

Relevance of Advanced Technologies to the Current Day Library and Information Science Research

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Abstract

The introduction of technologies to Library and Information Science (LIS) has no doubt influenced the services and operations of the library including the current-day research. This study examined the relevance of advanced technologies to the current day library and information science research. The study adopted a systematic literature reviews to harvest articles from databases including Google Scholar, Research Gate, Academia, and ProQuest. Based on reviews, it was discovered that the current day LIS research is characterized by the widespread use of digital technologies as influenced by the availability of information resources in digital form. The study also affirmed that advanced technologies such as Artificial Intelligence, Machine Learning, Natural Language Processing, and Augmented/Virtual Reality are relevant to LIS research through preservation of information resources, access to information resources, information discovery, security and dissemination. However, the challenges of using advanced technologies in LIS research including inadequate technical expertise, high costs of infrastructure, ethical concerns and resistance to change stand as barriers to effective adoption and use. Interestingly funding, infrastructure, capacity building, strengthening of ethical frameworks and promotion of culture of innovations and adaptation to change are crucial to exploiting the benefits of the advanced technologies in contemporary LIS research. The study recommended that libraries and LIS researchers should adopt the dynamic nature of knowledge and implement the integration of advanced and evolving technologies to redesigning services and provision of digital resources for enhanced research.

Keywords: advanced technologies, current-day research, LIS Research, AI, Virtual/Augmented Reality

Introduction

The adoption of computer systems in libraries, the proliferation of personal computers, the rise of the internet, smartphones and Artificial Intelligence have empowered and challenged the society including the current day research in Library and Information Science (LIS). Thus, almost all modern research probably use computers, from word processing papers to analysing statistics with software. In response to this significant change, the current-day LIS research focuses on addressing the dynamic challenges and opportunities in managing, preserving, and disseminating digital information for promotion of research. This involves the integration of advanced technologies to enhance library operations and improve user experience including the utilization of innovative methods for digital preservation, accessibility, and the ethical use of information, ensuring that resources needed for research remain relevant and secure (Paul, 2024).

It involves information literacy, and the role of libraries in supporting education, research, and community development. Interestingly, advanced technologies have become indispensable tools in LIS research, enabling innovative approaches to access, preservation and managing both physical and digital resources. Song et al. (2023) noted that the research focus of library science has experienced a change from traditional to digital library. Technologies such as Artificial Intelligence (AI) and machine learning are revolutionizing search systems, enabling semantic search and personalized recommendations for library users. These tools help researchers analyze large data efficiently, allowing libraries to better understand user behavior and tailor services to meet their needs (Senthilkumar et al. 2024). Further, AI-driven chatbots streamline user assistance, improving service delivery by providing instant responses to queries. It is imperative to note that digital preservation has become a critical focus in LIS research, with databases, digital repositories, and cloud computing and blockchain technology playing significant roles. Cloud computing offers scalable and cost-effective storage for digital repositories, ensuring accessibility and security (Wiche et al., 2024). Blockchain enhances the authentication and traceability of digital resources, safeguarding intellectual property and reducing the risks of digital piracy. These technologies address the long-standing challenges of preserving both physical and digital information resources, ensuring their availability for future research.

Furthermore, advanced technologies like virtual and augmented reality (VR/AR) have redefined user engagement in libraries enhancing the environments for learning and exploration and providing users with interactive access to rare and historical collections. Libraries also use VR for virtual tours, making their spaces more accessible to remote users (Enakrire & Oladokun, 2024). Such innovations not only enhance user experience but also bridge the gap between physical and digital spaces in libraries, promoting inclusivity and accessibility in information services. The Internet of Things (IoT) and RFID technologies further enhance the operational efficiency of libraries. IoT-enabled environmental monitoring systems ensure the preservation of physical resources by maintaining optimal storage conditions (Wiche et al., 2024). RFID systems streamline inventory management and resource tracking, reducing human error and enabling faster service delivery. These technologies contribute to the seamless integration of traditional and modern library functions, fostering sustainable practices in resource management.

