

From Custodians to Catalysts: The Evolving Role of Academic Libraries in the Digital Scholarly Ecosystem

Sudipta Shee

Librarian, Vijaygarh Jyotish Ray College, W.B.

Abstract:

The rapid evolution of the digital ecosystem has fundamentally restructured the mechanisms of scholarly communication. Traditional models of academic publishing, historically defined by subscription pay walls and physical dissemination, are increasingly challenged by open access (OA) paradigms, digital repositories, dynamic data-sharing frameworks, and artificial intelligence (AI). This paper examines the evolving role of academic libraries within this transformed landscape. Drawing upon contemporary research, it explores how academic librarianship has shifted from a passive stewardship of print collections to an active, strategic facilitation of open science, research data management (RDM), digital preservation, and altimetry assessment. The findings indicate that academic libraries are vital infrastructure providers and collaborative partners, driving institutional repository development, negotiating transformative agreements, and leading education in scholarly ethics and compliance.

Keywords: Scholarly communication, academic libraries, open access, institutional repositories, research data management, digital preservation, transformative agreements.

1. Introduction

Scholarly communication—the process by which academics, researchers, and scholars create, evaluate, disseminate, and preserve knowledge—has undergone a profound paradigm shift over the past three decades (Borgman, 2007; Meadows, 1998). Historically, academic libraries operated as the primary buyers and custodians of bound journals and print books produced by commercial publishers and scholarly societies. However, the advent of the internet, digitization, and hyper-connected research networks has disrupted this traditional lifecycle.

The digital ecosystem has democratized content dissemination while simultaneously introducing severe economic and systemic challenges. The "serials crisis"—characterized by journal subscription costs rising well above inflation rates—forced higher education institutions to reconsider the sustainability of commercial publishing models (Panitch & Caro, 2005; Suber, 2012). Concurrently, global mandates for open science and publicly accessible research (e.g., Plan S in Europe and the White House Office of Science and Technology Policy guidelines in the United States) have accelerated the transition toward open access models (European Commission, 2020; OSTP, 2022).

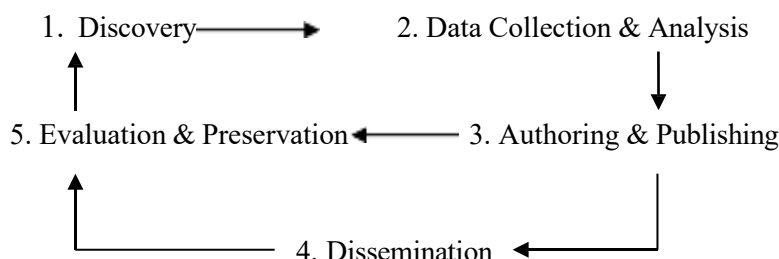
Within this dynamic landscape, academic libraries have redefined their mission. No longer restricted to information curation, libraries now serve as strategic partners across every stage of the scholarly research lifecycle (Tenopir et al., 2015). This paper provides a comprehensive analysis of the role of academic libraries in modern scholarly communication, examining open access advocacy, research data management, institutional repositories, digital preservation, and emerging metrics.

2. Theoretical Framework and the Research Lifecycle

To understand the changing position of the academic library, it is useful to contextualize scholarly communication through the lens of the **Research Lifecycle Framework** (Boock et al., 2020). The research lifecycle encompasses five main phases:

1. **Idea Generation & Literature Review:** Discovering existing research and identifying gaps.
2. **Data Collection & Analysis:** Gathering, processing, and storing raw research data.

3. **Authoring & Publishing:** Writing manuscripts, undergoing peer review, and select publishing venues.
4. **Dissemination & Outreach:** Sharing outputs via repositories, social media, and academic networks.
5. **Preservation & Impact Evaluation:** Long-term archival and monitoring citations, usage, and societal impact.



Whereas libraries historically focused on Phase 1 (providing discovery tools) and Phase 5 (archiving physical outputs), the modern digital environment requires active library intervention across all five stages.

3. Core Functions of Academic Libraries in the Digital Era

3.1 Open Access Advocacy and Transformative Agreements

The Open Access (OA) movement aims to make peer-reviewed research outputs freely available online without financial, legal, or technical barriers (Suber, 2012). Academic libraries have stood at the forefront of this movement through advocacy, financial management, and direct negotiation.

Libraries regularly manage **Article Processing Charge (APC)** funds to support researchers who publish in Gold OA journals (Björk, 2017). Furthermore, library consortia have pioneered **Transformative Agreements** (also known as "Read and Publish" or "Publish and Read" contracts) with major academic publishers (e.g., Elsevier, Wiley, Springer Nature). These contracts reallocate traditional library subscription fees toward coverage of APCs for institutional authors, systematically shifting the financial model of academic publishing from access-based paywalls to open publication (Poynder, 2019; Geschuhn & Stone, 2017).

3.2 Institutional Repositories and Green Open Access

Institutional Repositories (IRs)—such as those built on DSpace, EPrints, or Samvera platforms—are foundational infrastructures managed by academic libraries. IRs facilitate "Green OA" by allowing scholars to self-archive preprints, postprints (author accepted manuscripts), and technical reports (Lynch, 2003).

