

The principal challenge is that fluent AI-generated language does not necessarily indicate factual accuracy. LLMs can produce fabricated references, inaccurate statements, incomplete explanations, or misleading interpretations. AI-generated content therefore cannot automatically be considered authoritative scholarly evidence.

This limitation strengthens the importance of professional librarianship in several areas:

- source verification;
- authority assessment;
- citation analysis;
- evidence evaluation;
- provenance assessment;
- contextual interpretation;
- bias identification; and
- research-integrity education.

The professional objective should therefore extend beyond teaching users how to operate an AI system. Librarians should increasingly teach users how to critically evaluate AI-generated knowledge.

3.3 AI Competencies and the Changing Role of Librarians

A major theme in contemporary scholarship concerns the development of AI-related competencies among academic librarians.

Hervieux and Wheatley (2021) examined perceptions of AI among academic librarians and identified both opportunities and concerns associated with AI adoption. Their findings indicate the importance of professional preparation and organisational support.

Wheatley and Hervieux (2024) developed the B-Wheel model for building AI competencies in academic libraries. The model emphasises a holistic approach to competency development rather than treating AI skills as isolated technical capabilities. It incorporates organizational learning, design approaches, and learning through practical engagement.

The significance of this approach is that AI readiness cannot be achieved simply by providing librarians with short-term training in individual AI applications. Sustainable AI capability requires:

- institutional strategy;
- continuous professional development;
- experimentation and practical application;
- interdisciplinary collaboration;
- ethical governance;
- technological awareness; and
- organisational learning.

The ACRL AI Competencies for Academic Library Workers further institutionalize this direction by identifying ethical considerations, AI knowledge, analysis and evaluation, and practical use and application as core competency domains.

AI competency is therefore increasingly becoming a substantive dimension of professional academic librarianship.

3.4 AI Literacy and Information Literacy

Information literacy and AI literacy are closely interconnected.

Traditional information literacy requires users to evaluate authority, relevance, credibility, context, evidence, and bias. These principles remain applicable when users interact with AI-generated information, although AI-mediated environments introduce additional technical considerations.

Users must understand that AI-generated responses are outputs produced by computational systems rather than inherently authoritative sources. Consequently, AI literacy requires an understanding of:

- how AI systems generate outputs;
- the limitations of training data;
- algorithmic bias;
- hallucination and fabrication;
- source provenance;
- citation reliability;
- prompt formulation;
- data privacy;
- intellectual property; and
- appropriate human oversight.

Academic librarians are particularly well positioned to provide this educational support because critical information evaluation has historically been central to librarianship.

AI literacy should therefore be regarded not as a replacement for information literacy, but as an extension of information literacy into AI-mediated information environments.

3.5 Retrieval-Augmented Generation and Academic Research

Retrieval-Augmented Generation represents an important technical architecture for connecting generative AI with external information sources.

RAG combines an information-retrieval mechanism with a generative language model. Instead of relying exclusively on information embedded within the model, the system retrieves relevant external documents and supplies them as contextual information for response generation.

A simplified RAG workflow can be represented as:

User Query → Retrieval System → Relevant Documents → Context Construction → LLM → Generated Response

This architecture has considerable relevance to academic libraries because it can potentially connect AI systems with curated scholarly collections, institutional repositories, research databases, and controlled information resources.

For example, an academic-library RAG environment could retrieve relevant documents from an institutional repository before generating a response to a researcher's query. Such systems could potentially improve grounding and traceability, although retrieval quality, source authority, metadata quality, model behavior, access controls, and evaluation remain critical considerations. Librarians may therefore become important contributors to RAG-based academic discovery because they possess expertise in:

- metadata;
- indexing;
- authority control;
- collection development;
- information retrieval;
- taxonomy;
- controlled vocabularies;
- research databases; and
- Information provenance.

3.6 Semantic Search, Embeddings, and Vector-Based Discovery

Academic discovery is increasingly moving beyond conventional keyword matching towards semantic retrieval.

Semantic search uses machine-learning models and language representations to identify conceptual relationships between queries and documents. A major technical component is the use of embedding's, which represent textual or other information as numerical vectors.

In a simplified model:

Document → Embedding Model → Vector Representation
and

Research Query → Embedding Model → Query Vector

The retrieval system can then compare the query vector with document vectors according to a similarity measure.

This enables systems to identify conceptually related information even where identical keywords are absent. Such functionality can potentially improve discovery in multidisciplinary and conceptually complex research environments.