More importantly, assistive technologies have become indispensable in LIS research, ensuring the enabling libraries to serve diverse user groups, including individuals with disabilities. Speech recognition and screen-reading tools, for instance, have made library resources more accessible to visually impaired users (Horsfall & Opara, 2023). As libraries continue to adopt these advanced technologies, LIS research remains at the forefront of addressing evolving challenges in the information age.

Objectives of the Study

1. Examine the current day library and Information Science Research

2. Identify the advanced technologies and their relevance to library and information science research
3. Identify the challenges of Using Advanced Technologies in Library and Information Science Research
4. Discuss the way forward to overcome the challenges in the use of Advanced Technologies for Library and Information Science Research

Literature Review

Literatures were reviewed under the following headings: current day library and information science research, the advanced technologies and their relevance to library and information science research, the challenges of using advanced technologies in library and information science research and way forward to overcome the challenges in the use of advanced technologies for library and information science research.

Current-day library and Information science Research

Current day Library and Information Science (LIS) research is shaped by the profound changes brought about by technology, shifting societal needs, and the evolving role of libraries as knowledge hubs. A significant area of focus is the digital transformation of library services, where the shift from physical to digital collections is creating new opportunities and challenges. Libraries are digitizing resources to enhance access and usability for managing, preserving, and curating these digital collections (Zhang,et al., 2024). This includes exploring metadata standards, interoperability, and sustainability in digital preservation, as well as addressing the ongoing need for physical collections, particularly for rare and fragile materials.

The integration of advanced technologies, particularly artificial intelligence (AI) and machine learning (ML), is another major research area. These technologies are transforming library operations by enabling automation, improving information retrieval, and personalizing user experiences. LIS researchers are examining the ethical implications of AI, such as algorithmic bias and data privacy, while also studying how these technologies can be deployed effectively to benefit a diverse range of users (Enakrire & Oladokun, 2024). The role of AI in processing large datasets and enhancing library services to ensure that these innovations are accessible and user-friendly. Another pressing issue in contemporary LIS research is the promotion of information literacy and the fight against misinformation. Nsirim and Idoniboye-Obu (2023) noted that the proliferation of digital resources has made it easier for misinformation to spread, challenging libraries to play a active role in educating users on information literacy, equipping them with the skills to critically evaluate and use credible sources. Such efforts are vital in promoting critical thinking and research in a rapidly evolving nature of research.

Open access and digital preservation are also central themes in current LIS research. The push for open access seeks to make scholarly materials freely available to everyone, and researchers are studying the impact of this movement on academic publishing and knowledge dissemination (Nyemezu & Nsirim, 2023). Security concerns are becoming increasingly common as libraries

manage both physical and digital information resources. Thus, Orji and Alex-Nmecha (2023) opined that the adoption of electronic security systems (ESS), such as RFID technology, CCTV, and cybersecurity measures, is a response to threats like theft, data breaches, and unauthorized access to address vulnerabilities and create secure environments that protect resources while ensuring that authorized users can access them without barriers. The preservation of indigenous knowledge systems is gaining attention, with research emphasizing ethical documentation and the respectful integration of these cultural assets into library collections. Therefore, collaborative approaches to knowledge sharing is important aspect of promoting research in LIS to ensure that such efforts honor intellectual property rights and cultural sensitivities.

Advanced technologies and their Relevance of in library and information science research

Advanced technologies have significantly transformed LIS research facilitating information discovery for enhanced research. The advanced technologies that facilitate LIS research include Artificial Intelligence, Machine Learning, Natural Language Processing (NLP), Augmented/Virtual Reality.

