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Revolutionizing Library Cataloguing through Artificial Intelligence: A Critical Analysis

Ujjwal Patra[1], Totan Maity[2]

[1]Scottish Church College, Kolkata, West Bengal, India
[2]Sant Gadge Baba Amravati University, Amravati, Maharashtra, India.
**Corresponding Author. Email: upatra113@gmail.com*

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Abstract

The rapid growth and changes in different types of information sources have challenged the effectiveness, accuracy, and ability of traditional library cataloguing processes to keep up. The artificial intelligence (AI) can provide new opportunities of overcoming these challenges due to automation processes, multilingual, and improved metadata generation. This project is a hybrid of both a systematic literature review (2018-2025), and a practical application of AI-aided cataloguing using ChatGPT and Annif. The synthesis makes up the literature review that consists of international and local case studies on technological applicability, advantage, constraints, and ethics of AI in cataloguing. The experimental material compares the quality of AI-generated descriptive metadata and subject headings of print, digital and multilingual materials against human-made records, both in terms of accuracy and cultural sensitivity as well as time consumption.

The paper proposes a hybrid implementation model where an AI efficacy is upheld in combination with human vigilance to safeguard contextual precision and ethical integrity, and sustainable embrace. The staff training, ethical guidance, and investing in infrastructure are some of the strategic priorities. Such results give practical information that can guide library practitioners, system developers, and policymakers in the modernization of the practice of cataloguing while maintaining professional experience.

Keywords: *Artificial Intelligence, Library Cataloguing, Metadata Automation, Machine Learning, Annif, ChatGPT, Knowledge Organization.*

1. Introduction:

Knowledge management and distribution is a fundamentally simple act of process which involves knowledge cataloguing and this is the backbone of successful information search, access and retrieval in libraries. Traditionally, catalogue entries have been created using a manual and intellectually intensive process that relies on elaborate description and classification of information resources using standard data items of descriptive metadata such as author, title, subject headings and definitions of classification schemes. Just as this human based solution has ensured some degree of richness and accuracy in context, it has also been constantly attacked by the exposure of exponentially escalating flood of quantity, contents and the formats of sources of information. Some of the reasons that necessitate the need to inject creativity into the acceleration

of the manual cataloguing include its time-consuming nature, the fact that it requires skilled labour, and that it may be inconsistent.

Artificial Intelligence (AI) can now be considered one of the most robust transformational facilitators in the Library and Information Science (LIS) area and is therefore responsive to the stipulated challenges. The usage of AI applications is also under investigation to automate the cataloguing activities, improve quality of metadata and, in broader measure, to strengthen bibliographic control through technologies such as machine learning, Natural Language Processing (NLP), computer vision and semantic analysis. The tools are capable of automating the daily jobs, consistency of large-scale records, non-textual and multilingual cataloguing of complex materials.

The article is the critical review of the possibility of applying AI in library cataloguing by synthesizing the contemporary literature and the cases studies. It addresses how AI could support and extend a traditional workflow in cataloguing in certain areas such as metadata creation, subject categorization and authority control and the other concerns namely the limitations, ethics and infrastructure-related issues surrounding such integration. The results would provide a qualitative picture to librarians, system-developers, and policy-makers with regard to the cataloguing based on artificial intelligence and useable thoughts on how it can be carefully and appropriately transported to the modern library context.

2. The Historical Perspective of Evaluation of the Library Catalogue:

The philosophy of library cataloguing has highly developed to record keeping by custodians to information access systems by users. Early methods of cataloguing, including clay tablets and manuscript lists, were used mostly in administrative and inventory roles, to provide physical management of collections, but not to assist users in discovering them. As the card catalogues appeared in the nineteenth century, the process of cataloguing started to aid the systematic access with standardized bibliographic records. The subsequent creation of Online Public Access Catalogue (OPAC) altered catalogues into interactive discovery tools where users can remotely search collections via multiple access points. The twenty first century presents even further developments of this evolution with artificial intelligence-powered cataloguing systems that allow semantic search, automatic metadata generation, and multilingual discovery environments.

