

# Librarians as Catalysts for Integrating AI Tools in Scholarly Research: A Proposed Model

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## Abstract

*The main purpose of this study is to propose a model that outlines the crucial role of librarians in facilitating the integration of Artificial intelligence (AI) tools into scholarly research. A comprehensive review of existing literature on the intersection of librarianship, AI technology, and scholarly research was conducted. The study identified some vital research domains where librarians can provide crucial support to researchers through the integration of AI tools. These areas include aiding in the selection of suitable AI technologies, conducting comprehensive literature searches and mapping, facilitating data analysis and visualization, managing citations and references, promoting research integrity and ethical awareness, and assisting with copyediting tasks. Additionally, the study emphasizes the notable challenges confronted by librarians in developing countries in the integration of AI tools in library services. However, the proposed model carries significant implications for both librarians and researchers, providing a strategic framework to optimize the benefits of AI in research activities.*

**Keywords:** Artificial Intelligence; Scholarly Research; Academic Librarians; AI tools

## 1. Introduction

Artificial intelligence technologies have become a transformational force in academic research, offering the potential to increase productivity, efficiency, and the capacity to discover new insights. According to Okunlaya et al. (2022), "AI has become indispensable because the rapid development of AI has substantially made some practical and significant advances" (1871p.). Wheatley and Hervieux (2019) stated that the AI can satisfy the distinct requirements and preferences of pupils of different fields. The integration of artificial intelligence techniques is a problem and also a promise in the dynamic field of scholarly research. AI has the ability to completely change how research is carried out, analysed, and shared as technology develops. Rathinasabapathy et al. (2023) pointed out that AI tools have emerged as invaluable assets for researchers, significantly improving efficiency and productivity across various tasks such as conducting experiments, writing scientific articles, publishing in journals, or working on theses or dissertations. Still, a key concern remains in the midst of all the enthusiasm and anticipation: who will oversee this integration process and make sure it complies with ethical standards and intellectual rigour?



In this transforming journey, librarians—long acknowledged as stewards of knowledge and information navigators—emerge as potential catalysts. According to Hussain (2023, 15p.), “Librarians are change agents of modern and advanced technologies and have long been responding to current technologies that improve their services”. Because of their specialisation in information literacy, research techniques, and information retrieval, they can help scholars to integrate AI tools more easily. Librarians are becoming more and more important in negotiating the incorporation of emerging technologies as the environment of academic research continues to change. They have, however, received little attention and have rarely been fully investigated in this regard. This systematic study explores the many ways in which librarians facilitate the smooth integration of AI-powered technologies into the research process.

This study addresses the particular competences and best practices that librarians possess, allowing them to bridge the gap between the fast-evolving AI landscape and the demands of academics, using a thorough examination of the current literature. Librarians are in a unique position to enable scholars to comprehend the revolutionary potential of these cutting-edge technologies, from curating AI-powered resources to offering training and assistance. Upon examining the case studies and empirical facts exhibited, this study aims to illuminate the crucial roles that librarians play in creating an environment that is conducive to the successful use of AI-related research. The findings seek to support librarians’ critical position as strategic collaborators in the quest of knowledge, innovation, and academic excellence.

## **2. Objectives of the Study**

To attain the goal of the study, the researchers have designed specific research objectives as follows:

- ❖ To make a strategic framework for librarians to facilitate the integration of AI tools in scholarly research; and
- ❖ To identify and address the challenges encountered by librarians in developing countries when integrating AI tools.

## **3. Methodology**

To accomplish the above objectives, a literature review methodology is utilized to thoroughly investigate and analyse the current body of literature. The study is founded upon a comprehensive review of the literature. To find out the relevant literature, the researchers searched various online databases including Taylor and Francis, Sage, Emerald Insight, EBSCOhost, Web of Science, Scopus, Library Information Science & Technology Abstracts (LISTA), Library and Information Science Abstracts (LISA), and Science Direct, etc. The study employed several search terms in these databases such as “AI in research”, “Librarians’ role in research”, “Librarians and research”, etc., to query the compiled literature. Significantly, the research prioritized only peer-reviewed journal articles. However, accessibility constraints limit the current search from encompassing all published literature worldwide.

