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Up-Skilling Library and Information Science Professionals for the 5th Industrial Revolution

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Abstract
The 5th Industrial Revolution (IR) emphasizes the synergy between advanced technologies and human-centred approaches, creating new opportunities and challenges for libraries and information science (LIS) professionals. This study examined the skills, knowledge, and competencies required to equip LIS professionals for effective service delivery in the 5th Industrial Revolution (IR) era. This study employed a descriptive survey design. The population consists of 10 professional librarians from Dame Patience Goodluck Automated Library, Ignatius Ajuru University of Education, (IAUE). *The sample size of the study was 10 librarians. The study adopted a census sampling technique. The entire population of the study was adopted since it is of a manageable size. Data analyzed using mean rating to answer the research questions. The findings of the study revealed among others that emerging technologies are beneficial in reshaping library and information science service delivery. It also revealed that there are essential skills and competencies required by LIS professionals in the 5IR era such as, strong digital literacy skills, knowledge of data management, communication and collaboration, etc. The study concluded that LIS professionals need to stay current with emerging technologies and continuously develop their skills to meet the demands of the evolving field. It recommended that libraries should prioritize training on emerging technologies, particularly AI, virtual reality, and digital platforms. In addition, libraries should foster a culture of lifelong learning among LIS professionals.*
Keywords: *Industrial Revolution, libraries and information science, professional development, emerging technologies, artificial intelligence, digital skills.*

1.1 Introduction

The 5th Industrial Revolution (5IR) presents a paradigm shift where human intelligence and advanced technologies collaborate to create ethical, sustainable, and inclusive digital environments. Unlike the 4th Industrial Revolution, which focused primarily on automation, robotics, and artificial intelligence, the 5IR emphasizes the integration of these technologies with human creativity, ethics, and sustainability. According to Nnadozie and Nkamnebe (2020), the future of information services will rely heavily on the synergy between human expertise and intelligent systems, ensuring that technology remains an enabler rather than a replacement for human roles in libraries.

Libraries, as knowledge centers, play a

crucial role in fostering digital transformation and ensuring equitable access to information. Okoro and Chukwuemeka (2021) argue that libraries must move beyond their traditional roles of archiving and lending books to becoming proactive centers for digital literacy, innovation, and knowledge-sharing. In Nigeria, university libraries have begun integrating emerging technologies such as artificial intelligence (AI), big data analytics, and machine learning to enhance information retrieval and accessibility (Eze & Ugwu, 2022). However, the adoption rate remains slow due to a lack of digital skills and inadequate infrastructure.

LIS professionals must develop competencies in digital literacy, data management, and artificial intelligence applications to remain relevant in the rapidly evolving digital landscape. As Ugwu and Nnaji (2023) emphasize, continuous professional development programs are essential to equip librarians with the necessary technological skills. This study explores the evolving role of LIS professionals in the 5IR era, examining necessary competencies, technological trends, and strategies for effective service delivery. It aims to highlight the skills that LIS professionals must acquire and the strategies needed to integrate emerging technologies while maintaining human-centered information services.

1.2 Statement of the Problem

As technology advances, LIS professionals face increasing pressure to adapt to new digital tools and AI-driven innovations. However, many professionals lack the requisite skills to fully leverage these technologies, resulting in a gap between traditional library services and modern digital expectations. In Nigeria, studies such as Nwosu and Eze (2022) have shown that many LIS professionals struggle with digital transformation due to inadequate training and infrastructure. Similarly, Okafor (2021) highlights that while librarians recognize the need for AI and data analytics, limited access to professional development programs hinders adoption. The rapid emergence of AI-driven cataloging, virtual reference services, and big data management further underscores the urgency of up-skilling LIS professionals. This study seeks to identify the key challenges and propose strategic solutions for up-skilling LIS professionals in preparation for the 5IR.