Explaining the relevance of advanced technologies in illuminating a path toward an enriched and accessible knowledge for enhanced research, Panda and Kaur (2023) focused on Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP), Augmented Reality (AR) and Virtual Reality (VR), and explores how these technologies redefine digital library experiences. The authors noted that while AI and ML algorithms empower intuitive content curation automating metadata generation, and recommendation, reshaping the way users interact with digital resources that promote research,

Natural Language Processing (NLP) is also an advanced technology that enhance LIS research. This is a branch of artificial intelligence that focuses on the interaction between computers and human language, enabling machines to understand, interpret, and generate text or speech in ways that are meaningful to humans (Priyadarshini et al., 2020). In Library and Information Science (LIS) research, NLP is highly relevant for tasks such as automatic indexing and metadata extraction which improve information retrieval and user experience. It facilitates the development of intelligent search engines, personalized recommendations, and chatbots for library services. NLP enhances the efficiency and accuracy of managing and analyzing large amount of data and information resources, making it an indispensable tool for modern LIS research. It helps to bridge the gap between human language intricacies and digital systems, enhancing search functionalities and making information retrieval seamless.

Another advanced technologies that have transformed LIS research is Virtual/augmented reality. According to Wohlgenannt et al., (2020), Virtual Reality is a technology that creates a simulated environment, allowing users to feel like they are in a different place or world. This immersive experience according to Hamad and Jia, (2022) is achieved through the use of computer modeling and simulation, which enables interaction with a three-dimensional (3D) visual or other sensory

environment, thus, provide novel ways to engage users with information, enabling the creation of virtual libraries and interactive learning environments. Augmented then overlay digital information onto the physical world, expanding interactive learning possibilities (Scavarelli, et al., 2021) transforming research paradigms and ensuring digital libraries not only preserve vast knowledge repositories that will enhance research but also present information in engaging and accessible formats.

The Internet of Things plays a significant roles in LIS research by connecting physical objects through the Internet, enabling exchange of data and information (Ali, 2015). The Internet of Things (IoT) is a network of physical devices, vehicles, appliances, and other objects integrated with sensors, software, and network connectivity, enabling them to collect and exchange information and data. By integrating IoT with advanced technologies like AI, and cloud computing, researchers can process and analyse data efficiently leading to more precise and timely findings. IoT can also foster research by bridging physical and digital systems thereby addressing global research challenges in library and information science research. Furthermore, through AI-driven metadata generation and content tagging, digital libraries are systematically organized and enriched, amplifying search accuracy. These innovations not only preserve the past but also illuminate a future where knowledge is universally accessible, fostering curiosity, learning, and exploration.

Another transformative technology facilitating research in LIS is Cloud computing. This is relevance to LIS research as it provides scalable storage solutions and cloud platforms that facilitate collaborative research and support the preservation of digital resources (Nsirim & Okeke, 2024). LIS researchers can therefore, use cloud-based systems to analyze large data, develop open-access repositories, and enable seamless information-sharing. Cloud technology also supports the integration of artificial intelligence and machine learning tools, further enriching the scope of LIS research and practice.

Challenges of Using Advanced Technologies in Library and Information Science Research

The utilization of advanced technologies in library and information science research has challenges. Some of the challenges are high cost of technology acquisition and maintenance, lack of technical expertise, ethical and privacy concerns, resistance to change, inadequate infrastructure and rapid technological obsolescence

One of the most significant challenges in using advanced technologies in library and information science (LIS) research is the high cost of acquisition, installation, and maintenance. Okunlaya et al., (2022) noted that technologies such as artificial intelligence (AI), machine learning (ML), and big data analytics require significant financial investment in hardware, software, and skilled personnel. Similarly Ndibalema (2022) regretted that many institutions, especially in developing countries, struggle to afford these tools, leading to disparities in technological adoption and hindering the pace of research. Additionally, Okem et al., (2023) stressed that the continuous need

for updates and maintenance further compounds financial constraints. The integration of advanced technologies into LIS research require the use of techniques and expertise in data science, programming, and systems analysis, which many library professionals may lack (Oyetola et al., 2023). This skill gap limits the capacity of researchers and institutions to fully utilize the potential of emerging technologies (Omehia et al., 2021). Moreover, the lack of adequate training opportunities could worsens this issue, as institutions may not have the resources and infrastructure to render specialized training in use of advanced technological (Okeke & Nsirim, 2024).