## **4. The Role of Librarians in Supporting Research Activities**

Librarians are pivotal in supporting researchers to proficiently utilize AI tools. Drawing on their expertise in information management and research activities, librarians serve as invaluable guides, steering researchers

towards maximizing the potential of AI tools in their endeavours (Munshi et al., 2024). As highlighted by Leonard et al. (2023), librarians are not just passive participants but can actively engage in research projects, offering substantial support to scholars at every stage of their research trajectory through the utilization of diverse tools and technologies. Further, Rathinasabapathy et al., (2023) mentioned that the librarians are poised to play a pivotal role in sensitizing their users—students, research scholars, faculty, and scientists—regarding the effective and efficient utilization of AI tools to strengthen their academic and research process. Librarians are uniquely positioned to assist users through comprehensive information literacy programs, which empower researchers with the skills to effectively navigate a multitude of information resources (Mukherjee and Patra, 2024). Moreover, librarians provide invaluable guidance on mastering proper citation and referencing techniques, ensuring scholarly integrity and adherence to academic standards (Ajani, 2022). Notably, based on the above discussion and the significant role of librarians in assisting researchers, the present study has proposed a model outlining how academic librarians can support research activities using AI tools (Figure 1).

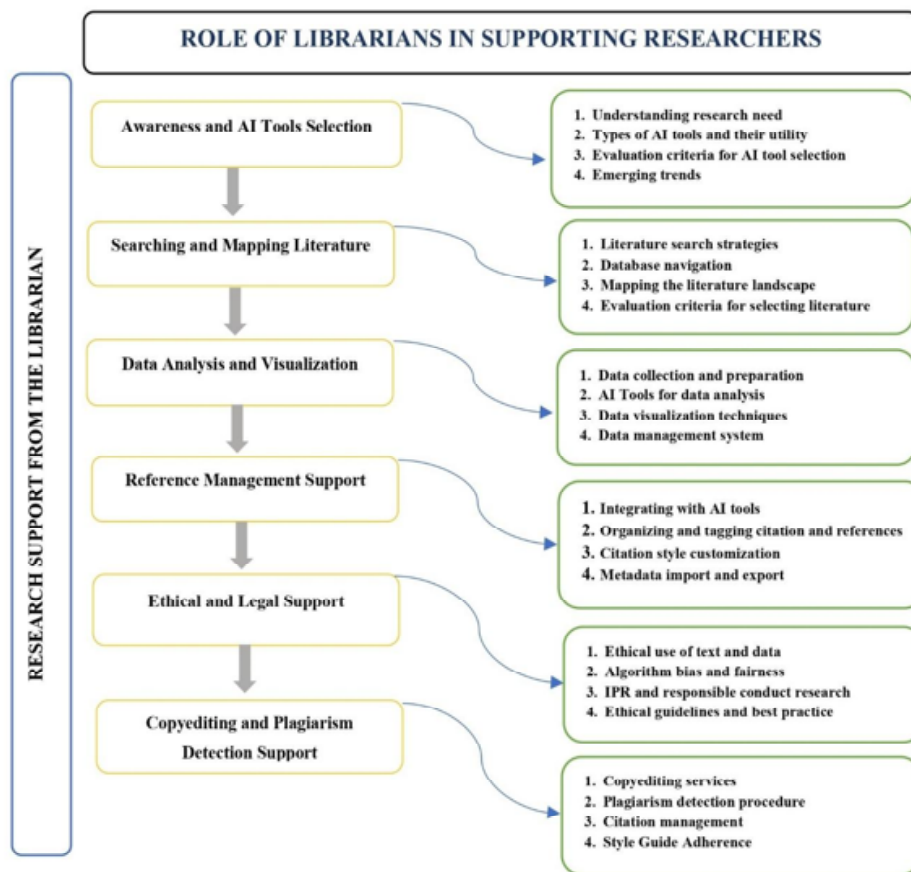


Figure 1: A Proposed Model for Librarians Supporting Researchers in the Use of AI Tools