However, semantic retrieval also introduces professional questions concerning:

- authority;
- relevance;
- representativeness;
- metadata quality;
- algorithmic bias;
- ranking transparency;
- collection coverage; and
- source provenance.

The emerging librarian does not necessarily need to become a machine-learning engineer. Nevertheless, sufficient technical literacy is increasingly necessary to understand and critically evaluate AI-mediated discovery systems.

4. RESEARCH OBJECTIVES

The study has the following objectives:

1. To examine the transformation of academic librarianship within an AI-driven education ecosystem.
2. To identify emerging professional roles of librarians as Research Co-Pilots.
3. To examine the technical competencies required by AI-enabled academic librarians.
4. To analyse the relevance of Generative AI, LLMs, RAG, semantic search, knowledge graphs, APIs, and AI agents to academic research.
5. To examine the role of librarians in AI literacy and information-literacy education.

6. To analyse ethical, technical, professional, and organisational challenges associated with AI adoption.
7. To develop a conceptual technical competency framework for the librarian as a Research Co-Pilot.
8. To recommend strategies for developing AI-ready academic library services.

5. RESEARCH QUESTIONS

RQ1: How is Artificial Intelligence transforming the professional role of academic librarians?

RQ2: What technical and professional competencies are required for librarians to function effectively as Research Co-Pilots?

RQ3: How can librarians support the critical, ethical, and responsible use of Generative AI in academic education and research?

RQ4: How can technologies such as LLMs, RAG, semantic search, knowledge graphs, and APIs enhance research-library services?

RQ5: What ethical and technical risks must academic librarians address when implementing AI technologies?

RQ6: What conceptual framework can guide the development of AI-enabled Research Co-Pilot services within academic libraries?

6. RESEARCH METHODOLOGY

This study adopts a conceptual and literature-based research methodology. The analysis synthesises scholarly literature, professional frameworks, institutional guidance, and research concerning Artificial Intelligence, academic libraries, AI literacy, information literacy, Generative AI, research support, professional competencies, and human–AI collaboration.

The study does not employ primary survey or experimental data. Instead, it develops a conceptual interpretation of emerging professional roles and technical competencies from the available literature and professional frameworks.

The analytical process involved the following stages:

1. identification of major themes relating to AI and academic librarianship;
2. examination of emerging AI-related professional competencies;
3. analysis of technical technologies relevant to academic libraries;
4. consideration of information-literacy and AI-literacy requirements;
5. examination of ethical and professional implications; and
6. synthesis of these themes into a conceptual Librarian-as-Research-Co-Pilot Technical Competency Framework.

This methodology is appropriate for examining an emerging professional paradigm for which institutional practices, technologies, and competency requirements continue to evolve.

7. ARTIFICIAL INTELLIGENCE TECHNOLOGIES RELEVANT TO ACADEMIC LIBRARIES

7.1 Machine Learning

Machine Learning enables computational systems to identify patterns in data and improve performance without relying exclusively on explicitly programmed rules.

Within academic libraries, ML can support:

- recommendation systems;
- classification;
- information retrieval;
- collection analysis;
- usage-pattern analysis;
- metadata enhancement; and
- Personalized discovery.

The professional role of librarians increasingly involves understanding how such systems operate sufficiently to evaluate their outputs and implications.

7.2 Natural Language Processing

Natural Language Processing enables computers to process and analyse human language.

Potential applications in academic library environments include:

- natural-language information retrieval;
- automated subject classification;
- text summarization;
- entity extraction;
- question answering;
- document analysis; and
- conversational reference services.

NLP is particularly relevant to Research Co-Pilot services because researchers increasingly interact with information systems through natural-language questions rather than formal search syntax.

7.3 Knowledge Graphs

Knowledge graphs represent entities and relationships in structured computational form.

For example:

Researcher → authored → Article

Article → cites → Article

Article → discusses → Legal Concept

Legal Case → interprets → Statute

Such structures can support advanced discovery by exposing relationships among authors, institutions, subjects, publications, legal authorities, research concepts, and scholarly networks.

Knowledge graphs also create an important professional opportunity for librarians because traditional expertise in metadata, authority control, taxonomies, ontologies, and knowledge organization can contribute directly to AI-enabled discovery environments.

7.4 Application Programming Interfaces

Application Programming Interfaces enable different software systems to communicate and exchange data.

A potential academic-library AI architecture may be represented as:

Library Management System



Discovery Layer / API



Institutional Repository



AI Retrieval Service



LLM / Generative AI System

Such an architecture could enable AI-assisted research interfaces while maintaining connections to authoritative institutional information resources.

