



LIBRARY AND INFORMATION EDUCATION AND THE 5TH INDUSTRIAL REVOLUTION: IMPLICATIONS FOR THE LECTURERS

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Abstract

The evolution of knowledge has consistently addressed humanity's core survival needs, driven by an insatiable quest for wisdom and the development of advanced methods to achieve greater efficiency with reduced effort. This progression aligns with the transformative phases of the Industrial Revolution, particularly the Fifth Industrial Revolution (5IR), which emphasizes the fusion of human creativity with advanced technologies such as artificial intelligence (AI), robotics, and biotechnology. Unlike the Fourth Industrial Revolution (4IR), which focused on automation and data-driven solutions, 5IR prioritizes human-machine collaboration, ethical considerations, and sustainability. This study explores the implications of 5IR for Library and Information Science (LIS) education, particularly in Nigerian universities, where the integration of ICTs has already begun but requires further sophistication to meet 5IR demands. The 5IR is characterized by technologies like AI-driven cataloging, IoT-enabled resource management, blockchain for data integrity, and VR/AR for immersive learning experiences. These advancements necessitate a realignment of LIS curricula to include courses on AI, big data analytics, and cybersecurity, among others. Lecturers must undergo training to adapt to these changes, and institutions must attract and retain experts in these emerging fields. The study highlights the relevance of LIS subjects such as digital libraries, information retrieval, and cloud computing to the 5IR, emphasizing the need for interdisciplinary collaboration and ethical considerations in technological applications. By embracing these advancements, LIS education can prepare future professionals to navigate the complexities of the 5IR, ensuring that libraries evolve into dynamic, user-centric hubs of digital knowledge and innovation. The study concludes with recommendations for strengthening LIS education, including updating curricula, fostering interdisciplinary learning, and promoting lifelong learning to equip students with the skills necessary for the rapidly evolving information ecosystem of the 5IR.

Keywords: Library and Information Education, 5th Industrial Revolution, Implication, Lecture

Introduction

Knowledge evolves to address human core needs for survival through series of discipline based thoughts and ideas informed by the insatiable quest for upgrading the

frontiers of wisdom and creating advanced methods and techniques for achieving greater task with less kinetic and intellectual demand. This statement is in consonant with the transformative thoughts of the early industrial revolution (late 18th and early 19th century) which is known for its series of transformative periods in human history characterized by significant technological, economic, and social changes (Mokyr, 1990) that sparked innovations in particularly, production machines that require little human labour or intervention. Today, this thought has metamorphosed and continued to grow in phases although interconnected, each phase with its distinct requirement and goal. For instance, the third, fourth and fifth industrial revolutions share similar and selected goals.

The fifth industrial revolution (5IR) which is the focus of this study, seek to promote new phase in the evolution of industrial and technological advancements. While it remains somewhat speculative, it is generally characterized by the fusion of human creativity and advanced technologies such as artificial intelligence (AI), robotics, biotechnology, and quantum computing (Xu et al., 2021). It is distinguished from the 4th Industrial Revolution (4IR), which focused heavily on automation, connectivity, and data-driven solutions, by its emphasis on human-machine collaboration and the integration of ethical, sustainable, and social considerations into technological development (Schwab, 2016; Xu et al., 2018; Schwab, 2020).

This 5th revolution is essentially driven by Artificial Intelligence (AI) which used for AI-driven cataloging, chatbots, and personalized recommendations (Lee & Kim, 2022); Internet of Things (IoT) for Smart libraries with IoT-enabled systems for resource management (Wang et al., 2021); Blockchain for ensuring data integrity and secure transactions in digital libraries (Tapscott & Tapscott, 2018); Virtual and Augmented Reality (VR/AR) for immersive learning experiences and virtual reading rooms (Roberts, 2022) and Big Data and Analytics for leveraging data for decision-making and user engagement (Chen et al., 2021). By implication, library and information science education particularly in Nigerian universities must realign its courses to fit these requirements of the 5IR. Although most of the library and information science schools in Nigeria have adopted and domesticated ICTs in teaching and for providing training in information services and facilitation of access to information resources in academic libraries, the 5IR comes with more sophistication that demand core realignment in the courses taught in these schools. This implies that the curriculum should accommodate ICT courses that would equip students for the 5IR. The lecturers are now faced with undergoing training to upgrade their knowledge and education to meet up with the intricacies of the 5IR and the school management must provide opportunities for this, and attract, employ and retain hands with the requisite expertise. It is against this backdrop that an extensive literature is explored and analysed to reveal an understanding of the implications of 5IR for Lecturers in LIS schools.