## **4.1 Awareness and Selection of AI Tools**

Facilitating scholars' comprehension and choice of AI tools is crucial for enabling their efficient use of these technologies. OpenAIs, ChatGPT, chatbot, introduced in 2022, allows users to customise conversation duration, structure, degree of information, style, and language. But in addition to ChatGPT, researchers and libraries have access to a wide range of AI technologies. Librarians can act as mentors for researchers, helping them navigate the wide range of AI tools available and making sure they have the knowledge and awareness needed to make decisions that are particular to their requirements and goals (Rathinasabapathy et al., 2023). They can also provide a substantial contribution to researchers' ability to use AI technology to enhance their scholarly role by promoting a culture of awareness and offering help in tool selection (Ali et al., 2020). This, in turn, can enrich the research landscape across varied fields.

### **4.1.1 Understanding Research Needs**

When it comes to assisting researchers in their research endeavour, thoroughly understanding their needs and critically evaluating their unique requirements are among the most imperative tasks for a librarian to begin with. Only then the librarians could provide AI tools to them according to their specific demands. The certainty of successful AI integration in academic research is heavily dependent on this key aspect.

### **4.1.2 Types of AI tools**

There is an array of AI tools for different purposes. It is absolutely imperative that researchers and librarians alike grasp the intricacies of diverse AI tool categories and their distinct uses within research domains, as this facilitates aware decision-making in tool selection and integration into scholarly research.

### **4.1.3 Evaluation Criteria**

In academic research, evaluation of AI tools is necessary to make informed decisions. Librarians can use their knowledge to help researchers consider precision, measurability, interpretability, and ease of use. By providing information on pros and cons of various AI technologies, librarians also help researchers navigate the field. Librarians can provide tailored training sessions and well-chosen materials, in order to improve the effectiveness and efficiency of integrating AI tools into scholarly work.

### **4.1.4 Future Trends**

Technology is evolving every day. It's getting better and more reliable. Librarians are the precursor of sharing information on any emerging trend, including the fusion of artificial intelligence (AI) with novel technologies like edge computing or blockchain. Librarians may proactively assist researchers in adjusting to and capitalizing on these breakthroughs by keeping up with these changes. Informing researchers about these emerging trends, encouraging them to adapt these new technologies, and offering advice are all crucial roles played by librarians.

## **4.2 Searching and Mapping Literature**

Integration of AI tools in the rigmarole of literature search may save a lot of time and efforts of researchers and librarians alike. Librarians may be invaluable in helping researchers navigate the tangle of accessible material because of their proficiency in information retrieval and database navigation (Mukherjee and Patra, 2024). This section critically looks at the many roles' librarians may play in helping researchers with literature search techniques, database navigation, mapping the literature landscape, staying updated on the subject, and assessing the reliability of the literature using AI at its full capacity.

### **4.2.1 Literature Search Strategies**

Searching for relevant literature is a humongous task, therefore it takes careful implementations of search techniques. Librarians are skilled at customising methods of searching to fit the unique requirements of scholars experimenting with artificial intelligence techniques. Librarians may assist scholars in creating exact searches that provide pertinent results by providing assistance on keyword selection, database selection, and refined search strategies (Munshi et al., 2024). Tools like Elicit automates research tasks, including literature reviews, using language models. Elicit may quickly uncover relevant research papers, condense key conclusions, and extract crucial information for researchers and libraries (Rathinasabapathy et al., 2023). Additionally, libraries may incorporate recommendation systems driven by AI into their search strategies, which will help scholars find unexpected information and expand their search beyond what they originally asked (Arora, 2020).