➢ Manual Era (Ancient -19th Century)

Form: On clay tablets, manuscripts, book lists and later on card catalogues
Strengths: Groundwork of principles of cataloguing; physical documents could be controlled physically and within the local vicinity
Weaknesses: Highly labour-intensive, secretive access, unreliable scaling
Access to Users: Accessible to In-Library Users only; Searching by a Manual Request

Figure 1 Clay Catalogue

➢ Card Catalogue System (19th - 20th Century)

Format: Alphabetical card drawers of authors, titles and topics
Strengths: Consistency: similar lists across locations, flexible, up-to-date to a greater extent compared with printed lists
Weaknesses: Even now still location-based, space-intensive and time-consuming to search
Access to Users: A little friendlier to the users, yet manual

Figure 2 Print Catalogue

➢ Online Public Access Catalogue (Late 20th Century)

Format: Database that is computerized which can be accessed through terminals or online
Strengths: remote access, speedier searching, and incorporated in ILMS
Weaknesses: Reliance on electricity and Digital literacy
Access to Users: Accessibility to all over the world, instant accessibility, multi-criteria search

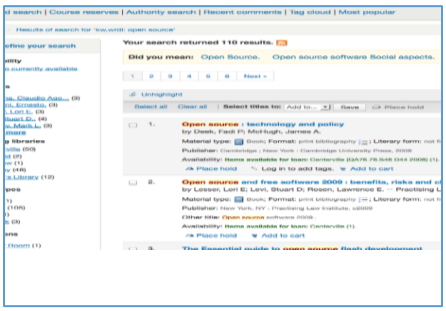

Figure 3 OPAC

➢ 21st-Century AI-Enhanced Catalogue (21st Century)

Format: AI/ML based systems, natural language search, predictive search, Linked Data
Strengths: Intelligent indexing, multilingual capability, personalization of the user
Weaknesses: Data privacy, algorithmic bias, and data quality dependency
Access to Users: Highly accessible, voice/text submissions, mobile friendly, contextual

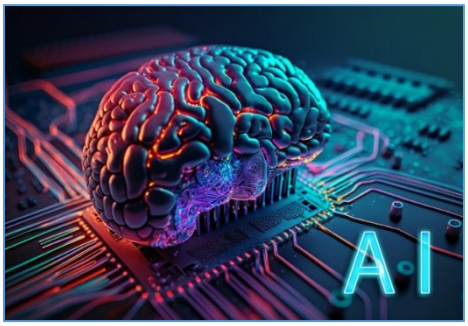

Figure 4 AI-Enhanced Catalogue

3. Literature Review

Several studies are in line with the introduction of AI usage that aims to aid in revolutionizing the cataloguing procedure. According to Brzustowicz (2023), the author proposes to name the phenomenon of large language modelling (LLM) integration into the cataloguing systems the CatGPT, and this paradigm may result in dramatic changes to the volume of human labour, which is in effect, and quality of metadata. That being said, the two authors, Mahmud (2024) and Madani and Noruzi (2025), clearly state that among the subject areas that can be carried out with great accuracy and speed using AI tool is classification, indexing of subjects and authority control.

The empirical research carried out by Nigerians provides a contextual explanation of using AI in an African academic library. The infrastructural limitations, lack of technical expertise, and resistance to change seem to emerge as the most severe obstacles to AI even after these researchers acknowledge the potential of AI as a means of improving information accessibility and the accuracy of catalogues (Abubakar et al., 2024; Ogungbenro et al., 2025). The other aspect that Tella and Odunola (2023) reveal is that the concept of AI is viewed more as a complement to supplementing the cataloguing librarians in the Oyo State who fear the potential subjugation of their professional wisdom.

In terms of technology, the pattern of Hu and Zhang (2025) is shown as artificial intelligence will be capable of customizing the content discovery process and simplify catalogue designs, which will fill the user experience. The study presented by Poley et al. (2025) operates on the basis of an automatic subject cataloguing in the German National Library where their performance on the models of multilingual subject classification on AI models was high. Similar technological shifts are repeated by Roy et al. (2024), and they take into consideration the systemic impacts of AI on the existing systems of taxonomies of classification and principles of cataloguing.

