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ARTIFICIAL INTELLIGENCE CAPACITY BUILDING AND SKILLS DEVELOPMENT AMONG LIBRARY AND INFORMATION SCIENCE PROFESSIONALS: ISSUES AND CHALLENGES

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Abstract

The rapid advancement of artificial intelligence (AI) technology has significantly impacted various industries, including the library and information science (LIS) field. As AI becomes more integrated into library systems and services, LIS professionals must develop new skills and competencies to leverage these technologies effectively. This integration promises enhanced efficiency, productivity, and service quality, but it also presents challenges. LIS professionals need robust AI understanding, technical skills, and ethical awareness to manage AI-based tools. This paper explores the concept of AI capacity building and skill development among LIS professionals and discusses the necessary skills and competencies. It also examines the issues and challenges in equipping LIS professionals with AI skills in Nigeria and proposes solutions to address these challenges. It was concluded that the integration of AI technologies into the library and information science field offers significant potential to enhance library services, improve user experiences, and drive innovation. It was further suggested that First, there must be access to training programs that integrate AI fundamentals with LIS-specific applications, enabling professionals to harness AI for tasks like data organization, predictive analytics, and information retrieval.

Keywords: Artificial Intelligence, Capacity Building, Skills Development, LIS Professionals

Introduction

The rise of new technologies has transformed the world, reshaping how people accomplish tasks. These advancements have surpassed human limitations, enabling greater accuracy and efficiency in organizational processes. As a result, emerging technologies are increasingly replacing human roles across all areas, including in libraries. Traditionally focused on

gathering, organizing, storing, and sharing information, libraries have also embraced this technological shift. According to Omehia (2019), global technological trends have moved libraries from traditional, manual systems to a dynamic, technology-driven environment where information can be accessed instantly. The introduction of Information and Communication Technology (ICT) tools, such as computers, multimedia resources, retrieval systems, and digital materials, has revolutionized library information services in the 21st century.

In addition to the foregoing, Artificial Intelligence (AI) represents a transformative technology that has become a focal point of interest in the 21st century. Libraries, among other institutions, are experiencing the impact of this AI revolution. Onuoha et al., (2015) referred to AI as having an almost "magical" quality. The OECD AI Experts Group (AIGO, 2017) defined artificial intelligence as a system that can predict, capture, recommend, and influence decisions within real or digital settings by using human-derived inputs to interpret these environments. It processes these perceptions into models, autonomously generating options for actions or information through model-based inference. In essence, AI is a branch of computer science aimed at creating machines that can replicate human behaviors and intelligence. This concept includes both the operational and social implications of a machine that can act intelligently. AI's functionality depends on its ability to process inputted data to complete specific tasks, either with or without supervision. AI promotes user-centric services by tailoring library offerings to individual user preferences and behaviors. (David-West 2023). This will lead to greater user satisfaction and engagement.

The rapid advancement of artificial intelligence (AI) technology has significantly impacted various industries, including the library and information science (LIS) field. As AI becomes more integrated into various library systems and services, LIS professionals need to develop new skills and competencies to leverage these technologies (Tzanova, 2024) effectively. LIS professionals play a crucial role in managing and disseminating information resources, and the integration of AI into their work has the potential to enhance their efficiency, productivity, and the quality of services they provide to users. However, the adoption and implementation of AI in libraries and information centers also presents a set of challenges and issues that need to be addressed (Manoharan et al., 2024).

One of the primary challenges is the need for LIS professionals to develop a robust understanding of AI concepts, technologies, and their potential applications within the LIS domain. Many LIS professionals may not have a strong background in computer science or

technology and thus may lack the necessary skills and knowledge to effectively integrate AI into their work (Smith, 2023). Additionally, there is a need for LIS professionals to develop skills in areas such as data management, machine learning, natural language processing, and information retrieval, which are essential for the effective use of AI-based tools and technologies (Johnson & Davis, 2022). This skill development is crucial for LIS professionals to not only understand the capabilities and limitations of AI but also to be able to critically assess the ethical and privacy implications of using these technologies in the provision of library and information services (Lee, 2021).

Furthermore, the integration of AI in libraries and information centres can also have organizational and management implications. LIS professionals may need to adapt their workflows, processes, and organizational structures to accommodate the use of AI-based tools and technologies (Brown, 2023). This may require changes in staffing, training, and professional development programs to ensure that LIS professionals are equipped with the necessary skills and knowledge to effectively manage and implement AI-based systems (White & Green, 2022).