Beyond providing free access to research, IRs serve several key strategic functions for universities:

- **Preserving Institutional Memory:** Archival of dissertations, faculty papers, conference proceedings, and administrative records.
- **Global Visibility:** Indexing local research in search engines like Google Scholar, thereby increasing global citations and impact (Swan & Carr, 2008).
- **Compliance Management:** Helping researchers satisfy open-access mandates established by government funding bodies (e.g., NIH, NSF, Horizon Europe).

3.3 Research Data Management (RDM) and FAIR Principles

Modern scholarship is heavily driven by data. As funding agencies increasingly mandate that underlying empirical data be made accessible, academic libraries have expanded into **Research Data Management (RDM)** services (Cox et al., 2017).

Librarians assist researchers in drafting Data Management Plans (DMPs), selecting appropriate metadata standards (e.g., Dublin Core, Data Documentation Initiative), and organizing research data in accordance with the **FAIR Principles**—ensuring data is *Findable, Accessible, Interoperable, and Reusable* (Wilkinson et al., 2016). Libraries frequently host or manage dedicated data repositories (such as Dataverse or Figshare instances) to guarantee long-term data curation and assign Persistent Identifiers (PIDs) like Digital Object Identifiers (DOIs).

3.4 Digital Preservation and Persistent Identifiers

The transition from tangible print formats to volatile digital files introduces the risk of "digital decay" and broken web links (link rot). Libraries safeguard the continuity of digital knowledge through robust digital preservation programs, adhering to the Open Archival Information System (OAIS) reference model (ISO, 2012).

Furthermore, libraries promote and manage ecosystem infrastructure centered on Persistent Identifiers (PIDs):

- **DOIs (Digital Object Identifiers):** Ensuring permanent routing to publish literature and data assets.
- **ORCID IDs:** Disambiguating author names to accurately attribute institutional research output (Haak et al., 2012).
- **ROR (Research Organization Registry):** Standardizing institutional affiliation metadata.

3.5 Bibliometrics, Altmetrics, and Research Evaluation

As universities focus on demonstrating the impact of funded research, libraries have developed specialized research intelligence services. Librarians utilize traditional bibliometric platforms (e.g., Web of Science, Scopus) to evaluate citation impacts, h-index distributions, and institutional collaboration networks (Astrom & Bjorneborn, 2019).

Simultaneously, libraries lead the adoption of **Altmetrics** (alternative metrics), which track online engagement with scholarly outputs across news media, policy documents, Wikipedia, blogs, and social platforms (Priem et al., 2010). By providing holistic metrics, libraries assist academic departments with tenure review, grant reporting, and institutional strategy, while advocating for responsible research assessment frameworks like the San Francisco Declaration on Research Assessment (DORA, 2012).

4. Challenges facing Academic Libraries in Scholarly Communication

Despite these advancements, academic libraries navigate significant systemic challenges within the digital scholarly ecosystem:

1. **Budgetary Constraints:** Persistent budget cuts combined with high costs for database licenses and APC fees strain library resources (Machovec, 2020).
2. **Equity Concerns in Open Access:** While Gold OA removes paywalls for readers, high APC fees create new barriers for researchers in low- and middle-income countries, threatening equity in scholarly publishing (Lawson, 2019).
3. **Generative AI and Copyright:** The rapid rise of Generative AI tools (e.g., LLMs) poses new copyright, licensing, and author-attribution questions regarding how digital collections are mined and credited (Lund et al., 2023).
4. **Skills and Staffing Gaps:** Expanding into computational research support, data science, and complex licensing negotiation requires continuous professional development and restructuring of traditional library roles (Cox et al., 2017).

5. Conclusion

The digital ecosystem has permanently altered the creation, evaluation, and sharing of human knowledge. Rather than rendering academic libraries obsolete, this shift has heightened their importance. Academic libraries have transformed from passive repositories into active co-creators, system architects, and advocates within the scholarly communication

network. By steering open access transitions, building data management infrastructure, ensuring digital preservation, and providing research impact intelligence, academic libraries remain vital to the global scientific enterprise. Looking forward, libraries must continue adapting to technical disruptions—such as artificial intelligence and evolving publishing mechanics—while maintaining their commitment to equitable, sustainable, and transparent knowledge access.

The digital ecosystem has fundamentally disrupted the centuries-old mechanics of scholarly communication, transforming the enterprise of knowledge creation from a static, physical workflow into a dynamic, highly interconnected network. Central to navigating this ongoing transformation are academic libraries. Far from diminishing the authority or necessity of the library, the shift toward a hyper-digital, open-science paradigm has elevated academic libraries from traditional clearinghouses of physical collections to vital, strategic infrastructure providers and collaborative intellectual partners.