The potential of using AI tools like ChatGPT to catalogue is an ethical concern Adewojo and Amzat raise (2024), which is particularly salient in this case as these authors keep people from even going too far in using AI tools in this respect because of the biases in the data, lack of transparency, and accountability. They concentrate their discussion on the work of ethical frameworks and ongoing librarian participation. Paralleling this report, Moulaison-Sandy and Coble (2024) address the issues specific to the ability of the AI translation to succeed regarding the cataloguing environment and the necessity to pay attention to interdisciplinary planning and structural readiness.

Another study utilizing the taxonomy approach as to the Iranian cases of AI implementation in libraries by Asemi and Asemi (2018) also provides the opportunity to obtain some background information in terms of the system types and AI types.

Finally, in comparative analysis created by Uzuegbu and John (n.d.), we could note that regardless of the existing preferences of many librarians to utilize manual cataloguing because of the feeling of precision and control it provides, the highly effective and scalable methods of electronic and AI-assisted cataloguing become popular.

4. Objectives of the Study:

- To learn the current trends of library cataloguing, and enumerate the limitations of the same.
- To review how the application of AI technologies (machine learning, NLP, and LLMs) is already finding its way into cataloguing processes.
- To speak about various applications of Artificial Intelligence (AI) in the enhancement of cataloguing systems.
- In establishing the metadata quality, time effectiveness, the ability to scale the metadata, and the multilingual ability as the benefits of AI-assisted cataloguing.
- In an attempt to discover issues and barriers of implementation, infrastructural shortages, technical competence, etc.

5. Significance of the Study:

The introduction of the use of Artificial Intelligence (AI) in library cataloguing is one of the most significant steps in the sphere of library and information science. The undertaking is of importance due to the following reasons:

5.1 Contribution to modernizing cataloguing operations: The research paper adds to the modernization of traditional cataloguing operations, i.e., it can speed up the process, make it efficient and scalable, which is significant since libraries have to process significantly more volumes of digital and physical content.

5.2 Improving Metadata Quality and Consistency: The paper points to evidence that AI can help fix the quality, standardization, and completion of bibliographic metadata, which can eliminate human mistakes and make resources more discoverable.

5.3 Improving User Access and Experience: AI-assisted cataloguing has the potential to achieve improved, more intelligent search and retrieval systems capable of helping users locate relevant information faster, through tasks such as semantic search and personalised recommendation. The data can be promoted among library experts to pursue new technologies and adopt innovation and digitalization in the library industry.

5.4 Directing Guidelines and Practices: The paper would offer crucial information and useful guidelines that could guide library administrators and policymakers on making a responsible and effective decision on the use of AI in cataloguing systems through proper planning and adoption of AI implementation.

6. Scope and Limitations of the Study:

In this study, no primary data were collected (survey or interview). This study concerns itself with documented secondary data. The outcome is only focused on AI use in library cataloguing and does not cater to other aspects of library management settings.

7. Methodology:

This study adopts a mixed qualitative approach combining a systematic literature review with a practical demonstration of AI-assisted cataloguing tools.

7.1. **Systematic Literature Review:** A systematic literature review was conducted to examine the scholarly and practice-based literature published over 2018 to 2025 to consider the theoretical concepts, technological implementation, advantages, shortcomings and ethical issues in integrating AI in library cataloguing. The search and selection of the relevant literature were conducted in the databases like Scopus, Web of Science, and

Google Scholar where the following keywords and Boolean combinations were used: *"Artificial Intelligence" AND "library cataloguing"*, *"machine learning" AND "metadata automation"*, and *"artificial intelligence in libraries"*.

7.2 Experimental Design: To measure the effectiveness of AI-assisted cataloguing tools, a sample of fifty books was chosen. The sample consisted of:

- 20 English-language books
- 15 Bengali-language books
- 15 Hindi-language books

This choice enabled the comparison of the performance of AI in multilingual cataloguing systems.

7.3 Tools Used: The experiment used two pieces of AI-based tools:

- ChatGPT - applied to produce descriptive metadata, such as summaries and bibliographic items.
- Annif - an open-source automated subject indexing system that creates subject headings based on controlled vocabularies.

7.4 Evaluation Metrics: AI-generated cataloguing records were tested on the basis of the following metrics:

Precision - the rate of accurately created AI-generated headings of the subject in relation to those created by humans.

