A Study on Impact of Artificial Intelligence (AI) on Library Services

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ABSTRACT

Artificial intelligence (AI) is one of the emerging technologies of this phase. AI is an extensively used technology in library services that can transform the best services in the era of information technology. This paper aims to highlight the impact of AI on library services. Several researches have been undertaken on this subject, but they only address a few applications. AI and libraries have a substantial nexus; nevertheless, the use awareness and impact on academic scholars of AI in library services are still creating question marks addressed in this paper. This study will help the policy stakeholders, librarians, and scholars in the field to address these issues before the deployment of AI in library services.

KEYWORDS: Academic Libraries; Artificial Intelligence; Library Services; Smart Libraries.

INTRODUCTION

In the digital age, libraries face evolving challenges in managing vast amounts of information, providing efficient services, and ensuring a seamless user experience. Traditional library systems have been significantly transformed by the integration of automation and information technologies. One such transformative technology is Artificial Intelligence (AI), which has the impending to revolutionize library operations and services.

This research aims to explore and analyze the role of Artificial Intelligence in various aspects of libraries and its services. The study will investigate various applications of AI within libraries, such as collection management, cataloging, user services, data analytics, and recommendation systems. (Kurzweil, 2022)

To conduct the research, a mixed-methods approach will be employed. Surveys and interviews will be conducted with research scholars, faculty members, and library professionals to measure their perspectives and experiences with AI implementations. Furthermore, case studies of libraries that have already integrated AI into their operations will be analyzed to gain insights into best practices and potential pitfalls.

The findings of this research are expected to shed light on how AI enhances the services and improves the overall efficiency and effectiveness of library services. Additionally, the study will identify potential ethical and privacy concerns associated with AI adoption in libraries and propose guidelines for responsible AI usage.

By understanding the role of A I in library services, this research will contribute to the growing body of knowledge of how technology can support and transform information institutions in the modern era. Libraries can use the research findings as a guide to make informed decisions regarding the implementation of AI solutions and to enhance their services, ultimately benefiting library users and the broader community (Jadhav D,2020)

Artificial Intelligence (AI) has emerged as a transformative technology with immense potential in the field of library and information science. Libraries, as repositories of knowledge and providers of information services are embracing AI to enhance operational efficiency, improve user experiences, and deliver innovative services. AI encompasses a range of techniques, including natural language processing, machine learning, and data analytics, which enable machines to simulate human intelligence and perform tasks traditionally requiring human involvement (Asemi A, 2018).

The integration of AI in libraries offers exciting possibilities. AI-powered algorithms and systems can facilitate efficient information retrieval and management, enabling users to access relevant resources quickly and effectively. Through advanced recommendation systems, libraries can offer personalized content based on user preferences, fostering a more engaging and tailored user experience. Furthermore, AI can automate routine tasks and processes, freeing up library staff to focus on higher-value activities such as user assistance and community engagement. Additionally, AI enables data-driven decision-making by analyzing vast amounts of data, and providing valuable insights for collection development, resource allocation, and service improvement. (Jha, S.K, 2023)

UNDERSTANDING AI TECHNOLOGIES

John McCarthy, who coined the term in 1955, defines AI as "the science and engineering of making intelligent machines" (McCarthy, 2007). Artificial intelligence (AI) is the field of study that focuses on the creation of computer systems that are capable of learning, reasoning, problem-solving, perception, and natural language processing – all functions that are traditionally only performed by intelligent people. To analyze and handle massive volumes of data, AI systems use statistical models and algorithms. Based on user feedback, these systems can adjust and enhance their performance over time. According to prominent scholars and textbooks in the field, AI involves the creation and advancement of a "fully conscious, intelligent, computer-based entity" that surpasses humans in its capacity to comprehend the world and carry out difficult activities. (Nil's, J.Nilson, 1998)

Allison D (2020) stated that AI tries to accomplish some goals, including object manipulation, generalization, logical reasoning, knowledge discovery, and natural language processing. AI has recently attracted a lot of interest in a variety of fields, including computer science, information science, mathematics, linguistics, psychology, and other specialized domains. The most significant use of AI in the discipline of Library and Information Science (LIS) has been the development of expert systems. Expert systems have shown to be helpful not just in performing routine

library activities but also in boosting productivity and assisting library professional's decision-making processes. (Cox, A.M., Pinfield, S. and Rutter, S., 2019)

