

**ARTIFICIAL INTELLIGENCE IN REFERENCE SERVICES:
TRANSFORMING LIBRARY USER SUPPORT**

Harpreet Singh¹, Mohit Dutta²

Research Scholar¹, Assistant Librarian²

¹Lovely Professional University, ²Sant Baba Bhag Singh University

Abstract

Reference service is a fundamental function of libraries that supports users in locating, accessing, and utilizing information effectively. With the advancement of digital technologies, the nature of reference services has undergone significant transformation, particularly with the integration of Artificial Intelligence (AI). This study examines the role of AI in enhancing reference services, with special reference to a digital library in Hoshiarpur. The research is based on a mixed-method approach, combining interviews and questionnaires. Data were collected from 50 students through interviews and 200 users through questionnaires. The findings indicate that the majority of users are students preparing for competitive examinations who require quick and reliable information. In the absence of a formal reference section, users depend largely on librarians for guidance and support. The study further reveals a growing use of AI chatbots such as ChatGPT, Google Gemini, and Microsoft Copilot for instant answers, concept clarification, and exam preparation. AI tools improve the efficiency of reference services by providing fast, accessible, and user-friendly information. However, concerns related to accuracy and reliability highlight the continued importance of librarian support. The study concludes that the integration of AI tools with professional librarian expertise enhances the overall quality of reference services. This combined approach improves user satisfaction, increases accessibility, and supports the evolving information needs of users in digital library environments.

1. INTRODUCTION

Reference service is a fundamental function of library and information centers that focuses on assisting users in identifying, locating, and effectively using information sources to meet their specific needs. It involves direct or indirect interaction between the librarian and the user, where the librarian provides

guidance, answers queries, and helps in accessing appropriate resources. This service may range from simple factual assistance, such as providing definitions or dates, to more complex research support that requires the use of multiple information sources and search strategies. Over time, reference services have evolved from traditional face-to-face interactions to digital and virtual modes, reflecting changes in user behavior and technological advancements.

Artificial Intelligence (AI) refers to the ability of computer systems to perform tasks that typically require human intelligence, such as understanding language, learning from data, problem-solving, and decision-making. In the context of libraries, AI is used to develop systems that can interact with users, interpret their queries, and provide relevant information in an efficient manner. These intelligent systems are designed to simulate human thinking and communication, thereby enhancing the speed and accessibility of information services. The integration of AI into reference services has brought significant changes in the way libraries deliver user support. Modern library systems increasingly utilize AI-powered technologies to provide quick, accurate, and user-friendly services. Unlike traditional methods that depend entirely on human assistance, AI-based systems can operate continuously, respond instantly to multiple users, and offer personalized recommendations based on user preferences and search history. This transformation has improved the overall efficiency of library services and has made information more accessible to users regardless of time and location.

Several AI tools are currently being used in library reference services to support users effectively. These include conversational chatbots that answer user queries in real time, virtual assistants that guide users through databases and catalogues, and recommendation systems that suggest relevant books, articles, or digital resources. Widely used AI tools include ChatGPT, Google Gemini, Microsoft Copilot, and Grok, which are capable of generating human-like responses and assisting users in information searching. In addition, some libraries have developed their own customized AI chatbots integrated into their websites to handle frequently asked questions, provide library information, and assist in research activities.

Despite the many advantages of AI, such as speed, availability, and efficiency, there are also certain limitations that need to be considered. AI systems may sometimes provide inaccurate or incomplete information due to limitations in data understanding and context interpretation. Issues related to data privacy, ethical concerns, and algorithmic bias also require careful attention. Therefore, while AI plays an important role in enhancing reference services, it cannot fully replace the expertise and critical thinking abilities of professional librarians. In this context, the present study aims to examine the role of

Artificial Intelligence in transforming reference services and improving library user support. It focuses on understanding how AI tools are integrated into library systems, their benefits and challenges, and their impact on the changing role of librarians in the digital age.

2. LITERATURE REVIEW

The concept of reference service has been extensively discussed in library and information science literature, with early contributions laying the philosophical and practical foundation of user-centered library services. One of the most significant contributors in this field is S. R. Ranganathan, often regarded as the father of library science, whose work *Reference Service* emphasizes the principle of connecting the right reader with the right information at the right time. His human-centered approach highlights the importance of personal assistance, efficient organization of knowledge, and responsiveness to user needs, which continue to guide modern reference practices. These foundational ideas are further supported by Bopp and Smith in *Reference and Information Services: An Introduction*, where reference service is described as a systematic process involving user interaction, query analysis, and the use of appropriate information sources.