The use of advanced technologies in LIS research often involves the collection, processing, and analysis of vast amounts of user data. This raises ethical and privacy concerns, particularly around data security, consent, and confidentiality. For example, Mavriki and Karyda (2022) opined that the application of big data analytics in understanding may inadvertently expose sensitive personal information if not handled properly. Thus, balancing the need for data-driven insights with the protection of user rights is a persistent challenge (Ofoegbu et al., 2024). Resistance to change among library professionals and stakeholders is another challenge that hampers the adoption of advanced technologies. Many LIS professionals may be hesitant to embrace new technologies due to fear of obsolescence, lack of confidence in their ability to adapt, or skepticism about the relevance of these tools to traditional LIS research paradigms (Omehia et al., 2021). Such resistance can create barriers to technological adoption and innovation.

Inadequate technological infrastructure, especially in resource-constrained environments, poses a significant barrier to using advanced technologies in LIS research (Wiche et al., 2024). Issues such as unreliable power supply, limited internet access, and outdated systems prevent researchers from effectively leveraging modern tools. These infrastructural limitations can stifle innovation and widen the digital divide between well-equipped institutions and those lacking basic resources. The rapid proliferation of technological advancements presents another challenge for LIS researchers (Okeke & Nsirim, 2024). Technologies and tools that are advanced and emerging today may become obsolete in a few years, making it difficult for institutions to keep up. This necessitates continuous investment in upgrading technologies and retraining staff, which can strain resources and hinder long-term planning. Moreover, the obsolescence of certain technologies may result in the loss of valuable research data if appropriate migration strategies are not in place.

Way forward to the Overcoming the Challenges in the use of Advanced Technologies for Library and Information Science Research

The Challenges in the use of Advanced Technologies for Library and Information Science Research can be curbed through increased funding and strategic investments, capacity building and skill development, strengthening ethical frameworks promoting a culture of innovation and adaptability, upgrading technological infrastructure, embracing sustainable technology practices

To address the financial challenges associated with advanced technologies, there is a need for increased funding and strategic investments in library and information science (LIS) research. Adekoya (2023) stated that governments, academic institutions, and private organizations must prioritize technological advancement in libraries by allocating adequate budgets for purchasing, installing, and maintaining infrastructural tools. Collaborative funding opportunities such as grants and partnerships with tech companies can also help reduce costs while ensuring access to the latest technologies. Developing the technical expertise of LIS professionals is critical for effective technology adoption. Institutions should invest in training programs, workshops, and certifications that equip librarians with relevant skills (Wali, 2021). Partnering with universities and industry experts to offer continuous professional development programs can bridge the knowledge gap and empower LIS professionals to confidently use and manage advanced technologies.

To address privacy and ethical concerns, there must be robust policies and frameworks that guide the use of advanced technologies in LIS research (Oyetola et al, 2023). Institutions should implement clear data governance policies that emphasize transparency, user consent, and data security. Regular audits, compliance with data protection regulations, and the adoption of secure data-handling technologies can further protect user privacy and build trust in technology-based research methods. Creating an environment that fosters innovation and adaptability is essential for overcoming resistance to change. Adopting cloud-based solutions and leveraging open-source technologies can also help reduce costs and enhance access to advanced tools in resource-constrained environments.

To mitigate the challenge of rapid technological obsolescence, LIS institutions should adopt sustainable technology practices. This includes implementing scalable systems, regularly upgrading software, and ensuring that hardware and data storage solutions are future-proof. Institutions should also develop long-term plans for digital preservation and data migration to protect against data loss (Wiche et al., 2024). Engaging in continuous research on emerging trends and technologies will enable LIS professionals to anticipate changes and adapt proactively. By taking these steps, the LIS field can overcome current challenges, ensuring that advanced technologies are effectively harnessed to enhance research, improve service delivery, and drive innovation in library and information science.

Methodology

The study adopted a systematic literature reviews to harvest articles from databases including Google Scholar, Research Gate, Academia, and ProQuest. Literature review focused on the current day library and information science research, the advanced technologies and their relevance to library and information science research, the challenges of using advanced technologies in library and information science research and way forward to overcome the challenges in the use of advanced technologies for library and information science research. Keywords were used for literature search includes Advanced Technologies, Current Day OR Modern Research in Library and Information, AI and Library and Information Science Research, Virtual Reality/Augmented

Reality and Library and Information Science Research, Natural Language Processing and Library and Information Science Research, and Cloud Computing and Library and Information Science Research. The literature search ranged from 2020 to 2024. Inclusion criteria were educational peer reviewed articles. Exclusion criteria include blog posts, articles published before 2020 and articles not in English language.