The Concept of 5th Industrial Revolution

Industry 5.0 also known as 5IR represents the next phase of industrialization, building upon the advancements of the Fourth Industrial Revolution (Industry 4.0). This new phase emphasizes the integration of humans and advanced technologies, such as artificial intelligence (AI), the Internet of Things (IoT), big data analytics, and robotics, to enhance workplace processes and improve societal well-being (Schwab, 2017). For instance, collaborative robots (cobots) are expected to work alongside humans in a variety of sectors such as manufacturing, healthcare, and education, allowing humans to leverage their creativity and problem-solving skills in new ways. Meanwhile, biotechnologies, including



genetic engineering and personalized medicine, could lead to significant advancements in health outcomes, potentially enhancing human longevity and combating diseases more effectively (Brynjolfsson & McAfee, 2014; Schwab, 2016).

By expanding the concept of 4IR this new industrial revolution is described by the European Union as providing “a vision of industry that aims beyond efficiency and productivity as the sole goals, and reinforces the role and the contribution of industry to society.” This is a unique departure the approach of Industry 4.0, as described by the European Union (EU), since “it places the wellbeing of the worker at the centre of the production process and uses new technologies to provide prosperity beyond jobs and growth while respecting the production limits of the planet (European Commission, 2021). The EU has several policy initiatives that support the goals of Industry 5.0, one of them is the Digital Education Action Plan (2021-2027) initiative which it targeted at promoting high-quality, inclusive and accessible digital education across Europe member states by 2027 through improving connectivity, digital equipment and digital skills among educators and students. It also includes developing high-quality digital content and ethical guidelines for AI and data use in education (European Commission, 2020).

Components of the 5th Industrial Revolution

1. **Human-Centered Innovation:** The core of 5IR lies in the collaboration between humans and machines, fostering more personalized and innovative solutions. For instance, in healthcare, AI can analyze vast amounts of data to assist doctors in diagnosing diseases, while doctors bring their expertise and empathy to patient care (Murata Manufacturing, 2023).
2. **Sustainability Practices:** 5IR promotes sustainable industrial practices. Companies are increasingly adopting renewable energy sources, reducing waste through recycling and reusing materials, and designing products with longer lifespans to mitigate the environmental impact of industrial activities (Skills Portal, 2023).
3. **Advanced Robotics and AI:** Robotics and AI are central to 5IR. Robots are becoming more capable of performing complex tasks alongside humans. AI algorithms can analyze data in real-time, enabling businesses to make informed decisions quickly. For instance, predictive maintenance uses AI to foresee equipment failures, reducing downtime and maintenance costs (HGS, 2024).
4. **Proactive Market Adaptation:** Businesses equipped with 5IR technologies can anticipate market trends and customer needs. For example, AI-driven analytics can identify shifts in consumer behavior, allowing companies to adjust their strategies proactively. This adaptability ensures they remain competitive and relevant (Skills Portal, 2023).
5. **Enhancing Workforce Skills:** 5IR encourages the upskilling and reskilling of the workforce. As technology evolves, workers need to acquire new skills to collaborate effectively with advanced machines. Continuous learning programs and vocational training are essential to prepare the workforce for the future (Murata Manufacturing, 2023).
6. **Resilient Supply Chains:** The integration of IoT and blockchain technology in supply chains enhances transparency and efficiency. IoT devices provide real-time monitoring of goods, while blockchain ensures secure and traceable transactions. This combination helps create resilient supply chains that can adapt to disruptions (HGS, 2024).
7. **Ethical Considerations:** 5IR emphasizes the ethical use of technology. This includes

ensuring data privacy, preventing algorithmic biases, and addressing the ethical implications of AI and automation. Companies are encouraged to adopt ethical guidelines and frameworks to govern their use of technology (Skills Portal, 2023).