In addition to classical perspectives, broader theoretical frameworks are provided by Rubin and Rubin (2020), who explain that reference service is an integral part of the overall library system, linking users with both print and digital resources. Similarly, Bawden and Robinson (2020) emphasize the evolving nature of information science, highlighting how digital environments have reshaped information access and user expectations. These works collectively establish that reference services are not static but continuously adapt to technological and social changes.

With the transition from traditional to digital environments, modern literature has increasingly focused on virtual and technology-supported reference services. Cassell and Hiremath, in their work *Reference and Information Services in the 21st Century*, discuss how libraries have moved beyond physical reference desks to include online platforms, virtual reference, and social media-based services. The process of user interaction, particularly the reference interview, has also been critically examined by Ross and colleagues, who highlight the importance of understanding user needs through effective communication. This process is especially relevant in the context of AI, as modern systems attempt to replicate similar interactions through automated means.

The growing role of technology in reference services is further explored in works such as *The Desk and Beyond: Next Generation Reference Services*, which describes the shift toward embedded and mobile library services. These developments reflect a broader transformation in which libraries are becoming more flexible, user-focused, and technology-driven. Early forms of virtual reference services, as discussed by Lipow, laid the groundwork for the integration of more advanced technologies such as Artificial Intelligence.

Recent studies have specifically examined the application of AI in library environments. Luo and Hostetler (2020) highlight that AI technologies, including chatbots and machine learning systems, have the potential to improve service efficiency, provide instant responses, and enhance user experience. Similarly, McNeal and Newyear (2013) discuss the use of chatbots in libraries as tools for handling routine queries and providing basic information support. Huang and Rust (2021) further analyze AI in service contexts, noting both its advantages in automation and its limitations in understanding complex human needs. These studies indicate that while AI enhances accessibility and speed, it still requires human supervision to ensure accuracy and reliability.

Additional contemporary perspectives emphasize the need to redefine reference services in the age of digital information and search engines. Works such as *Reinventing Reference* highlight how libraries must adapt to compete with and complement automated information systems like search engines and AI tools.

The integration of AI tools such as ChatGPT, Google Gemini, and Microsoft Copilot represents a significant shift in how users interact with information systems, enabling more conversational and personalized access to knowledge.

Overall, the literature suggests that reference services have evolved from traditional, librarian-mediated interactions to hybrid models that combine human expertise with intelligent technologies. While foundational theories emphasize personalized service and user engagement, modern research highlights the role of AI in enhancing efficiency, accessibility, and scalability. However, the consensus across studies is that AI cannot fully replace the critical thinking, contextual understanding, and ethical judgment provided by professional librarians. Therefore, the future of reference services lies in a balanced integration of technological innovation and human expertise.

3. METHODOLOGY

This study adopts a mixed-method research approach, combining both qualitative and quantitative techniques to examine the role of Artificial Intelligence in reference services. This approach is suitable as it allows the researcher to collect detailed user experiences as well as structured data regarding the use of AI tools in a real library environment. The research was conducted at a digital library in Hoshiarpur, where users regularly access both traditional reference services and digital information resources. The study is based on primary data, collected through two main methods: interviews and questionnaires. The interview method was used to gather in-depth qualitative information. Semi-structured interviews were conducted with selected library users, particularly students preparing for competitive examinations. These users frequently rely on reference services for quick information, concept clarification, and access to relevant study materials. The interviews focused on understanding user behavior, their interaction with library services, and their experiences with AI-based tools such as chatbots. This method helped in exploring user opinions, preferences, and challenges in detail.

In addition to interviews, a structured questionnaire was designed to collect quantitative data from a broader group of users. The questionnaire included questions related to the frequency of using reference services, preference between traditional sources (books) and digital tools, and the use of AI-based chatbots for information searching. Special emphasis was placed on identifying which AI tools are most commonly used by users, such as ChatGPT, Google Gemini, and Microsoft Copilot. The questionnaire also gathered responses regarding user satisfaction in terms of speed, accuracy, and usefulness of AI-generated information. The combination of these two methods provided a more comprehensive understanding of the research problem. While interviews offered detailed insights into user experiences, the questionnaire helped in identifying general trends and patterns among users. Additional observations and informal discussions with library staff were also conducted to understand the practical implementation of reference services in the digital environment. The collected data were analyzed using a qualitative and descriptive approach. Responses from interviews were interpreted thematically, while questionnaire data were summarized to identify common user preferences and usage patterns. This combined analysis enabled the researcher to

evaluate the effectiveness of Artificial Intelligence in reference services from both individual and general perspectives.

Overall, this mixed-method methodology provides a balanced and reliable framework for understanding how AI tools are influencing reference services and user behavior in a digital library setting.