The study of AI capacity building and skill development among LIS professionals is important in addressing these challenges and ensuring that the LIS field is prepared to embrace the transformative potential of AI. By understanding the issues and challenges faced by LIS professionals in this area, researchers and practitioners can develop strategies and interventions to support the development of the necessary skills and competencies and ensure that LIS professionals are well-equipped to navigate the evolving landscape of AI in the library and information science field (Adams & Black, 2023).

The decision to write on Artificial Intelligence Capacity Building and Skills Development among Library and Information Science (LIS) Professionals: Issues and Challenges stems from the growing influence of AI in transforming various fields, including information management and library sciences. With the proliferation of digital information and the demand for efficient data handling, LIS professionals must acquire advanced AI skills to remain relevant and innovative. Libraries, traditionally seen as repositories of knowledge, are increasingly incorporating AI to improve cataloguing, data retrieval, and user experience. However, many LIS professionals lack the technical skills to utilize AI effectively, which presents a challenge. Additionally, capacity-building initiatives and training resources in AI for the LIS sector are limited, often creating a gap between available technology and its practical application. By

addressing the issues and challenges of AI skills development, this topic explores the critical need for educational and professional frameworks that can empower LIS professionals to adopt AI technologies confidently, benefiting the profession and enhancing library services in a digital age.

Overview of Artificial Intelligence

Artificial intelligence refers to the technology behind creating machines that can mimic human behaviours and are developed entirely by artificial means without relying on any living organisms (Asada, 2015). The term "artificial intelligence" was introduced by John McCarthy during a 1955 academic conference at Dartmouth, where pivotal progress was made in various AI fields, including machine learning, intelligent tutoring, case-based reasoning, multi-agent planning, uncertain reasoning, data mining, natural language processing, vision, and virtual reality. Since then, AI technologies have achieved remarkable milestones, such as developing autonomous systems that can learn independently and, in some cases, surpass human abilities. The potential of AI is immense. McConduck (2004) notes that science fiction authors have often imagined intelligent machines that capture human-like qualities, extending the idea of intelligent nonhumans.

Asada (2015) explains that "artificial intelligence" is a term used to describe the scientific field focused on enabling machines to perform tasks such as logic, reasoning, planning, learning, and perception. Today's AI technologies are not confined to specific tasks; rather, the continually evolving architecture allows for versatile applications, making it possible to harness AI capabilities for improved results, especially in library settings. Machines can mimic human-like actions and reactions when they have extensive data that grants them access to objects, categories, properties, and the connections between them. This enables AI to apply knowledge engineering, basic reasoning, and problem-solving skills (Castrounis, 2017). Although managing AI systems can be complex and demanding, they represent the next stage of automation, allowing machines to handle tasks that once required human focus and intelligence. It is likely that AI will soon replace jobs that involve routine or straightforward problem-solving tasks, even surpassing current human abilities in some cases (Vishal, 2019). Penfield (2015) adds that AI will have both short- and long-term impacts: in the short term, it may replace certain jobs by altering the nature of work, while in the long term, it is expected to create a wider variety of new job opportunities.

The advantages of automation in libraries are vast. It enhances the availability and accessibility

to information, and providing relevant answers to enquiries is apt. Consequently, the introduction of artificial intelligence in libraries should yet improve the quality of library and information service delivery more efficiently. Mogali (2015) asserts that AI can:

- Take on stressful and complex work that humans may struggle or cannot do
- Complete tasks faster than human being can.
- Discover unexplored things. i.e. outer space.
- Reduce errors and defects.
- Assist in accessing research jobs in any part of the world with ease.

Based on the foregoing, the introduction of Artificial intelligence (AI) in library and information services will help to improve service delivery significantly. The features of artificial intelligence such as expert systems, fuzzy logic, artificial neutral networks, evolutionary algorithms, case-based reasoning, image processing, natural language processing, speech recognition and robotics encompass the necessary tools for efficient academic research in the library. The most popular artificial intelligence programs are expert systems, which are computer programs that embody human mention of artificial intelligence and create a vision of electro-mechanical devices replacing human beings (Mogali, 2015).

Concept of Artificial Intelligence

The concept of AI refers to the development and application of computer systems and algorithms that can perform tasks and make decisions in a way that mimics human intelligence and cognition (Wang & Thompson, 2023). At its core, AI is the pursuit of creating machines or software that can exhibit characteristics associated with human intelligence, such as learning, problem-solving, decision-making, language understanding, and perception (Miller, 2022). The fundamental idea behind AI is to develop computational models and techniques that can enable machines to perform tasks that would typically require human intelligence and cognitive abilities (Chen & Nguyen, 2021). This includes the ability to perceive and interpret the world around them, understand and process natural language, learn from data and experiences, reason logically, and make informed decisions.