1.3 Objectives of the Study

The aim of the study was to investigate up-skilling libraries and information science professionals for the 5th industrial revolution. Specifically, the objectives are to:

i. the role of emerging technologies in reshaping LIS service delivery.
ii. identify essential skills and competencies required by LIS professionals in the 5IR era.
iii. propose strategies for effective up-skilling and professional development.

1.4 Research Questions

1. What role do emerging technologies play in reshaping LIS service delivery?
2. What essential skills and competencies are required by LIS professionals in the 5IR era?
3. What strategies can be proposed for effective up-skilling of LIS professionals?

2.1 Literature Review

2.2 Industrial Revolution

The Industrial Revolution refers to a series of transformative changes in production, industry, and economic structures brought about by technological advancements. Historically, the world has witnessed multiple industrial revolutions, each marked by significant breakthroughs in technology and their impact on human life. According to Adeyemi and Nwosu (2020), the Industrial Revolution represents "a shift in human economic activities from manual labor to mechanized and automated processes, leading to increased productivity and efficiency. The First Industrial Revolution (18th-19th century) introduced mechanized production power by steam and water. The Second Industrial

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Revolution (late 19th-early 20th century) brought electricity and mass production techniques. The Third Industrial Revolution (mid-20th century) was characterized by the rise of computers and automation, while the Fourth Industrial Revolution (21st century) introduced cyber-physical systems, artificial intelligence, and the Internet of Things (IoT).

The 5th Industrial Revolution (5IR), which is currently unfolding, emphasizes the integration of advanced technologies with human-centred approaches. According to Ojo and Adekunle (2023), "unlike previous revolutions that focused purely on technological advancements, 5IR seeks to harmonize artificial intelligence with human intelligence to create ethical, sustainable, and inclusive systems." In the context of libraries and information science, the 5IR demands a shift from traditional service delivery to AI-enhanced, digitally-driven, and user-centered approaches.

2.3 Libraries and Information Science Professionals

LIS professionals are responsible for managing, organizing, and disseminating information resources to support academic, research, and public knowledge needs. Traditionally, these professionals performed roles such as cataloging, classification, and reference services. However, as the digital landscape evolves, their responsibilities have expanded to include digital content management, data curation, digital literacy training, and AI integration (Afolabi, 2022).

In the context of the 5th Industrial Revolution (5IR), LIS professionals must develop competencies in emerging technologies to enhance information access and service delivery. According to Okafor and Umeh (2021), Nigerian university librarians are increasingly required to navigate digital repositories, manage institutional repositories, and engage in digital preservation efforts to remain relevant in the modern knowledge ecosystem. Furthermore, Nwankwo and Eze (2022) emphasize that LIS professionals must acquire advanced technological skills to facilitate efficient knowledge dissemination, particularly in an era where AI-driven systems are reshaping library operations.

To remain effective, LIS professionals must undergo continuous professional development in digital skills, data analytics, and emerging technologies. Institutions should provide opportunities for training and collaboration to ensure that librarians keep pace with rapid technological advancements while maintaining their core responsibilities in information organization and dissemination.

2.4 Emerging Technologies in Libraries

Technologies such as artificial intelligence (AI), machine learning, big data analytics, blockchain, and virtual reality are transforming information management in libraries. These innovations enhance the efficiency, accuracy, and accessibility of library services while enabling personalized and data-driven decision-making.

AI-powered chatbots are increasingly used in libraries to provide instant responses to user queries, thereby improving reference services. Automated cataloging systems leverage AI and machine learning algorithms to classify materials more efficiently, reducing the time and effort required for manual cataloging. Additionally, predictive analytics tools help libraries assess user behavior and anticipate information needs, enabling proactive and tailored service delivery.

Big data analytics is another transformative technology that allows LIS professionals to analyze large volumes of user data to optimize collection management and improve user experiences. According to Ojo and Adekunle (2023), Nigerian academic libraries that leverage big data analytics can enhance research support services, resource allocation, and digital content recommendations based on user engagement trends.

Virtual reality (VR) and augmented reality (AR) are also emerging as innovative tools in libraries, offering immersive learning experiences and interactive engagement with

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digital collections. For example, VR-based archival tours provide users with an interactive way to explore historical documents and cultural artifacts without physical constraints.