### **4.2.2 Database Navigation**

Semantic search techniques equipped with AI can hugely impact the way researchers navigate scholarly articles. Librarians who are adept in AI technologies may provide scholars with important advice in navigating these platforms therefore optimising their search efforts. Explain Paper is an AI tool which helps in reducing the difficult work of comprehending dense academic texts. Academic papers may be uploaded by users, who can also flag confusing portions and get answers. This is an invaluable tool for scholars and librarians who frequently struggle to understand complex research publications (Rathinasabapathy et al., 2023). With the help of Explain Paper, users may better understand the complexities and importance of academic text in a more approachable manner.

### **4.2.3 Mapping the Literature Landscape**

Bibliometric tools with integrated AI technologies can immensely help researchers to find important papers and key authors. Librarians may create detailed record of related literature by using machine learning algorithms that examine co-authorship networks and citation patterns. This will direct scholars to areas of rich intellectual material.

Any Summary, an AI-driven tool, efficiently summarizes lengthy interview audio, video files, research papers, and other extensive texts. It facilitates summarizing from files or URLs and enables modification of

summaries into bullet points, quotes, or whole abstracts. Any Summary is extremely helpful for researchers and librarians who are working with large volumes of textual or video data because it contains examples, consumer comments, and frequently asked questions. Another useful AI tool is Books AI which enables users to generate book summaries effortlessly by capturing a photo of the book in question by utilizing Vision AI and GPT-4. Books AI offers a quick solution to those seeking insights into the content of various publications.

#### **4.2.4 Evaluation Criteria of Selecting Literature**

AI technology can largely help to evaluate the reliability, applicability, and calibre of specific literatures. Moreover, sentiment analysis techniques powered by AI can enhance librarians' assessment skills by allowing them to measure the academic conversation around specific subjects. Librarians can give researchers nuanced insights into the prevalent attitudes and perspectives within the academic community by utilising natural language processing algorithms that identify underlying sentiment and tone within scholarly texts.

### **4.3 Data Analysis and Visualization**

The use of AI technologies in academic research has the potential to completely change how data is visualised and analysed. There is an array of tools that can facilitate the work of data representation and visualisation such as Tome AI, Google Data Studio, Qlik Sense, KNIME, Bing Create, Nvivo, etc. Using these and many more AI techniques to support researchers in their hunt for significant insights, this section explores the critical responsibilities librarians may play at each stage of data analysis and visualisation.

#### **4.3.1 Data Collection and Preparation**

The process of converting raw data into analysable datasets may be rationalized by librarians offering academic advice on effective data cleaning, pre-processing, and formatting methods using AI-driven algorithms. Researchers may speed up the preliminary phase and reduce problems with the accuracy of data by using AI technologies, which will accelerate the research cycle. Several widely-used AI tools such as OpenRefine, IBM Watson Studio, KNIME, RapidMiner, etc. provide robust capabilities for effectively cleaning and transforming messy data.

#### **4.3.2 AI Tools for Data Analysis**

When it comes to familiarizing researchers with an array of AI-driven techniques, from natural language processing instruments to machine learning algorithms, librarians are essential. Through raising awareness and assisting with the selection of AI tools, librarians enable academics to use state-of-the-art analytical methods, increasing the scope and depth of scholarly study. Qlik Sense, Jupyter AI, MonkeyLearn, Polymer, KNIME, Nvivo, etc. are leading tools in the realm of data analysis and visualization.

### **4.3.3 Data Visualization Techniques**

Beyond the conventional charts, tables, figures and graphs, AI can offer endless possibilities of data representation. Librarians can provide academics with information on a variety of data visualisation tools and resources. By carefully utilising these AI-powered visualisation tools, researchers can create captivating narratives and further simplify complex data structures, promoting enhanced comprehension of multifaceted ideas. Tableau excels in its ability to transform raw data into interactive visualizations that facilitate deep analysis and intuitive insights. Its user-friendly interface allows users to create dashboards and reports swiftly, making complex data sets. Power BI offers robust analytics and whole integration within Microsoft's ecosystem, enabling users to visualize and share insights effectively across organizations. Qlik Sense is also enabling interactive analytics and facilitates data discovery and visualization.