Librarians increasingly require sufficient technical literacy to understand:

- APIs;
- authentication;
- metadata formats;
- data exchange;
- access controls;
- vendor integrations;
- interoperability;
- system architecture; and
- data security.

The objective is not to transform librarians into software engineers. Rather, librarians should become technically literate research professionals capable of participating effectively in technology-enabled research environments.

7.5 Prompt Engineering and Prompt Literacy

Prompt engineering refers to the systematic design, refinement, and evaluation of instructions provided to generative AI systems.

A research-oriented prompt can be structured around:

Role + Task + Context + Evidence Requirement + Constraints + Output Format

For example:

Act as an academic research assistant. Identify peer-reviewed literature on AI literacy in academic libraries published between 2022 and 2026. Provide verified DOI information and distinguish empirical studies from conceptual papers.

Prompt literacy can therefore be understood as an extension of advanced information-search and research-consultation skills.

Academic librarians are well positioned to teach prompt literacy because they already possess expertise in information needs assessment, search strategy, source evaluation, evidence requirements, and research communication.

8. THE LIBRARIAN AS A TECHNICAL RESEARCH CO-PILOT

The Research Co-Pilot represents a hybrid professional profile in which traditional library competencies are integrated with emerging technical competencies.

Professional Competency	Corresponding Technical Competency
Information literacy	Prompt engineering
Reference service	Natural Language Processing
Research consultation	Semantic search
Metadata	Knowledge graphs
Citation management	APIs
Research-data management	Vector databases

Professional Competency

Scholarly communication
Information evaluation
Copyright
Research ethics

Corresponding Technical Competency

Retrieval-Augmented Generation
AI evaluation
Data governance
AI risk assessment

This hybrid competency profile represents an emerging professional identity for academic librarians. The Research Co-Pilot is therefore not simply a librarian who knows how to use AI applications. The role involves understanding how AI-mediated information environments affect the quality, authority, discoverability, accessibility, provenance, security, and ethical status of scholarly information.

9. PROPOSED LIBRARIAN-AS-RESEARCH-CO-PILOT TECHNICAL COMPETENCY FRAMEWORK

The proposed framework consists of six interrelated competency dimensions.

Dimension 1: AI Literacy

The librarian should understand fundamental AI concepts, including:

- machine learning;
- generative AI;
- LLMs;
- NLP;
- multimodal AI;
- AI agents;
- prompting;
- model limitations; and
- algorithmic bias.

The objective is functional and critical understanding rather than advanced AI engineering.

Dimension 2: Information and Research Expertise

This dimension builds upon established professional competencies in:

- information retrieval;
- scholarly communication;
- research consultation;
- literature searching;
- citation management;
- source evaluation;
- metadata; and
- research methodology.

These capabilities remain fundamental because AI-generated outputs require authoritative information and critical assessment.

Dimension 3: Computational and Data Literacy

Research Co-Pilots should develop sufficient knowledge of:

- structured and unstructured data;
- metadata;
- data formats;
- APIs;
- databases;
- vector representations;
- interoperability;
- data security; and
- research-data management.

Dimension 4: AI-Assisted Discovery and Retrieval

This dimension includes practical understanding of:

- semantic search;
- embeddings;
- vector databases;
- RAG;
- recommendation systems;
- knowledge graphs; and
- AI-enabled discovery systems.

The librarian's role is to evaluate and optimise information discovery while maintaining scholarly quality and provenance.

Dimension 5: Critical Evaluation and Verification

This competency area is central to the Research Co-Pilot model.

The librarian should be able to evaluate:

- factual accuracy;
- source authority;
- citation validity;
- evidence quality;
- algorithmic bias;
- hallucinated content;
- retrieval quality;
- provenance; and
- contextual relevance.

Dimension 6: Ethical AI Governance

The final dimension addresses:

- privacy;
- copyright;
- intellectual property;
- data protection;
- research integrity;
- transparency;
- accountability;
- responsible AI use; and
- AI risk assessment.

UNESCO's guidance on Generative AI in education and research emphasises human-centred, safe, equitable, and pedagogically appropriate implementation. Academic librarians can contribute substantially to these objectives because AI literacy and information literacy are closely interconnected.

10. PROFESSIONAL ROLES OF THE RESEARCH CO-PILOT

The transformation towards AI-enabled librarianship produces several emerging professional roles.

10.1 AI-Enabled Research Strategist

The librarian assists researchers in identifying appropriate AI tools, developing research workflows, designing search strategies, and integrating AI into research processes.