Yao F. Wrotes (2010) The potential applications of AI when it comes to library ideas are seemingly limitless, and librarians who embrace this technology and its practical implications on their field will be well-positioned to drive innovation., "The codification of knowledge and the process of enhancing human learning will be the cornerstones of the next phase of human history. In the second industrial revolution, the wealth and power of nations will be based on non-material resources, by the ability to create and facilitate knowledge. Seen in this light, the librarian is a natural leader for the age of knowledge that is now unfolding." (Ray Kurzweil,2022)

APPLICATION OF AI IN LIBRARIES

Artificial Intelligence (AI) has a profound impact on various business activities within Smart Libraries. According to the ACRL, "Although some could argue that public libraries would be better suited to introducing their users of artificial intelligence, academic libraries are in a unique position where they can combine their information literacy initiatives with AI literacy." Through case analysis and a systematic review of domestic and foreign literature and practical applications, several areas of application have been identified:

a) Cataloging and Classification   **b) Reference Service (User Service)**

c) Collection Management and   **d) Security System:**

The Integration of Artificial Intelligence in the Library for Enhanced User Experiences and Accessibility:

Artificial Intelligence (AI) has emerged as a potent tool, revolutionizing various sectors. Libraries, custodians of knowledge and information, are harnessing the potential of AI to enhance user experiences and accessibility, propelling traditional library services into the digital age. The infusion of AI is redefining how libraries interact with their patrons and expanding the scope of accessibility in diverse and innovative ways.

1. **Smart Book Recommendation system**: AI-powered recommendation systems revolutionize how libraries organize and present collections. These systems analyze user preferences, borrowing history, and reading patterns to suggest personalized reading lists and relevant resources. This approach simplifies the discovery of materials and enhances user engagement and satisfaction.

2. **Chatbots and Virtual Assistants**: Chatbots, driven by AI, provide immediate assistance to users by answering inquiries, guiding them through library resources, and assisting in navigating the library's digital and physical spaces. These virtual assistants significantly improve accessibility by ensuring users can obtain information and support around the clock.

3. **Automated Administrative Tasks**: AI can automate routine administrative tasks, such as handling book reservations, managing due dates, and generating overdue notifications. This automation allows library staff to focus more on assisting patrons, curating collections, and developing programs to enrich the user experience.

4. **Enhanced Accessibility for People with Disabilities**: AI is vital in enhancing accessibility for individuals with disabilities. Text-to-speech and speech-to-text capabilities improve accessibility for the visually impaired or those with reading difficulties. AI-driven image recognition facilitates the description of visual content, making it accessible for those with visual impairments.

5. **Data Analytics for Collection Development**: AI-powered data analytics assist libraries in collection development by providing insights into the usage patterns of various resources. Analyzing this data helps make

informed decisions about acquiring and retaining materials, ensuring the library's collection remains relevant and aligned with user interests.

6. **Preservation and Restoration of Materials**: AI technologies, such as Optical Character Recognition (OCR) and content analysis, aid in digitization efforts, preserving rare and fragile materials. Additionally, AI facilitates the restoration of old or damaged texts, maintaining historical records for future generations.

7. **Virtual Reality (VR) and Augmented Reality (AR) Experiences**: AI-driven VR and AR technologies offer immersive experiences within libraries, allowing users to virtually explore library spaces, attend events or engage with digital collections. These experiences augment user engagement and attract a broader audience.

8. **Language Translation Services**: AI-based language translation services within libraries break language barriers, making resources accessible globally. Patrons can access content in their preferred language, promoting inclusivity and diversity.

PROBLEM STATEMENT

Honghai GC (2020) believes Libraries have long been the custodians of vast amounts of information, serving as valuable resources for users seeking knowledge, research materials, and entertainment. However, in the face of an increasingly digitized and interconnected world, traditional library systems encounter challenges in efficiently managing and providing seamless access to the abundance of information available. To address these challenges, libraries have started to adopt modern and cutting–edge technologies, and among these, Artificial Intelligence (AI) holds great promise as a transformative solution. (P. H.Winston, 1999)

The problem at hand is to investigate and understand the role of Artificial Intelligence in improving library operations and its impact on improving library services. Despite the potential benefits of AI, there exist various complexities and uncertainties in integrating AI solutions into library operations.