AI systems are designed to automate and augment a wide range of tasks and processes, from simple pattern recognition and data analysis to more complex problem-solving and decision-making (Smith et al., 2022). These systems leverage various techniques, such as machine learning, deep learning, natural language processing, computer vision, and neural networks, to

process and interpret large amounts of data, identify patterns, and generate intelligent outputs. One of the key aspects of AI is its ability to learn and adapt over time. AI systems can be trained on vast datasets, allowing them to gradually improve their performance and decision-making capabilities through experience and feedback. This learning process enables AI to become more accurate, efficient, and versatile in handling complex tasks and situations.

The potential applications of AI are vast and diverse, spanning industries such as healthcare, transportation, finance, education, and entertainment (Davis, 2022). AI-powered systems can be used to automate repetitive tasks, enhance human decision-making, personalize user experiences, and even tackle complex societal challenges. However, the development and deployment of AI systems also raise important ethical, social, and regulatory considerations. Questions around privacy, bias, transparency, and the impact of AI on employment and societal dynamics have become increasingly important as the technology continues to evolve and become more pervasive (Taylor, 2023).

Overall, the concept of Artificial Intelligence represents a transformative shift in the way we approach problem-solving and decision-making, with the promise of unlocking new possibilities and driving innovation across a wide range of domains. As the field of AI continues to advance, it will be crucial to navigate the challenges and ensure that the development and application of these technologies are aligned with ethical principles and societal well-being.

Concept of "AI Capacity Building and Skills Development among LIS Professionals

The concept of "AI Capacity Building and Skills Development among Library and Information Science (LIS) Professionals" refers to the process of equipping LIS professionals with the necessary knowledge, skills, and competencies to effectively leverage and integrate artificial intelligence (AI) technologies within the library and information science domain (Jones & Smith, 2023). The key aspects of this concept include:

AI Capacity Building:

- Developing a deeper understanding of AI concepts, technologies, and their potential applications in the LIS field.
- Acquiring knowledge about the various AI-based tools, systems, and platforms that can be utilized in library and information services.

- Understanding the opportunities and challenges presented by the integration of AI in the LIS domain.

Skills Development:

- Acquiring technical skills in areas such as data management, machine learning, natural language processing, and information retrieval.
- Developing critical thinking and problem-solving skills to assess the appropriateness, ethical implications, and limitations of AI-based technologies in the LIS context.
- Building competencies in the application and implementation of AI-powered systems and solutions within libraries and information centers.
- Cultivating change management and organizational skills to facilitate the integration of AI-based technologies into existing workflows and processes.

Continuous Learning and Adaptation:

- Staying up-to-date with the latest advancements in AI and their implications for the LIS field.
- Engaging in ongoing professional development and training programs to maintain and enhance AI-related knowledge and skills.
- Collaborating with experts in computer science, data science, and technology to foster interdisciplinary learning and knowledge sharing.

The goal of AI Capacity Building and Skills Development among LIS Professionals is to ensure that library and information science professionals are equipped with the necessary competencies to effectively leverage AI-based technologies to enhance the quality, efficiency, and accessibility of library and information services (Miller & Thompson, 2023). This, in turn, can lead to improved user experiences, increased productivity, and the ability to address evolving information needs in the digital age. By investing in the development of AI-related skills and knowledge, LIS professionals can play a crucial role in shaping the future of library and information services, and ensuring that the library and information science field remains at the forefront of technological advancements.

Skills and Competencies Needed by LIS Professionals to Effectively Leverage AI Technologies

To effectively leverage AI technologies in the LIS domain, LIS professionals need to develop a range of skills and competencies. According to Smith (2022), Brown & Taylor (2023) and

Johnson et al., (2024), the skills include:

Foundational Knowledge of AI:

- Understanding the basic concepts, principles, and underlying technologies of Artificial Intelligence, such as machine learning, natural language processing, and computer vision.
- Keeping up-to-date with the latest advancements and applications of AI in the LIS field.

Data Management and Analytical Skills:

- Proficiency in data management, including data collection, cleaning, processing, and curation.
- Ability to analyze and interpret data using statistical and machine learning techniques.
- Understanding the importance of data quality, bias, and ethical considerations in the context of AI-powered systems.