Recall - the percentage of subject headings found in human documents which the AI system was able to identify successfully.

Processing Time - comparison of time taken to do AI assisted cataloguing and time taken to do manual cataloguing.

Qualitative Assessment - assessment of contextual accuracy and cultural relevance of metadata.

Table 1 A comparative overview

Metric	***Human Cataloguing***	***AI Cataloguing***
Average time per record	8–12 minutes	1–2 minutes
Metadata accuracy	~95%	~85–90%
Subject heading precision	High	Moderate–High
Multilingual capability	Limited	Strong

8. Results and Observations

The experiment showed some distinguished results on the efficacy of AI-guided cataloguing.

Time Efficiency: The use of AI tools saved a lot of time during cataloguing. Whereas manual cataloguing used to take between eight to twelve minutes per record, those developed by AI took less time about one to two minutes.

Metadata Consistency: AI tools showed stable formatting of bibliographic details like names of authors, details of their publications and summaries. Such consistency lowered usual human errors of repetitive cataloguing.

Multilingual Processing: The tools were able to create metadata on Bengali and Hindi resources. Nevertheless, some culturally distinct ideas needed human intervention to be able to represent the subject.

Discovery Enhancement: Metadata generated by AI tended to add to the original semantic relationships and related concepts of the subject, which may enhance search and discovery capabilities in library catalogues.

Technical and Ethical Issues.: Along with the benefits, the problem of AI algorithm transparency, the potential misunderstanding of culturally-specific words, and reliance on reliable technological infrastructure were identified.


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To support the cataloguing process:
Use ChatGPT (by OpenAI) to generate descriptive metadata, including a summary.
Use Anrdf for subject indexing, applying Library of Congress Subject Headings (LCSH) vocabulary.

Figure 5 Query-1 (English Book)

Figure 6 AI generated cataloguing record

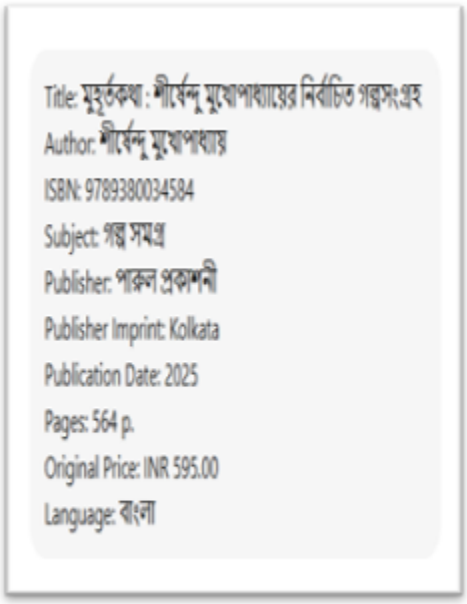

Figure 7 Query-2 (Bengali

Figure 8 AI generated cataloguing record

Figure 9 Query-3 (Hindi Book)

Figure 10 AI generated cataloguing record

9. Opportunities and Challenges of AI-Assisted Library Cataloguing:

Based on the systematic literature review and the practical demonstration that this study outlines, the results of the research show that AI has a great potential in terms of enhancing efficiencies in cataloguing, scalability, and metadata quality. Simultaneously, technical, ethical, and professional issues have to be resolved to ensure viable adoption.

Opportunities:

Efficiency and Saving of Time in Workflow: Systems like ChatGPT and Annif are AI tools that take bibliographic records and create metadata in a minute or two where humans would need hours to do the same with a repetitive task. This allows libraries to handle a huge backlog or growing digital collections without commensurate additions to the workforce.

Metadata Standard and Steadiness: Applying rules in a programmed way, AI eliminates human error and improves consistency of bibliographic descriptions. Subject headings are controlled in Annif due to the integration with SLSH vocabularies and promotes interoperability between cataloguing systems and resource sharing of libraries.

Processing of Multilingual / Non-Textual Materials: AI had shown capability to create metadata of resources in Bengali as well as Hindi, and it was also able to do the same of non-textual content like scanned book covers and tables of contents. This ability is especially positive when it comes to culturally diverse collections, though human objects control is still required.