OBJECTIVES

- ✓ To find out the attitudes of research scholars towards A I based library services.
- ✓ To find out factors that predict research scholars attitudes towards A I based library services
- ✓ To examine the challenges faced by scholars while using A I based library services

Research questions

The research study seeks to answers the following questions:

1. What is the research scholars' level and source of awareness about A I?

2. What is the research scholars' perception of the importance of A I on Library services

3. What are the constraints that research scholars' encounter when utilising A I based

library services?

Research Hypotheses

H01: There is no significant relationship between awareness and utilisation ofA I based library services by research scholars

H02: There is no significant relationship between awareness and perception of A I based library services by research scholars.

LITERATURE REVIEW

Numerous studies have explored the diverse applications of AI in library settings. AI-powered systems have been used for collection management, assisting in the selection and acquisition of materials based on user preferences and demand patterns (Fernandez P., 2016). Cataloging and metadata creation have also been streamlined through AI techniques, such as natural language processing and machine learning algorithms, leading to improved accuracy and efficiency (Tella A.2020).

AI-driven recommendation systems have shown great potential in enhancing user experience and engagement with library resources. Personalized book recommendations, tailored to individual users' reading habits and preferences have been found to increase user satisfaction and circulation rates (Shin et al., 2021).

Despite the promising potential of AI in libraries, several challenges have been identified. Integrating AI with existing library systems can be complex and resource-intensive, especially for smaller and underfunded libraries (Omehia A, 2020). Additionally, ensuring the accuracy and fairness of AI algorithms is a critical concern to avoid perpetuating biases in library services (Shin D, 2021).

On the other hand, AI presents opportunities to optimize library workflows and services, freeing up librarians' time from mundane tasks to focus on higher-value activities, such as user engagement and specialized support (Hobohm et al., 2018).

Understanding user perspectives on AI implementation in libraries is vital for successful adoption. Studies have shown that users generally welcome AI-based services that enhance their experience, such as personalized recommendations and faster access to relevant information (Gul S, Bano S, 2019). However, concerns related to privacy and data security have also been expressed, highlighting the need for transparent data handling and consent mechanisms (Makri et al., 2022).

The Ethical implications of AI usage in libraries have been a subject of increasing discussion. Libraries must navigate issues surrounding data privacy, algorithmic bias, and the impact of automation on human librarians' roles (Harper et al., 2021). Ensuring ethical AI practices requires clear guidelines and policies that prioritize user rights and promote responsible AI development and deployment.

METHODOLOGY

The correlational research design was adopted. The study population consisted of all research scholars and faculty members as well as post-graduate students of the faculties of Arts, Social Sciences, and Science of Mysore University. The sample size was 966, questionnaires were used to collect data, and descriptive and inferential statistics were used to analyze the data collected.

Table 1: Sample size of Questionnaire distributed.

Sl. No	Faculty	Questionnaire Distributed	Questionnaire received	% of Response received
1	Arts	250	214	85.60
2	Science &Technology	400	363	90.75
3	Commerce	300	276	92.00
4	Education	075	061	81.33
5	Law	075	052	69.33
	Total	1100	966	87.82

Table 2: Distribution of the participants based on gender, age qualification, cadre, and teaching experience.

Factor/Variable	Frequency	%age
Gender		
Male	464	48.03
Female	502	51.97
Total	966	100.00
Age		
20 to 30 Years	376	38.92
31 to 40 Years	211	21.84
41 to 50 years	305	31.57
51 to 60 Years	48	04.97
>60 years	26	02.69
Total	966	100.00
Academic Status		
PG Student	336	34.78
Research Scholar	217	22.46
Assistant Professor	208	21.53
Associate Professor	107	11.08
Professor	35	03.62
Librarian	63	06.52
Total	966	100.00
Qualification		
P.G.	696	72.05
M.Phil.	61	06.31
Ph.D.	193	19.98
Others	16	01.66
Total	966	100.00
Research/ Teaching Experience		
< 3 years	423	43.79