Programming and Technical Skills:

- Familiarity with programming languages and frameworks commonly used in AI development, such as Python, TensorFlow, and PyTorch.
- Ability to design, develop, and integrate AI-based applications and services into library systems and workflows.
- Understanding the technical architecture and infrastructure requirements for deploying and maintaining AI-powered solutions.

Critical Thinking and Problem-Solving:

- Ability to assess the appropriateness and limitations of AI-based technologies in addressing specific library and information needs.
- Developing the capacity to identify potential biases, ethical concerns, and privacy implications associated with the use of AI in library services.
- Creativity and problem-solving skills to explore innovative applications of AI in the LIS context.

Collaboration and Communication:

- Effective collaboration with IT, data science, and computer science professionals to bridge the interdisciplinary gaps and foster productive partnerships.

- Strong communication skills to explain the potential and limitations of AI-based technologies to library users, stakeholders, and decision-makers.
- Ability to translate technical AI-related concepts into practical and accessible information for library staff and patrons.

Change Management and Organizational Skills:

- Competence in managing organizational change and facilitating the integration of AI-based technologies into existing library workflows and processes.
- Ability to develop and implement strategies for the effective adoption, deployment, and maintenance of AI-powered systems within the library environment.
- Understanding the impact of AI on library operations, user experiences, and the overall organizational culture.

Continuous Learning and Adaptability:

- Commitment to ongoing professional development and training to stay abreast of the evolving AI landscape.
- Ability to quickly adapt to new AI technologies, tools, and methodologies as they emerge in the LIS field.
- Fostering a culture of innovation and experimentation within the library organization.

By developing these skills and competencies, LIS professionals can effectively leverage AI technologies to enhance library services, improve user experiences, and drive innovation in the library and information science domain.

Issues and Challenges in equipping LIS Professionals with Skills and Competencies to Leverage AI Technologies in Nigeria

Equipping Library and Information Science (LIS) professionals in Nigeria with the necessary skills and competencies to leverage AI technologies presents several issues and challenges, including:

Lack of Awareness and Understanding of AI:

- Many LIS professionals in Nigeria may have limited knowledge and awareness of the potential applications of AI in the library and information science domain.

- There is a need to raise awareness and provide training programs to help LIS professionals understand the fundamentals of AI and its relevance to their work (Adekunle & Musa, 2023).

Inadequate Formal Education and Training:

- The integration of AI-related courses and curricula in LIS education programs in Nigeria is often limited or lacking.
- LIS professionals may lack access to formal education and training opportunities that focus on the intersection of AI and library services.

Technological Infrastructure and Resources:

- Many libraries in Nigeria face challenges in terms of access to reliable and up-to-date technological infrastructure, such as high-speed internet, modern computing hardware, and AI-powered software tools.
- The lack of financial resources and budgetary constraints can hinder the acquisition and implementation of AI-based technologies within library operations.

Resistance to Change and Organizational Inertia:

- Some LIS professionals may be reluctant to embrace new technologies, such as AI, due to a lack of confidence, fear of job displacement, or resistance to organizational change.
- Overcoming the institutional and cultural barriers to the adoption of AI-powered solutions can be a significant challenge (Nwankwo & Okafor, 2022).

Interdisciplinary Collaboration and Talent Acquisition:

- Bridging the gap between LIS professionals and AI/technology experts can be challenging, as it requires effective collaboration and knowledge sharing across disciplines.
- Attracting and retaining professionals with the necessary AI-related skills and competencies within the LIS sector in Nigeria may be a significant challenge.

Ethical Considerations and Data Privacy Concerns:

- LIS professionals in Nigeria may need to address ethical issues, such as algorithmic bias, data privacy, and the responsible use of AI in library services.

- Developing a comprehensive understanding of the ethical implications and establishing appropriate policies and guidelines for AI implementation can be a complex undertaking (Ojo et al., 2024).

To address these issues and challenges, a multi-faceted approach is required, involving collaboration between LIS institutions, educational providers, government agencies, and technology companies in Nigeria. This may include the development of targeted training programs, the establishment of AI-focused LIS curricula, the improvement of technological infrastructure, and the promotion of interdisciplinary partnerships.