10.2 Information Architect

The librarian contributes to the organisation, structuring, description, retrieval, and contextualisation of information resources within AI-enabled environments.

10.3 AI-Literacy Educator

The librarian provides training in:

- AI fundamentals;
- prompt literacy;
- AI-assisted research;
- source verification;
- responsible AI use; and
- information evaluation.

10.4 Evidence Validator

The librarian helps researchers distinguish authoritative evidence from AI-generated assertions and verifies citations, sources, and supporting documentation.

10.5 Research-Data Advisor

The librarian contributes to research-data management, metadata development, data discovery, data governance, and responsible data use.

10.6 Technology Evaluator

The librarian evaluates AI-enabled library products and services according to relevance, accuracy, interoperability, usability, privacy, accessibility, and scholarly value.

10.7 Ethical Intermediary

The librarian serves as a professional intermediary between researchers and AI systems by promoting transparency, privacy, intellectual-property compliance, research integrity, and responsible use.

11. ETHICAL AND PROFESSIONAL CHALLENGES

The adoption of AI within academic libraries introduces several interconnected risks.

11.1 Accuracy and Hallucination

Generative AI may produce plausible but incorrect information. Librarians must therefore promote systematic verification and discourage the uncritical acceptance of AI-generated content.

11.2 Citation Reliability

AI systems may generate nonexistent or inaccurate references. Academic library instruction should therefore emphasise independent verification of bibliographic information and DOI metadata.

11.3 Algorithmic Bias

AI systems may reproduce or amplify biases contained in training data, retrieval systems, ranking mechanisms, or institutional datasets. Librarians should therefore incorporate bias awareness into AI-literacy programmes.

11.4 Privacy and Data Protection

Research queries may contain confidential, unpublished, personal, or institutionally sensitive information. AI adoption must therefore consider data handling, privacy, access control, and vendor policies.

11.5 Copyright and Intellectual Property

The use of copyrighted scholarly materials in AI-enabled systems raises complex questions concerning licensing, access, reproduction, transformation, and intellectual property.

11.6 Research Integrity

AI-generated text, analysis, references, and research outputs can create challenges relating to authorship, attribution, transparency, reproducibility, and academic integrity.

11.7 Technological Dependency

Excessive dependence on AI systems may weaken users' independent analytical and research capabilities. The librarian should therefore promote AI as a research-support mechanism rather than as a substitute for scholarly judgement.¹² Human–AI Collaboration in Academic Research

The Research Co-Pilot model is fundamentally based on human–AI collaboration rather than technological substitution.

A simplified research workflow may be conceptualized as:



Within this workflow, AI provides computational capabilities such as rapid retrieval, pattern recognition, summarization, classification, and language generation. The librarian contributes professional judgment, contextual knowledge, evidence evaluation, source authority assessment, information architecture, ethical guidance, and research expertise.

The resulting model is therefore complementary:

AI = computational augmentation

Librarian = professional judgement and information governance

Researcher = intellectual responsibility and scholarly decision-making

This division of responsibilities provides a human-centred model for responsible AI-supported research.

12. IMPLICATIONS FOR ACADEMIC LIBRARY SERVICES

The Research Co-Pilot model has implications across multiple academic library services.

Reference and Research Consultation

Traditional reference services can evolve towards AI-supported research consultation in which librarians help users formulate research questions, develop advanced prompts, identify authoritative sources, and evaluate AI-generated outputs.

Information-Literacy Programmes

Information-literacy programmes should increasingly incorporate AI literacy, prompt literacy, source verification, algorithmic bias, AI hallucination, citation validation, and responsible AI use.

Research Support

Libraries can develop AI-enabled research-support services covering literature discovery, systematic-search assistance, research-data management, citation management, and scholarly communication.

Institutional Repositories

Repositories can potentially be integrated with AI retrieval services, enabling researchers to discover institutional research outputs through semantic and conversational interfaces.

Digital Scholarship

AI creates opportunities for libraries to support text analysis, computational scholarship, knowledge graphs, research-data analysis, and digital humanities initiatives.

Library Technology Evaluation

Librarians should increasingly participate in evaluating AI-enabled vendor products and library platforms, particularly with regard to accuracy, interoperability, accessibility, privacy, transparency, and scholarly value.

13. RECOMMENDATIONS

Based on the conceptual analysis, the following recommendations are proposed.

13.1 Develop Institutional AI Competency Programmes

Academic libraries should establish structured professional-development programmes covering AI literacy, prompt engineering, LLMs, RAG, semantic search, data literacy, AI evaluation, and ethical governance.