3 to 6 years	264	27.33
7 to 10 years	169	17.49
11- 15 years	083	08.59
>More than 15 years	027	02.80
Total	966	100.00

Table 1&2 reported the Distribution of the participants based on gender, age qualification, cadre, and teaching experience. Based on gender and age, out of the total participants, 48.03% were male and almost 52 % were female. Furthermore, 38.92 % of the participants were less than 30 years of age, 21.84 % were between 30 to 40 years, 31.57% were between 41 and 50 years and 4.97% were between 51.

out of the total participants, distribution according to designation and academic status revealed that 34.78% are Post Graduate Students, 22.46% Research Scholars, 21.53% Assistant Professors, 11.08% Associate Professors, 3.62% Professors and 6.52% Library Professionals, On the other hand, distribution according to qualification 72.05 % had Master's Degree, 6.31% PG with M.Phil degree, and 19.98 % had PhD.

Answers to the research questions

Research question 1: What is the lecturers' level and source of awareness about A I based library services?

Table 3: Level of awareness of A I based library services

To identify whether their academic ranking influenced their awareness of A I based library services, the following table tabulates both their academic status and their responses to the question of their awareness. The level of awareness according to their academic status was found to be almost similar at all academic status levels. However, in the academic status of professors, library professionals, associate and assistant professors, and research fellows the level of awareness is found to be higher

Academic status	Knew lot about this	Knew little about this	Total Yes	Total No	Total
PG students	214(63.69)	61(18.15)	275(81.85)	61(18.15)	336
Research Scholars	169(77.88)	29(13.36)	198(91.24)	19(08.76)	217
Assistant Professors	114(54.81)	73(35.10)	187(89.90)	21(10.10)	208
Associate Professors	69(64.69)	22(20.56)	91(85.05)	16(14.95)	107
Professor	23(65.71)	10(28.57)	33(94.29)	02(05.71)	35
Librarian	48(76.19)	11(17.46)	59(93.65)	04(06.35)	63
Total	637(65.94)	266(21.33)	843(87.27)	123(12.73)	966

Table 4: Chi-Square summary results

Chi square Calculated value	Degree of Freedom	Chi square tabulate value
17.616	5	16.750

This indicates that most of the academic scholars (87.27%) are aware about A I based library services.

The differences were confirmed using the cross-tabulation chi-square value; this suggests that there is a significant difference in the awareness about A I based library services between academic rankings at a 0.05 level of significance.

To learn researchers' awareness of A I based library services, the above questions in Table 3 were asked to the respondents. Their responses show that more researchers were aware of the general concept of A I based library services. The above table shows that out of 966 respondents 123 respondents were found to be unaware of A I based library services.

Research question 2: What is the research scholars' perception of the importance of A I on Library services

Table 5: Research scholars' perception of the importance of A I on Library

VARIABLES	SA	A	N	SD	D	Mean
AI based library services are Efficient information retrieval and management	419 (43.37)	271 (28.05)	14 (1.45)	48 (4.97)	214 (22.15)	3.65
Enhanced user experience and personalization	396 (4.099)	432(44.72)	11 (1.14)	96 (4.97)	79 (87.18)	4.05
Automation of routine tasks and processes	314 (32.51)	514 (53.21)	8 (0.83)	39 (4.04)	91 (9.42)	3.95
Advanced search capabilities and recommendation systems	96 (9.94)	321 (33.23)	11 (1.14)	226 (23.40)	312 (32.30)	2.65
Expansion of digital collections and accessibility	295 (3054)	614 (63.56)	3 (0.31)	39 (4.04)	15 (1.55)	4.25
Supporting diverse user needs and preferences	227 (24.78)	503 (54.91)	7 (0.76)	63 (6.88)	116 (12.66)	3.72
Collaboration and knowledge sharing among libraries	203 (21.01)	518 (53.62)	11 (1.14)	119 (12.32)	115 (11.90)	3.60

*SA: Strongly Agree, A: Agree, N: Neutral, SD: Strongly Disagree, D: Disagree

Out of the total chosen seven factors, the faculty members rate first-order characteristic features of A I based library services in terms of the Expansion of digital collections and enhancement of the accessibility as it secures mean score 4.25 on a five-point rating scale. This is the highest level of characteristic feature of A I based library services. The respondents' second-order perspectives order characteristic features of A I based library services in terms of Enhanced user experience and personalization as it secure 4.05 on 5 point rating scale. Automation of routine tasks and processes as it secures a mean score of 3.95 on 5-point rating scales.