4. REFERENCE SERVICE IN ACADEMIC AND PUBLIC LIBRARY

Reference services in libraries vary depending on the type of institution and the information needs of users. In academic libraries, reference service is a structured and essential function that supports teaching, learning, and research activities. These services are generally divided into short-range (ready reference) and long-range (research reference) services. Short-range reference services in academic libraries focus on providing quick and factual information to users. These include answering simple queries such as definitions, statistical data, citation styles, and basic conceptual explanations. Undergraduate students commonly use these services for immediate academic needs. In contrast, long-range reference services deal with complex and in-depth information requirements. These are mainly used by postgraduate students, researchers, and faculty members who require assistance in literature searching, database use, research methodology, and academic writing. Librarians play an important role in guiding users, selecting appropriate sources, and helping in the evaluation of information.

With the development of digital technologies, Artificial Intelligence (AI) has become an important component of academic reference services. AI-based tools such as chatbots and virtual assistants are integrated into library systems to provide instant responses to user queries. These tools are effective in handling short-range reference questions, including locating resources, providing basic explanations, and assisting users in accessing digital databases. AI systems can also suggest relevant books, articles, and research materials based on user interests. However, for long-range and complex research queries, the role of librarians remains important due to the need for critical analysis and contextual understanding. Public libraries function differently in terms of reference services. In many cases, there is no separate or formal reference section. Instead, librarians provide general guidance and assistance to users based on their needs. Public libraries serve a wide range of users, including general readers, school students, and community members, whose information needs are usually simple and practical.

In public library environments, AI tools are increasingly being used to support user services. AI-based chatbots are commonly utilized to answer routine queries such as library timings, membership procedures, and general information questions. These tools help users access information quickly without requiring direct interaction with library staff and support the efficient handling of basic inquiries.

5. DATA COLLECTION IN DIGITAL LIBRARY HOSHIARPUR

The data for this study were collected through a combination of interviews and questionnaires conducted in a digital library in Hoshiarpur. A total of 50 students were interviewed, and 200 users participated in the questionnaire, providing both qualitative and quantitative insights into the use of reference services and Artificial Intelligence tools. The interview findings indicate that the majority of users visiting the digital library are students preparing for competitive examinations. These users require quick, accurate, and easily accessible information to support their studies. It was observed that the digital library does not have a separate reference section; therefore, users depend largely on the librarian for reference assistance. Librarians play a key role in guiding users, recommending relevant study materials, and helping them access appropriate information sources. The questionnaire data highlight a significant shift toward the use of AI-based tools for meeting information needs. Many users reported that they prefer AI chatbots for quick answers, concept clarification, and exam-related queries rather than relying only on traditional books. The data collected from 200 respondents show the following distribution of AI tool usage:

- ChatGPT – 80 users
- Google Gemini – 40 users
- Microsoft Copilot – 30 users
- Perplexity AI – 10 users
- Grok – 20 users
- Others – 20 users