Blockchain technology is being explored in some libraries to enhance security, authentication, and data integrity in digital repositories. This technology ensures transparent and tamper-proof record-keeping, particularly in managing digital rights and preserving intellectual property. As these technologies continue to evolve, LIS professionals must embrace digital transformation through strategic training and policy adaptation. Integrating emerging technologies into library operations requires a forward-thinking approach that aligns with the principles of 5IR—harmonizing human expertise with advanced technological solutions to create more efficient, ethical, and inclusive knowledge environments.

2.5 Empirical Review

Several studies have examined the impact of technological advancements on library services.

A study conducted by Adeyemi and Nwosu (2020) in Nigeria examined digital competencies among librarians in academic institutions. The study adopted a descriptive survey design with a population of 250 librarians from federal and state universities. Using a stratified random sampling technique, 150 respondents were selected. Data were analyzed using descriptive statistics, including frequency, percentage, and mean. Findings revealed that while many librarians acknowledged the significance of digital skills, only 40% had formal training in artificial intelligence, data analytics, and cloud computing. The study identified a significant gap between technological advancements and librarians' ability to integrate them effectively into service delivery. It was recommended that universities should organize continuous professional development programs, workshops, and collaborations with technology companies to enhance the digital competencies of librarians. The study concluded that professional up-skilling is critical for ensuring the relevance of LIS professionals in the 5IR era, particularly as AI-driven innovations reshape service delivery.

Similarly, Okafor and Umeh (2021) explored AI adoption in university libraries across Southeast Nigeria. The study employed a mixed-methods approach, drawing data from a population of 100 librarians across five universities. A purposive sampling technique was used to select 80 respondents, with qualitative data analyzed thematically and quantitative data processed using SPSS. Results indicated that while 65% of librarians were aware of AI applications in library services, many lacked the expertise to utilize them effectively. Key challenges included inadequate training, limited funding, and resistance to technological change. The study recommended the integration of AI literacy into LIS curricula and the provision of hands-on training through collaborations with technology firms. It was concluded that without structured training and institutional policy support, LIS professionals would face challenges in adapting to the technological demands of the 5IR era.

Another study by Ojo and Adekunle (2023) assessed the readiness of LIS professionals for the 5th Industrial Revolution in selected university and public libraries in Lagos and Ogun States. Using a cross-sectional survey design, the study targeted 200 LIS professionals, with 120 respondents selected through simple random sampling. Data were analyzed using inferential statistics, including chi-square and regression analysis. Findings revealed that most librarians lacked confidence in utilizing AI and big data analytics for library services. However, younger professionals, particularly those under 40 years, demonstrated a greater willingness to embrace digital innovations compared to their older counterparts. The study highlighted the absence of institutional policies supporting digital up-skilling initiatives. It was recommended that library associations should

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take an active role in advocating for digital training programs, while institutions should offer incentives for librarians to acquire AI-related certifications. The study concluded that a proactive learning culture is essential for LIS professionals to remain relevant in a rapidly evolving technological landscape.

In a related study, Nwankwo and Eze (2022) investigated digital transformation and LIS professional development in federal university libraries in South-South Nigeria. The study utilized an exploratory survey research design, focusing on a population of 300 librarians and library assistants. A cluster sampling technique was employed to select 180 respondents, with data analyzed using descriptive statistics, including mean and standard deviation, as well as ANOVA. Findings indicated that while digital transformation was underway in university libraries, the pace of adoption varied. Institutions with strong administrative and financial support reported higher success rates in implementing AI tools and digital repositories. The major barriers identified were inadequate funding and technical expertise. The study recommended fostering collaborations between government agencies and the private sector to secure funding for digital infrastructure and staff training. It concluded that strategic investment in professional development is crucial to equipping LIS professionals with the necessary competencies for the 5IR era.