Library and Information Science Education

Library and Information Science (LIS) education has evolved over time to reflect changes in technology and information management practices. Initially rooted in traditional library science, the field expanded in the 20th century to incorporate information technology, digital archives, and knowledge management, addressing the growing complexities of managing both physical and digital information (Rosenberg, 2015).

According to Baker (2016) the roots of LIS education trace back to the late 19th and early 20th centuries when formal library schools were established to prepare professionals for the management of books and printed materials. In 1887, the first graduate program in library science was established at the University of Chicago, laying the foundation for the development of library schools across the United States (Adams, 2004). This marked the beginning of a more structured and academic approach to library education.

With the advent of the digital age, LIS education expanded to include a broader range of topics such as digital information management, data preservation, and information retrieval systems (Lynch, 2008). Today, LIS programs often include interdisciplinary studies, drawing from areas such as computer science, management, and communication to prepare graduates for roles beyond traditional libraries, including in sectors like business, health, and government (Bawden & Robinson, 2012).

Library and Information Science (LIS) programs today include a wide range of Information and Communication Technology (ICT)-related subjects to prepare students for the growing role of technology in managing, storing, and retrieving information in the 5IR. These subjects typically cover the following areas as reviewed:

1. **Information Systems and Technology:** Courses in this area focus on the design, implementation, and management of information systems within libraries and information centers. According to Bawden and Robinson (2012) topics include database management, systems analysis, and information retrieval technologies.
2. **Digital Libraries:** Students learn about the creation, management, and preservation of digital libraries, including metadata standards, digital repository systems, and digital content management (Lynch, 2008).
3. **Information Retrieval and Search Engines:** This subject covers techniques and technologies for retrieving information from large datasets and databases, including algorithms, indexing, and relevance ranking used in search engines (Rosenberg, 2015).
4. **Web Technologies:** Courses focus on the use of the web in libraries, including according to Baker (2016) website design, web programming, and the integration of web services into library systems.
5. **Data Management and Analytics:** With the growing importance of data science, courses in data management, big data analytics, and data visualization are increasingly offered to help students understand how to manage and analyze large datasets (Jadhav & Ravi, 2020).
6. **Social Media and Information Communication:** These courses focus on the use of social media for information dissemination, communication strategies, and community engagement within the library context (Bawden & Robinson, 2012).



7. **Information Security and Privacy:** This subject covers topics such as data encryption, security protocols, and privacy issues in digital environments, which are critical for protecting users' personal data and intellectual property in libraries (Lynch, 2008).
8. **Cloud Computing and Virtual Libraries:** Students are taught how cloud computing technologies are used to host and deliver library services remotely, along with concepts related to virtual libraries and digital access (Rosenberg, 2015).
9. **Software Tools for Libraries:** These courses focus on practical software tools used in library management systems, including Integrated Library Systems (ILS), content management software, and automated cataloging systems (Baker, 2016).

Relevance of LIS Information Technology Courses to the 5IR (Table 1)

LIS Subject	Relevance to 5th Industrial Revolution	References
Information Systems and Technology	The integration of AI and advanced data analytics into information systems supports the human-centric approach of the 5th IR, enabling personalized information services.	Bawden & Robinson (2012), Lynch (2008)
Digital Libraries	Digital libraries are essential for preserving and providing access to knowledge, which can be used in AI-driven knowledge discovery processes, contributing to innovation in the 5th IR.	Rosenberg (2015), Baker (2016)
Information Retrieval and Search Engines	The use of AI-driven search engines to provide more relevant and context-aware information retrieval aligns with the 5th IR's focus on intelligent data access.	Bawden & Robinson (2012), Rosenberg (2015)
Web Technologies	The development of intelligent web technologies, including web services and AI-based applications, supports collaborative human-technology interactions in the 5th IR.	Jadhav & Ravi (2020), Bawden & Robinson (2012)
Data Management and Analytics	The emphasis on big data, machine learning, and predictive analytics in data management aligns with the automation and decision-making capabilities of the 5th IR.	Jadhav & Ravi (2020), Lynch (2008)
Social Media and Information Communication	AI-powered social media platforms and communication tools are crucial for facilitating knowledge sharing, collaboration, and engagement in the 5th IR's evolving landscape.	Bawden & Robinson (2012)
Information Security and Privacy	The increasing use of AI and advanced cybersecurity technologies ensures secure data handling and privacy, which is critical for the digital economy of the 5th IR.	Lynch (2008), Rosenberg (2015)
Cloud Computing and Virtual Libraries	Cloud computing and virtual libraries enable scalable, AI-enhanced access to information and support remote collaboration, central to the decentralized nature of the 5th IR.	Baker (2016), Lynch (2008)
Software Tools for Libraries	AI-driven library software tools allow for the automation of cataloging, recommendation systems, and resource management, enhancing the user experience in the context of the 5th IR.	Rosenberg (2015), Bawden & Robinson (2012)