Implications of the Findings

The findings reveal that current-day Library and Information Science (LIS) research is undergoing profound transformation due to the integration of advanced technologies and shifting societal demands. Libraries, now positioned as knowledge hubs, must adapt to this evolving landscape by embracing cutting-edge technologies to remain relevant and efficient. This shift underscores the need for LIS professionals and researchers to realign their focus towards leveraging these technologies to address emerging challenges in knowledge management, access, and dissemination. By doing so, libraries can enhance their role as indispensable resources in academic, professional, and societal contexts.

The significant impact of advanced technologies like Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP), and Augmented/Virtual Reality (AR/VR) highlights their transformative potential in LIS research. These technologies enable more efficient information discovery, personalized service delivery, and improved research methodologies. For instance, AI-powered systems can analyze vast datasets to uncover trends and insights, while AR/VR enhances user engagement by creating immersive learning environments. The implications for LIS research and practice are profound, necessitating proactive efforts to integrate and optimize these technologies to maximize their benefits for researchers, institutions, and users alike.

However, the challenges identified, such as the high cost of acquiring and maintaining technologies, a lack of technical expertise, ethical concerns, and resistance to change, represent significant barriers to the adoption of advanced technologies in LIS. These issues highlight the pressing need for a comprehensive strategy to address resource constraints, foster digital literacy, and establish robust ethical frameworks. Without such measures, the potential of advanced technologies in LIS research risks being undermined, leaving libraries ill-equipped to meet the demands of the digital age.

The study further emphasizes the importance of actionable solutions, such as increased funding, strategic investments, and capacity-building initiatives, to curb these challenges. Promoting a culture of innovation, adaptability, and sustainable technology use is essential for ensuring the longevity and relevance of technological interventions in LIS. Upgrading infrastructure and strengthening ethical frameworks will also help bridge the gap between technological capabilities and practical implementation. These implications suggest that a concerted effort from

stakeholders, including policymakers, educators, and technologists, is critical for advancing LIS research and sustaining the transformative potential of advanced technologies.

Conclusion

The study identifies the relevance of advanced technologies on the current day library and information science research. It noted that the current day LIS research is characterized by the widespread use of digital technologies as influenced by the availability of information resources in digital form. The study therefore highlights the potential of the technologies in enhancing information management, affirming that through preservation of information resources, access to information resources, information discovery, security and dissemination advanced technologies such as Artificial Intelligence, Machine Learning, Natural Language Processing, and Augmented/Virtual Reality are relevant to LIS research, leading to innovative approaches to addressing challenges associated with information management that could facilitate and promote research. However, the challenges of using advanced technologies in LIS research including inadequate technical expertise, high costs of infrastructure, ethical concerns and resistance to change stand as barriers to effective adoption and use. Interestingly funding, infrastructure, capacity building, strengthening of ethical frameworks and promotion of culture of innovations and adaptation to change are crucial to exploiting the benefits of the advanced technologies in contemporary LIS research.

Recommendations

1. Libraries and LIS researchers should adopt the dynamic nature of knowledge and implement the integration of evolving technologies into their function such as redesigning services and provision of digital resources
2. To fully leverage the transformative potential of technologies like Artificial Intelligence, Machine Learning, Natural Language Processing, and Augmented/Virtual Reality, LIS professionals should invest in specialized training and workshops
3. Addressing challenges such as high costs, inadequate technical expertise, and ethical concerns, libraries should advocate for increased funding from government agencies, private sectors, and international organizations. Furthermore, institutions should establish clear ethical to ensure data privacy and address potential ethical issues, that will enhance trust and transparency in the use of advanced technologies
4. Libraries should imbibe the culture of adaptability to innovations through continuous professional development

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