### **4.3.4 Data Management**

In this stretch of big data, maintaining research integrity and reproducibility requires efficient data management. Librarians may assist researchers in putting strong data management practices, including metadata documentation, version control, and data storage. Librarians can also protect against data loss and ensure the durability of scholarly endeavours by facilitating effective data organisation and retrieval through the use of metadata tagging and classification tools powered by AI. To ensure effective handling of a variety of datasets, Informatica provides AI-powered solutions for metadata management, data integration, and data quality assurance. Talend Data Fabric uses AI to improve data quality and governance while integrating application integration and data management into a single platform. DataRobot ensures consistent and repeatable data-driven analysis by automating data preparation and deploying machine learning models using AI.

## **4.4 Reference Management Support**

Librarians have always been playing an important role in assisting scholars with reference management (Leonard et al., 2023). There are plenty of tools (Zotero, Mendeley, ReadCube Papers, EndNote, etc.) equipped with AI that offer seamless reference management and librarians may help scholars with their assistance in using these tools in full discourse (Rathinasabapathy et al., 2023). This could further help researchers to navigate the intricacies of reference management and utilising AI tools to improve efficiency and efficacy in effective management of references.

### **4.4.1 Integration with AI tools**

The fusion of AI technologies and reference management software advances the prospects for optimised research workflow. Librarians may explore ways to integrate AI tools into reference management systems in an efficient manner. For instance, they can guide researchers to use citation networks for bibliometric research or import citations into machine learning models for advanced analysis. Researchers can accelerate the pace of workflow, improve citation management, and obtain deeper insights into scholarly literature by utilising AI capabilities.

#### **4.4.2 Organizing and Tagging References**

Librarians may provide invaluable advice when it comes to organising reference libraries inside management applications. They can offer suggestions on how to make folders, tags, and keywords effectively so that researchers can quickly find and classify appropriate citations. Additionally, librarians may help make strategies that increase search capabilities in reference management systems, which will improve researchers' capability to quickly find relevant documents. There are plenty of AI driven tools to help users in organizing and tagging references like Zotero, Mendeley, Papers, ReadCube etc.

#### **4.4.3 Citation Style Customization**

One very often recurring problem faced by researchers is having to tailor citation styles to meet the criteria of particular journals or publications. Reference management tools with AI technologies can solve the problem. Almost all the reference management tools offer citation style customization service. Librarians can offer specialised assistance when exploring the customisation of citation styles inside reference management technologies in order to ensure adherence to various formatting rules.

#### **4.4.4 Metadata Import and Export**

Ensuring seamless data interoperability requires the import and export of metadata between reference management systems and other research platforms. Librarians can assist researchers in simplifying the procedures of exchanging metadata so as to enable perfect integration across various information systems. CiteULike is an open source reference management tool that can help users to import metadata from web pages and academic databases. It supports exporting references in several formats and offers tagging and organization features. JabRef is another such tool that focuses on BibTeX (it's a tool and file format used for managing bibliographic references) users. It enables importing metadata from e-databases and library catalogs and supports exporting references in BibTeX and other formats. Librarians may also help researchers export metadata for sharing or archival preservation, which promotes data reuse and accessibility.

#### **4.5 Ethical and Legal Considerations**

A plethora of ethical and legal issues arise when researchers integrate AI tools into the fast-changing field of academic research (Eke, 2023). Important aspects are covered in this part, along with the responsibilities of librarians may play in helping to encourage appropriate research habits and navigate these complications.