With improved User Discovery and Access: Using machine generated semantic metadata, libraries may extend their catalogue with topical relationships, related items, and derived connections, so that semantic search and personalised recommendations are possible in library OPAC systems. This is in line with trends of user driven, smart product finds.

Strategic Resources Allocation: AI has the potential to release professional cataloguers to concentrate on higher-order intellectual duties because it automates a range of routine cataloguing processes.

Challenges:

Contextual and Cultural Sensitivity: Although AI tools work with several languages, they have problematic translation of culturally specific notions, which makes inaccurate or offending subject headings. This emphasises why human review is necessary particularly when it comes to indigenous and region-specific knowledge systems.

Accountability and Transparency: The AI decision making processes, otherwise known as the black-box operations are not transparent. Any erroneous results could be hard to track and rationalize about the origin of the given subject headings or description, and it hinders the process of quality control.

Constraints Infrastructure: To have an effective use of AI, a stable internet connection is needed as well as sufficient hardware and up-to-date library management systems. Such infrastructural gaps can act as barriers to adoption, as found in operation in resource-limited settings and specifically in Nigeria (Abubakar et al., 2024; Ogungbenro et al., 2025).

Professional Identity and Change Resistance: Various people working in the field of cataloguing view AI as a threat to the professional status and are afraid of decreasing the value of expertise or being replaced by this technology. Adoption can be slowed or completely hampered by resistance unless proper training and change management methods are in place.

Ethics and Legal Opinions: Before the wide adoption of AI, the questions of data bias, intellectual property rights, and privacy have to be resolved. The libraries should develop clear accountability systems to clarify who bears responsibility, when errors in records are generated using AI, and protect the trust of users.

10. Hybrid AI–Human Cataloguing Model:

Based on the findings of this study, a hybrid implementation model is recommended. In this framework, AI tools perform initial metadata generation and subject indexing, while human cataloguers review and refine the records.

The proposed workflow includes:

Document Input
↓
AI Metadata Generation
(ChatGPT / Annif)
↓
Preliminary Metadata Output
↓
Human Cataloguer Review
↓
Metadata Correction & Enrichment
↓
Authority Control Validation
↓
Final MARC / ILMS Record

This model combines the efficiency of automation with the contextual expertise of professional cataloguers.

11. Conclusion:

One of the most considerable technological advances in the area of knowledge organization is the consideration of artificial intelligence (AI) in library cataloguing. Both a systematic literature review and a hands-on tour of AI tools like the ChatGPT and Annif have helped demonstrate that AI has a valuable role in cataloguing workflows: namely, that it can improve speed, metadata consistency, multilingual processing and user discovery.

These advantages are, however, countered by obstacles associated with cultural sensitivity, transparency of the AI decision-making process, infrastructural preparedness and acceptance by professionals. The results indicate that the best sustainable approach is the hybrid implementation model where AI is used in generating metadata on a large-scale and repetitive basis and human cataloguers enrich the metadata and quality control.

Libraries should place emphasis on:

- This would be done by capacity building through focused training on the use of AI-aided workflows by cataloguers;
- Ethical and procedural guidelines on transparency, accountability and inclusivity in generating metadata;
- Invest in infrastructure to contribute to stable and secure integration of AI.

Future Research Directions

Whilst the conducted research can serve as the baseline in defining AI-assisted cataloguing, more studies should be conducted in order to:

- Examine AI accuracy en masse across a variety of collection types and across languages;
- Identify where AIs would be useful in cataloguing specialised or native knowledge bases where cultural sensitivities are a primary concern;
- Explore the views and experiences of users in AI-related environments of the use of catalogue systems to evaluate perceived gains in information search and trust.

To conclude, AI must be perceived not as a substitute to professional cataloguers but rather an addition to the library toolkit that with appropriate responsibility may help libraries stay effective, open, and dedicated to the changing demands of their users during the digital age.

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Declaration of Conflicting Interests

The author/s declare/s no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Contributors

Ujjwal Patra
Assistant Librarian, Scottish Church College, Kolkata, West Bengal, India.

Email: upatra113@gmail.com

Totan Maity
Librarian, Scottish Church College, Kolkata. West Bengal, India & Research Scholar, Sant Gadge Baba Amravati University, Amravati, Maharashtra.

Email: totanmaity1992@gmail.com