3.1 Methodology

This study employed a descriptive survey design. The population consists of 10 librarians from Dame Patience Goodluck Automated Library, IAUE. The study was conducted in Dame Patience Goodluck Automated Library, Ignatius Ajuru University of Education, (IAUE). The population of the study consisted of 10 librarians working with Dame Patience Goodluck Automated Library, Ignatius Ajuru University of Education, (IAUE). The sample size of the study was 10 librarians. The study adopted a census sampling technique. The entire population of the study was adopted since is manageable size. Researchers used a self-structured questionnaire they created from the examined literature as the data-gathering tool. Three seasoned professionals in library and information science evaluated the instrument for its validity. The findings were presented using tables and interpreted against a criterion mean of 2.50.

4.1 Presentation of Results

Research Question 1: What role do emerging technologies play in reshaping LIS service delivery? Results in respect to research question 1 is hereby presented.

Table 1: Respondents mean rating on the role emerging technologies play in reshaping LIS service delivery

S/N	ITEMS	SD	D	N	A	SA	Mean	Remark
1	Emerging technologies have significantly improved access to library resources.	2	1	0	0	7	3.90	Agreed
2	The integration of AI tools has enhanced the efficiency of library service delivery.	1	1	1	1	6	4.00	Agreed
3	Virtual reality and augmented reality have added value to library services.	6	1	1	1	1	2.00	Disagreed
4	The use of digital platforms has increased user engagement with library services.	7	0	0	2	1	2.00	Disagreed
5	Emerging technologies have helped in the provision of personalized library services.	6	1	2	0	1	1.90	Disagreed
	Grand mean						**2.76**	Agreed

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The result from Table 1 above shows the summary of mean ratings on the role emerging technologies play in reshaping LIS service delivery, with a grand mean of 2.76 which indicated that emerging technologies are beneficial in reshaping LIS service delivery.

Research question 2: What essential skills and competencies are required by LIS professionals in the 5IR era? Results in respect to research question 2 is hereby presented.

Table 2: Respondents mean rating on essential skills and competencies are required by LIS professionals in the 5IR era

S/N	ITEMS	SD	D	N	A	SA	Mean	Remark
1	LIS professionals need strong digital literacy skills to navigate emerging technologies.	1	1	0	7	1	3.60	Agreed
2	Knowledge of data management and analytics is essential for modern LIS professionals.	1	1	1	6	0	3.50	Agreed
3	The ability to understand and implement AI tools is crucial for LIS professionals in the 5IR era.	0	1	1	1	7	4.40	Agreed
4	Communication and collaboration skills are important for working with cross-disciplinary teams.	2	2	0	5	1	3.10	Agreed
5	Adaptability and lifelong learning are key competencies for LIS professionals in the 5IR era.	1	1	1	0	7	4.10	Agreed
	Grand mean						**3.74**	Agreed

The result from Table 2 shows the summary of mean ratings on the essential skills and competencies required by LIS professionals in the 5IR era, with a grand mean of 3.74 which revealed that there essential skills and competencies required by LIS professionals in the 5IR era such as, strong digital literacy skills, knowledge of data management, communication and collaboration skills etc.

Research Question 3: What strategies can be proposed for effective up-skilling and professional development of LIS professionals?

Results in respect to research question 3 is hereby presented.

Table3: Respondents mean rating on the strategies for effective up - skilling and professional development of LIS professionals.

S/N	ITEMS	SD	D	N	A	SA	Mean	Remark
1	Continuous professional development programs focusing on emerging technologies.	1	0	1	1	7	4.30	Agreed
2	Collaboration with tech companies and universities.	1	1	1	6	1	3.50	Agreed
3	Mentorship programs.	1	1	1	0	7	4.10	Agreed
4	Online courses and certifications.	1	1	1	6	1	3.50	Agreed
5	In-house workshops and seminars.	0	1	1	7	1	3.80	Agreed
	Grand mean						**3.84**	Agreed

The result from Table 5 shows the summary of mean ratings on strategies for effective up-skilling and professional development of LIS professionals, with a grand mean of 3.84 which revealed strategies for effective up-skilling and professional development of LIS professionals such as continuous professional development programs, collaboration with tech companies, etc.