Research question 3: What are the constraints that research scholars' encounter when utilising A I based library services?

Table 6: Constraints academic scholars encounter during the utilisation of A I based library services

VARIABLES	SA	A	N	SD	D	Mean
Dependence on technology	161 (16.67)	232 (24.02)	29 (3.00)	316 (32.71)	228 (23.60)	2.77
Privacy in the Digital Age	314 (32.51)	296 (30.64)	11 (1.14)	139 (14.39)	206 (21.33)	3.38
Impact on traditional library services and roles	273 (28.26)	413 (42.75)	14 (1.45)	86 (8.90)	180 (18.63)	3.53
Ethical considerations and biases	414 (42.86)	261 (27.02)	19 (1.97)	96 (9.94)	176 (18.22)	3.66
Lack of human touch and personalized assistance	398 (41.20)	414 (42.86)	14 (1.45)	59 (6.11)	81 (8.39)	4.02
Technical challenges and limitations	208 (21.53)	311 (32.19)	12 (1.24)	214 (22.15)	221 (22.88)	3.07

*Sa: Strongly Agree, A: Agree, N: Neutral, SD: Strongly Disagree, D: Disagree

Out of the total chosen six factors, the faculty members rate first-order constraints of A I based library services in terms of Lack of human touch and personalized assistance as it secured mean score of 4.02 on a five-point rating scale. This is the highest level of constraint that academic scholars encounter during the utilization A I based library services. The respondents' second-order perspectives order constraints that academic scholars encounter during the utilization A I based library services in terms of Ethical considerations and biases as it secured 3.66 on 5 point rating scale. Impact on traditional library services and roles as it secures a mean score of 3.53 on 5 point rating scales.

Research hypotheses

H0$_1$: There is no significant relationship between awareness and utilisation of A I based library services by research scholars

Table 7: Relationship between awareness and utilisation of A I based library services by research scholars.

Variable	N	Mean	Std.D	r	Sig	Remark
Awareness of AI based library services	966	11.63	3.19	.179	.000	Significant
Utilisation of AI based library services	966	9.36	2.87			

Table No.9 reflects that there is a positive significant association between awareness and utilisation of A I based library services (r=.179; p<0.05). Therefore HO$_1$ is rejected. The positive relationship implies that increase in awareness brings about increase in use.

H0$_2$: There is no significant relationship between awareness and perception of A I based library services by research scholars.

Table 8: Relationship between awareness and perception of A I based library services by research scholars.

Variable	N	Mean	Std.D	r	Sig	Remark
Utilisation of AI based library services	966	9.36	2.87	.152	.000	Significant
Perception on AI based library services	966	12.67	3.23			

Table 7 revealed that there is a positive significant relationship between perception of the importance of AI based library services and its utilisation (r=0.152; p<0.05). Therefore $H0_2$ is rejected.

CONCLUSION

The integration of Artificial Intelligence (AI) in libraries presents significant strengths in rendering library services. AI offers libraries the potential for efficient information retrieval and management, enhanced user experiences through personalization, automation of routine tasks, and improved decision-making through data analysis. However, constraints such as ethical considerations, technical hurdles, and concerns about job displacement should be carefully addressed and the integration and impact of AI in libraries mark an exciting juncture in the evolution of these venerable institutions. AI is not merely a tool but an enabler of progress, a beacon guiding libraries toward a future where information is stored, intelligently curated, and made readily available to all. The AI-powered library is a symbol of progress, a witness to our ability to harness innovation in service of knowledge and society.

On the other hand, the opportunities presented by AI include advanced search capabilities, expanded accessibility of digital collections, support for diverse user needs, and collaboration among libraries. Nevertheless, libraries must also be aware of the interruptions and challenges associated with AI, such as privacy and security risks, dependence on technology and potential system failures, user acceptance and trust issues, and the impact on traditional library services and roles.

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