##### **4.5.1 Ethical Use of Text and Data**

There are many ethical conundrums in data utilisation, and librarians are the guardians of ethically responsible behaviour. They support open conversations on informed consent, ethical data collection methods, and strategies to preserve privacy. Furthermore, librarians support responsible data sharing practices and equitable data ownership, ensuring that researchers maintain ethical standards throughout the journey of research.



#### **4.5.2 Algorithm Bias and Fairness**

The potential for algorithmic bias is rife and presents significant obstacles to the hunt for objective information. Librarians are essential to bringing attention to bias concerns and developing mitigation solutions. Librarians foster an environment where scientific pursuits are free from bias by supporting diverse datasets and fighting for algorithmic openness. This paves the way for equal results in research endeavours.

#### **4.5.3 IPR and Responsible Conduct Research**

In this era of AI, now more than ever, it has become extremely crucial to promote awareness on intellectual property rights. Librarians can offer priceless advice on copyright, patents, trademarks, and licensing contracts, enabling researchers to compliantly negotiate the intricate network of intellectual property rights.

#### **4.5.4 Ethical Guidelines and Best Practice**

In the turmoil of AI integration in research, librarians may provide their invaluable assistance to the researchers to adapt ethical principles and best practices, acting as guiding lights for moral behaviour to promote responsible and ethical scholarship.

### **4.6 Copyediting and Plagiarism Detection Support**

Scholarly writing demands accuracy and integrity. As curators of academic integrity, librarians play an essential part in guaranteeing the calibre and veracity of research output. By utilising AI technologies, librarians may strengthen scholars' scholarly endeavours by offering invaluable assistance in copyediting and plagiarism detection. The aforementioned section provides an explanation of the several roles that librarians may play in different fields.

#### **4.6.1 Copyediting Services**

By carefully reviewing papers, correcting grammatical errors and improving coherence and clarity, librarians provide priceless insights to improve the calibre of intellectual discourse. They can exploit the power of AI to help the researchers in fixing typographical problems, inconsistent punctuation, grammatical faults, and syntactic difficulties. Jasper, Rytr, Quillbot, and Hurix Digital are powerful AI tools that enable copywriters and copyeditors. Notably, these tools have advanced algorithms and natural language processing to reorganize content editing processes.

#### **4.6.2 Plagiarism Detection Procedure**

In academic research, Plagiarism is a lurking threat that threatens the validity and integrity of research projects. Aware of this threat, librarians offer scholars a variety of advanced plagiarism detection software that are accessible via academic portals or institutional archives. By educating the researchers about the new and improved features of plagiarism detection tools equipped with AI, librarians can enable them to carefully review their work, preventing plagiarism and maintaining research integrity. Quetext is one of the

most popular and widely recognized AI tools for plagiarism detection, known for its robust features and powerful checking capabilities. It is free, easy to use, and supports multiple languages, offering a significant advantage. In addition, GPTZero, Duplichecker, and Grammarly are popular paid AI tools for plagiarism checking.

#### **4.6.3 Citation Management**

Sources in order to avoid the risk of plagiarism, citation management in academic discourse is of utmost importance since. Librarians' thoughtful advice on appropriate citation styles, stressing the need to correctly cite other works is crucial for any researcher. Librarians can also provide scholars with necessary skills to successfully navigate the complex web of citation standards, from clarifying the rules surrounding the attribution of borrowed ideas to clarifying the complexities surrounding the citation of paraphrased text and direct quotes.

#### **4.6.4 Style Guide Adherence**

Following certain style guides is an essential component of academic writing that supports consistency and coherence in a variety of academic fields. Librarians play a crucial role in encouraging conformity to the widely used style guides like APA, MLA, and Chicago, to these standards and AI chatbots are of great help in learning about these referencing styles. Librarians can also promote the use of various AI equipped reference management software. They can also provide scholars with their insightful advice, clarifying subtleties regarding reference lists, paper style, and citation formatting, thereby promoting correctness and uniformity in academic discourse.