This digital paradigm shift is not without its vulnerabilities. Academic libraries face complex, interrelated challenges, including enduring operational budget constraints, deep equity imbalances regarding high Article Processing Charges (APCs) for researchers in developing nations, and the operational demands of up skilling library staff to meet computational standards. Furthermore, the exponential proliferation of generative artificial intelligence and large language models (LLMs) introduces urgent legal, ethical, and practical questions surrounding copyright, text and data mining permissions, author attribution, and automated content generation.

Addressing these challenges requires academic libraries to remain adaptive, proactive, and values-driven. Libraries must continue to advocate for equitable open scholarship frameworks that prioritize inclusion alongside access. They must also forge stronger cross-institutional partnerships, lead university policy regarding responsible AI integration, and build resilient digital curation models that ensure current scholarly achievements remain available to future generations. Ultimately, the true value of the academic library in the digital era lies not merely in its capacity to adopt new technologies, but in its unwavering commitment to democratic access, information literacy, and ethical stewardship. As scholarly communication continues to evolve in response to technological disruption, academic libraries will remain indispensable drivers of open, transparent, and globally collaborative research.

References

- Astrom, F., & Bjorneborn, L. (2019). Research evaluation and bibliometrics in academic libraries: Integrating services into the university research ecosystem. *Journal of Librarianship and Information Science*, 51(3), 675–689. <https://doi.org/10.1177/0961000617742462>
- Bjork, B. C. (2017). Growth of open access publishing: Theory and evidence. *Publications*, 5(2), Article 10. <https://doi.org/10.3390/publications5020010>
- Boock, M., Peters, D., & Landis, C. (2020). Reimagining library services across the research lifecycle. *College & Research Libraries News*, 81(4), 178–182. <https://doi.org/10.5860/crln.81.4.178>
- Borgman, C. L. (2007). *Scholarship in the digital age: Information, infrastructure, and the Internet*. MIT Press.
- Cox, A. M., Kennan, M. A., Lyon, L., & Pinfield, S. (2017). Developments in research data management in academic libraries: Towards an understanding of research data service maturity. *Journal of Association for Information Science and Technology*, 68(9), 2182–2196. <https://doi.org/10.1002/asi.23781>
- DORA. (2012). *San Francisco Declaration on Research Assessment*. Declaration on Research Assessment. <https://sfdora.org/read/>
- European Commission. (2020). *Progress report on open science*. Publications Office of the European Union. <https://doi.org/10.2777/285263>

- Geschuhn, K. L., & Stone, G. (2017). It's the publishers, stupid! Deriving transformative strategies from license negotiations. *Insights*, 30(3), 36–50. <https://doi.org/10.1629/uksg.391>
- Haak, L. L., Fenner, M., Paglione, L., Pentz, E., & Ratner, H. (2012). ORCID: A system to uniquely identify researchers. *Learned Publishing*, 25(4), 259–264. <https://doi.org/10.1087/20120404>
- ISO. (2012). *Space data and information transfer systems — Open archival information system (OAIS) — Reference model* (ISO Standard No. 14721:2012). International Organization for Standardization. <https://www.iso.org/standard/57284.html>
- Lawson, S. (2019). Access, identity, and inequality in digital scholarly communication. *Journal of Electronic Publishing*, 22(1). <https://doi.org/10.3998/3336451.0022.102>
- Lund, B. D., Wang, T., Mannuru, N. R., Nie, B., & Wang, S. (2023). ChatGPT and a new academic reality: Artificial Intelligence-written research papers and the implications for the information science field. *Journal of the Association for Information Science and Technology*, 74(5), 570–581. <https://doi.org/10.1002/asi.24752>
- Lynch, C. A. (2003). Institutional repositories: Essential infrastructure for scholarship in the digital age. *ARL Bimonthly Report*, 226, 1–7.
- Machovec, G. (2020). COVID-19, academic libraries, and the global economic crisis. *Journal of Library Administration*, 60(5), 512–519. <https://doi.org/10.1080/01930826.2020.1760567>
- Meadows, A. J. (1998). *Communicating research*. Academic Press.
- OSTP. (2022). *Ensuring free, immediate, and equitable access to federally funded research* [Executive Memorandum]. Office of Science and Technology Policy, Executive Office of the President of the United States.
- Panitch, J. M., & Caro, S. (2005). The serials crisis in time of capital scarcity. *The Journal of Academic Librarianship*, 31(1), 14–21. <https://doi.org/10.1016/j.acalib.2004.09.009>
- Priem, J., Taraborelli, D., Groth, P., & Neylon, C. (2010). *Altmetrics: A manifesto*. Altmetrics.org. <http://altmetrics.org/manifesto/>
- Suber, P. (2012). *Open access*. MIT Press.
- Swan, A., & Carr, L. (2008). Institutions, their repositories and the open access movement. *Learned Publishing*, 21(2), 117–131. <https://doi.org/10.1087/095315108X288875>
- Tenopir, C., et. al. (2015). Research data services in academic libraries: Data availability, management, and curation. *PLoS ONE*, 10(3), Article e0117612. <https://doi.org/10.1371/journal.pone.0117612>
- Wilkinson, M. D., et. al. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data*, 3(1), Article 160018. <https://doi.org/10.1038/sdata.2016.18>