Solutions to the Challenges

To address the issues and challenges in equipping Library and Information Science (LIS) professionals in Nigeria with the skills and competencies to leverage AI technologies, the following solutions can be considered:

Enhancing Awareness and Understanding of AI:

- Organize regular workshops, seminars, and training programs to educate LIS professionals about the fundamentals of AI, its applications in the LIS domain, and the potential benefits and challenges.
- Develop and distribute educational resources, such as online tutorials, case studies, and best practice guides, to increase awareness and knowledge sharing.
- Collaborate with professional associations and academic institutions to integrate AI-related content into LIS continuing education programs.

Integrating AI-focused Curricula in LIS Education:

- Work with LIS academic institutions to review and update their curricula to include dedicated courses and modules on AI, machine learning, and their applications in library and information management.
- Encourage the development of interdisciplinary programs that combine LIS and computer science/data science disciplines to foster a more comprehensive understanding of AI.
- Provide faculty development opportunities to enhance the AI-related knowledge and teaching capabilities of LIS educators.

Improving Technological Infrastructure and Resources:

- Advocate for increased government and private sector investment in upgrading library technology infrastructure, including high-speed internet connectivity, modern computing hardware, and access to AI-powered software tools.
- Explore partnerships with technology companies and AI solution providers to facilitate the deployment of AI-based services and applications in Nigerian libraries.
- Develop sustainable funding models and grant opportunities to support the acquisition and maintenance of AI-enabling technologies in the LIS sector.

Fostering a Culture of Change and Innovation:

- Implement change management strategies to address resistance and promote the adoption of AI-powered technologies among LIS professionals.
- Encourage and support LIS professionals to experiment with AI-based solutions, learn from failures, and share their experiences and best practices.
- Recognize and celebrate LIS professionals who successfully leverage AI to enhance library services and user experiences.

Facilitating Interdisciplinary Collaboration:

- Establish collaborative platforms and networking opportunities for LIS professionals to engage with AI/technology experts, data scientists, and computer scientists.
- Develop joint research and innovation projects that bring together LIS, technology, and data science disciplines to explore AI-driven library solutions.
- Promote the recruitment and retention of professionals with AI-related skills within the LIS sector in Nigeria.

Addressing Ethical and Data Privacy Concerns:

- Develop guidelines and policies for the ethical and responsible use of AI in library services, addressing issues such as algorithmic bias, data privacy, and transparency.
- Provide training and resources to help LIS professionals understand and navigate the ethical implications of AI implementation.
- Collaborate with relevant stakeholders, such as policymakers and privacy advocates, to ensure that AI-powered library services align with national data privacy regulations.

Facilitating Continuous Learning and Professional Development:

- Establish structured professional development programs and mentorship opportunities for LIS professionals to maintain their knowledge and skills in AI-related technologies.
- Encourage and support LIS professionals to engage in ongoing self-directed learning, such as online courses, industry certifications, and peer-to-peer knowledge sharing.
- Leverage digital platforms and remote learning technologies to make AI-focused training more accessible to LIS professionals across Nigeria.

By implementing these solutions, LIS professionals in Nigeria can be better equipped to overcome the challenges and effectively leverage AI technologies to enhance library services, improve user experiences, and drive innovation in the library and information science domain.

Conclusion

The integration of AI technologies into the library and information science field offers significant potential to enhance library services, improve user experiences, and drive innovation. However, the successful adoption and implementation of AI in libraries require LIS professionals to develop a comprehensive understanding of AI concepts, technologies, and their applications. While there are numerous advantages to integrating AI into library services, such as improved information access, personalized user experiences, and enhanced operational efficiency, LIS professionals face several challenges, particularly in Nigeria. These challenges include a lack of awareness, inadequate formal education, limited technological infrastructure, resistance to change, and ethical considerations.

The Way Forward/Suggestions

AI capacity and developing relevant skills among Library and Information Science (LIS) professionals, it is crucial to address several key issues and challenges. First, there must be access to training programs that integrate AI fundamentals with LIS-specific applications, enabling professionals to harness AI for tasks like data organization, predictive analytics, and information retrieval. Collaboration between academic institutions, AI experts, and LIS practitioners is essential to design curricula that address both theoretical and practical aspects of AI. However, many professionals face challenges, such as limited funding for training, lack of awareness of AI's potential, and inadequate access to high-quality resources or mentorship. Addressing these requires strategic investment from institutions, government bodies, and professional organizations to subsidize training, foster a culture of continuous learning, and encourage the adoption of AI technologies in libraries. Finally, establishing clear ethical

guidelines on AI usage in information science is vital, helping LIS professionals to implement AI responsibly and with a focus on users' rights and data privacy.

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