### **5. Challenges of Librarians in Developing Countries**

Integrating AI tools into library services poses a significant challenge, particularly for librarians in developing countries. Researchers such as Ali et al. (2020), Echedom and Okuonghae (2021), Ajani (2022), Hussain (2023), and Barsha and Munshi (2024) have identified numerous hurdles faced by librarians in these regions. Among these challenges, inadequate IT infrastructure emerges as a prominent issue. Studies indicate that many libraries lack sufficient hardware, software, and Internet connectivity, with outdated IT systems being commonplace. According to Ali et al. (2020), technological barriers are a major impediment, with approximately thirty percent of academic librarians in Pakistan reported as critical obstacles to AI implementation. Furthermore, essential components such as computers, tablets, reliable internet access, and high-quality hardware and software are severely lacking in most academic libraries, further hindering progress in developing countries.

Arora et al. (2020) highlights the issue of data availability and quality as another significant challenge. Libraries in developing countries like India often face restricted access to digital resources and limited capabilities for digitizing and curating their collections. Echedom and Okuonghae (2021) stress the

“importance of comprehensive and representative datasets to ensure the ethical and effective implementation of AI in academic library services”.

Budgetary limitations present significant barriers to the integration of AI into library services in developing nations, a concern highlighted by many researchers. Ali et al. (2020) disclosed that 70% of librarians identified financial constraints as the primary impediment to implementing AI tools in university libraries in Pakistan. Ajani et al. (2022) observed that inadequate funding of administrative and academic libraries in Nigeria have hindered the adoption of AI tools for service provision. Echedom and Okuonghae (2021) highlighted the significance of sustainable funding models and strategic planning in overcoming financial constraints, thereby ensuring the long-term success of AI initiatives in libraries in Sub-Saharan Africa. Mahmud (2024) identified several significant challenges for adopting artificial intelligence in library services in Bangladesh, including inadequate technology infrastructure, funding limitations, a shortage of AI-skilled staff, and data privacy risks.

Winkler and Kiszl (2021) mentioned the critical role of thorough training initiatives in addressing the skills gap and maximizing the efficient integration of AI technologies within library services. According to Hussain, (2022), “resistance to change is an issue as some librarians are not interested in introducing new and innovative technologies”. Insufficient administrative support and limited training opportunities stand out as additional pressing concerns, as highlighted by several researchers (Hussain, 2020; Ali et al., 2020), particularly regarding librarians in developing nations. Besides, many librarians face challenges due to inadequate training and skills in utilizing AI tools for research purposes. Consequently, without proper training, they may struggle to offer effective research assistance to scholars and researchers. In addition to the mentioned challenges, librarians also grapple with ethical concerns surrounding the use of AI in research, as well as the need to raise awareness and promote acceptance of these technologies within their communities (Eke, 2023).

## **6. Conclusion**

Undoubtedly, AI is reforming our lives, perception, and professional realms. AI tools have become indispensable particularly in academia and scientific research. Librarians, positioned at the centre of information dissemination, can extensively facilitate researchers by integrating AI-based services within the library. By the adaptation of various AI tools, the efficiency of researchers can be improved drastically. Staying updated on the latest AI advancements and their real-world implications, librarians are proficient at guiding researchers in selecting customized AI solutions to meet their specific needs. Through comprehensive training and support, librarians empower researchers to maximize their research productivity by utilizing the power of AI tools effectively.

The researchers have identified six key areas where librarians can provide support to researchers through the use of AI tools. These areas include selecting appropriate AI tools, conducting literature searches and mapping, analysing and visualizing data, managing citations and references, ensuring research integrity

and ethical awareness, and providing copyediting services, etc. The study also highlights several popular AI tools commonly utilized in research. Notably, the study addresses the significant challenges faced by librarians in developing countries, as identified by previous research. It emphasizes the practical implications of the findings, suggesting that librarians can implement the proposed model to effectively assist researchers.

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