13.2 Integrate AI Literacy with Information Literacy

AI literacy should be embedded within existing information-literacy programmes rather than treated as an entirely separate educational activity.

13.3 Establish AI Governance Policies

Libraries should develop policies addressing:

- privacy;
- copyright;
- responsible AI use;
- research integrity;
- data security;
- vendor assessment;
- transparency; and
- human oversight.

13.4 Create Research Co-Pilot Services

Academic libraries should explore dedicated research-support services in which librarians collaborate with researchers throughout the research lifecycle.

13.5 Strengthen Technical Collaboration

Libraries should collaborate with IT departments, research offices, educational technologists, data scientists, faculty members, and institutional repositories to develop interoperable AI-enabled research environments.

13.6 Develop Continuous Professional Development

AI technologies evolve rapidly. Competency development should therefore be continuous rather than dependent on one-time training programmes.

13.7 Evaluate AI Systems Critically

Before implementing AI-enabled library services, institutions should evaluate systems for:

- accuracy;
- relevance;
- transparency;
- privacy;
- security;
- accessibility;
- interoperability;
- bias; and
- scholarly reliability.

13.8 Preserve Human Oversight

AI should augment professional librarianship rather than replace human judgement. Final decisions concerning evidence quality, research integrity, ethical use, and scholarly interpretation should remain subject to appropriate human oversight.

14. Discussion

The literature demonstrates that Artificial Intelligence is reshaping academic librarianship at technological, professional, educational, and organizational levels. Earlier scholarship focused substantially on AI applications in library services, whereas more recent work increasingly addresses AI competencies, AI literacy, ethics, research support, and organisational transformation. Gasparini and Kautonen (2022) provided an important foundation for understanding the implications of AI within research libraries. Subsequent competency-oriented research, including the B-Wheel model proposed by Wheatley and Hervieux (2024), has emphasised the importance of systematic and holistic AI capability development.

The ACRL AI competency framework further strengthens this professional direction by identifying ethical considerations, knowledge and understanding, analysis and evaluation, and use and application as core competency areas.

Nevertheless, an important conceptual gap remains: how these individual competencies can be integrated into a coherent model of librarian–researcher–AI collaboration.

The Research Co-Pilot concept addresses this gap by positioning the librarian as an active participant in the research process rather than as a passive provider of information resources.

Under this model, the librarian becomes simultaneously:

- research strategist;
- AI-literacy educator;
- information architect;
- evidence validator;
- research-data advisor;
- technology evaluator; and
- ethical intermediary.

The significance of this transformation lies not simply in the adoption of new technologies but in the redefinition of professional value. When information retrieval becomes increasingly automated, professional value shifts towards evaluation, contextualization, provenance, research strategy, ethical governance, and human judgment.

The Research Co-Pilot therefore represents a transition from technology-centred automation to human-centred augmentation.

15. Conclusion

Artificial Intelligence is fundamentally transforming the academic education ecosystem. Generative AI, Large Language Models, Natural Language Processing, semantic search, Retrieval-Augmented Generation, knowledge graphs, vector databases, APIs, and intelligent agents are creating new possibilities for research discovery, information management, teaching, learning, scholarly communication, and digital scholarship.

These developments simultaneously redefine the professional role of academic librarians. The librarian of the AI era cannot be limited to the traditional function of information provision. The emerging professional must understand how AI systems operate, assess their reliability, evaluate sources, manage information resources, protect user privacy, understand data and metadata, teach AI literacy, verify AI-generated information, support research-data management, and collaborate with researchers and technology specialists.

The Research Co-Pilot model provides a conceptual framework for understanding this transformation. It positions the librarian as a human–AI intermediary who combines professional information expertise with technological literacy, critical evaluation, research methodology, and ethical judgment.

The future academic librarian will increasingly operate at the intersection of:

Library and Information Science + Artificial Intelligence + Data Science + Information Literacy + Research Methodology + Digital Scholarship + Ethics

The objective is not to replace professional librarianship with automation. Rather, the objective is to establish a human-centred AI research ecosystem in which computational technologies enhance research capacity while librarians safeguard evidence quality, information integrity, ethical practice, privacy, scholarly independence, and responsible knowledge production.

Accordingly, the Research Co-Pilot should not be regarded merely as a new job title or an additional library service. It represents an emerging professional model for academic librarianship in the AI-driven education ecosystem one in which librarians become strategic partners in the production, discovery, evaluation, management, and responsible use of scholarly knowledge.

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