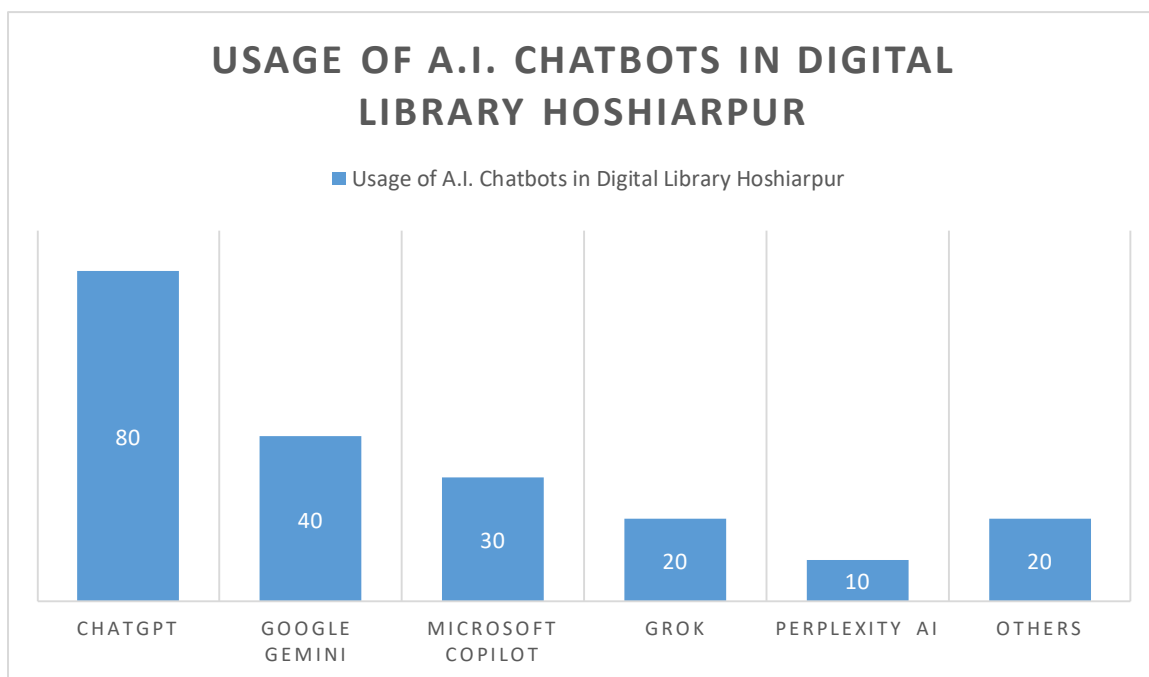


Figure 1. Usage of A.I. Chatbots in Digital Library Hoshiarpur

The data clearly indicate that ChatGPT is the most widely used AI tool, followed by Google Gemini and Microsoft Copilot. Other tools such as Perplexity AI and Grok are used by comparatively fewer users, while a portion of respondents rely on other available AI platforms. This variation suggests differences in user awareness, accessibility, and familiarity with different technologies. The graphical representation of this data provides a clear visual understanding of user preferences, showing that AI tools have become an important part of the study practices of digital library users. At the same time, the continued dependence on librarians for guidance reflects the need for human support alongside technological tools.

6. DISCUSSION

The findings of this study are based on field research conducted in a digital library in Hoshiarpur, where both traditional reference practices and modern digital tools are used to support users. The study shows that reference service in this environment is not formally structured through a separate reference section; instead, it is delivered through direct interaction between users and the librarian. Students, particularly those preparing for competitive examinations, frequently approach the librarian for assistance in locating relevant materials, understanding concepts, and accessing digital resources. This indicates that the role of the librarian remains central in guiding users and supporting their information needs, even in a digital setting.

At the same time, the study highlights the growing use of Artificial Intelligence tools, especially AI-based chatbots, as an additional support system for reference services. Librarians are not only providing traditional guidance but are also increasingly using AI tools to deliver faster and more efficient services. In many cases, librarians assist users by combining their professional knowledge with AI-generated information, ensuring that users receive accurate, relevant, and well-verified answers. This combination improves the quality of reference service by reducing response time while maintaining reliability.

One of the major advantages of AI chatbots is their ability to provide immediate responses, which saves time and supports continuous learning. These tools are available 24/7, allowing users to access information beyond library working hours. Additionally, AI chatbots can handle multiple queries simultaneously and provide simplified explanations, making them particularly useful for students preparing for examinations. They also assist users in discovering new information by suggesting related topics and resources.

Despite these advantages, the study also identifies several limitations in the use of AI chatbots. One of the main concerns is the accuracy and reliability of information, as AI-generated responses may sometimes be incomplete or not fully correct. AI systems often lack deep contextual understanding, especially in complex academic queries that require critical analysis. There are also concerns related to data privacy and ethical issues, as user interactions with AI tools may involve the sharing of personal or sensitive information. Furthermore, over-dependence on AI tools may reduce the habit of consulting authentic academic sources such as books and peer-reviewed materials.

In the present scenario, it becomes essential for librarians to develop adequate knowledge and skills related to Artificial Intelligence tools, particularly AI chatbots. Modern library professionals are expected not only to manage traditional resources but also to understand and effectively use digital technologies to support users. Knowledge of AI tools enables librarians to guide users more efficiently, evaluate AI-generated information, and integrate these technologies into library services. This shift highlights the evolving role of librarians as both information providers and technology facilitators in the digital age.

7. CONCLUSION

The present study highlights the changing nature of reference services in libraries with the integration of Artificial Intelligence. The findings from the digital library in Hoshiarpur show

that users, especially students preparing for competitive examinations, require quick, accurate, and easily accessible information. In the absence of a formal reference section, the librarian continues to play an essential role in guiding users, recommending appropriate resources, and supporting their information needs.

At the same time, the increasing use of AI chatbots has significantly enhanced the efficiency of reference services. These tools provide instant responses, continuous access to information, and simplified explanations, which are particularly useful for handling ready reference queries. AI chatbots have become an important support system for users by saving time and improving accessibility to information.

The study also indicates that the most effective approach to modern reference service is not the replacement of librarians by AI, but the integration of both human expertise and intelligent technologies. Librarians ensure the accuracy, reliability, and proper interpretation of information, while AI tools improve speed and convenience. This combination strengthens the overall quality of reference services and enhances user satisfaction.

Furthermore, the study emphasizes the need for librarians to develop knowledge and skills related to AI tools in order to meet the changing demands of users. The adoption of AI in libraries not only supports users more effectively but also contributes to the modernization and expansion of reference services in the digital environment.

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