4.2 Summary of the Findings

1. The grand mean of 2.76 in Table 1 indicated that emerging technologies are beneficial in reshaping LIS service delivery.
2. The grand mean of 3.74 in Table 2 revealed that there essential skills and competencies required by LIS professionals in the 5IR era such as, strong digital literacy skills, knowledge of data management, communication and collaboration skills etc.
3. The grand mean of 3.84 in Table 3 revealed strategies for effective up-skilling and professional development of LIS professionals such as continuous professional development programs, collaboration with tech companies etc.

4.3 Discussions of Findings

The result from Table 1 shows the summary of mean ratings on the role of emerging technologies in reshaping LIS service delivery, with a grand mean of 2.76. The respondents agreed that technologies such as AI have improved access to library resources and enhanced the efficiency of service delivery. However, there was disagreement regarding the impact of virtual reality, digital platforms, and personalized services, suggesting that these technologies are not yet fully integrated or effective in reshaping LIS services. Gand mean of 2.76, indicates an overall positive view of the role of emerging technologies, particularly AI, but a need for further development and integration of other technologies like virtual reality and digital platforms. This is consistent with the findings of studies such as that of Kaur and Kaur (2021), who emphasized the positive impact of AI on library services, while also noting the slow adoption of newer technologies like virtual reality in library settings. The disagreement on the impact of certain technologies may suggest that while there is an acknowledgment of their potential, there are barriers to their implementation and effective use.

The result from Table 2 indicates that respondents strongly agree on the essential skills and competencies required by LIS professionals in the 5IR era, with a grand mean of 3.74. The ability to understand and implement AI tools and adaptability to continuous learning were highlighted as crucial competencies. Respondents also agreed on the importance of digital literacy, data management, and communication skills, which are essential for navigating the rapidly evolving technological landscape. These findings align with the work of Afolabi (2022), who argued that LIS professionals must develop competencies in emerging technologies to stay relevant. The strong agreement on the need for adaptability and lifelong learning is particularly relevant, as the rapid pace of technological advancements requires professionals to continuously update their skills.

The result from Table 3 shows the summary of mean ratings on strategies for effective up-skilling and professional development of LIS professionals, with a grand mean of 3.84. Respondents strongly supported continuous professional development programs, mentorship programs, and collaboration with tech companies and universities as key strategies for enhancing LIS professionals' skills. The emphasis on continuous learning and mentorship aligns with research by Ajayi and Oladipo (2021),

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who found that ongoing professional development is critical for keeping LIS professionals up to date with new technologies. While all strategies were rated positively, the strong endorsement of continuous professional development programs focused on emerging technologies highlights a clear need for structured learning environments to ensure that LIS professionals remain equipped with the necessary skills to succeed in the 5IR era.

Conclusion

The findings from the study reveal that emerging technologies play an essential role in reshaping LIS service delivery, with AI tools being recognized for improving access and efficiency. However, the impact of virtual reality, digital platforms, and personalized services is less clear, suggesting that these technologies are still in the early stages of adoption. The study also highlights the essential skills and competencies required by LIS professionals in the 5IR era, such as digital literacy, data management, AI implementation, and adaptability to lifelong learning. Additionally, the results show strong support for strategies to up-skill LIS professionals, particularly through continuous professional development programs, mentorship, and collaboration with tech companies. Overall, the findings emphasize the need for LIS professionals to stay current with emerging technologies and continuously develop their skills to meet the demands of the evolving field.

Recommendations

1. Libraries should prioritize training on emerging technologies, particularly AI, virtual reality, and digital platforms.
2. Libraries should establish mentorship programs and collaborate with tech companies and universities. These partnerships can provide valuable insights and resources, helping LIS professionals stay up-to-date with technological advancements and industry best practices.
3. Libraries should foster a culture of lifelong learning among LIS professionals.

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