Table 1 highlights the relevance of various subjects taught in Library and Information Science (LIS) schools in relation to the Fifth Industrial Revolution (5th IR), which is characterized by the integration of advanced technologies such as artificial intelligence (AI), machine learning, cloud computing, and robotics, while emphasizing human-centric development. The table suggests that LIS education is evolving to align with these technological advancements, preparing future professionals to effectively manage and deliver information in an increasingly complex digital world. Below is a discussion of the subjects and their implications in the context of the 5th IR.

The integration of Artificial Intelligence (AI) and advanced data analytics into library and information systems is pivotal to the Fifth Industrial Revolution (5IR), transforming traditional library services into intelligent, adaptive platforms. AI enables personalized, efficient, and context-aware information retrieval, enhancing user experiences and operational workflows (Emerald, 2024). AI-driven systems facilitate automation in cataloging, indexing, and classification, allowing librarians to focus on strategic roles such as information curation and knowledge management (EJournals, 2024).

Digital libraries, central to the 5IR, leverage AI for improved management and retrieval of digital content, supporting innovative research and learning methodologies. As more libraries transition to digital formats, LIS schools must train professionals in managing digital repositories and ensuring metadata accessibility for both human and AI systems (EJournals, 2024). The evolution of AI-powered search engines also enables highly personalized, context-aware search results, transforming how users access and utilize information. This requires LIS professionals to develop competencies in managing AI systems while being aware of algorithmic bias and ethical implications (Restack, 2025; Internet Search Inc., 2025).

Web technologies are integral to the 5IR, with libraries increasingly relying on AI-powered applications to offer digital catalogs and virtual reference services (GoodFirms, 2024). Consequently, librarians must be skilled in web development and AI integration to support seamless access and user engagement. The exponential growth of data further emphasizes the need for sophisticated tools and analytical skills to manage and interpret complex datasets. LIS programs must include training in data science, including big data management and predictive analytics, to prepare students for cross-disciplinary collaboration (UNL, 2020).

Social media platforms powered by AI are reshaping global communication and knowledge dissemination. Libraries now use social media for community engagement, requiring LIS professionals to understand its ethical use and potential for information sharing (LIS Edunetwork, 2024). With increasing digitalization, privacy and information security have become crucial. Libraries must adopt cybersecurity technologies to safeguard data, and LIS curricula must emphasize security practices (NIST, 2024).

Cloud computing plays a foundational role by enabling scalable access to digital resources. Librarians need to manage virtual libraries effectively while ensuring service continuity and data protection (LIS Edunetwork, 2024). AI-based library management tools further enhance operations by automating resource recommendations and improving user experience, making it essential for LIS schools to train students in intelligent system design and implementation (Restack, 2025).

Conclusion

The integration of AI, cloud computing, big data, and other advanced technologies



into library and information science education offers significant potential to transform the field. As a result, LIS education must adapt to equip students with the skills necessary to navigate this new technological landscape. By focusing on these emerging technologies, LIS programs can ensure their graduates are well-prepared for the challenges and opportunities presented by the 5th Industrial Revolution. This shift will likely lead to a more dynamic, innovative, and user-centric future for libraries, where technology and human intelligence work together to improve information access and management on a global scale. LIS educators have significant prospects in the 5th Industrial Revolution. They will need to embrace technological advancements, focus on data literacy and ethics, adopt digital learning models, promote interdisciplinary collaboration, and foster lifelong learning. By doing so, they will equip future librarians with the necessary skills to thrive in the rapidly evolving information ecosystem. These transformations in LIS education will not only respond to emerging challenges but will also prepare future professionals to innovate within the field.

Way-forward

The following contributions would go a long way in strengthening Library and Information Science (LIS) educators in preparing students for the fifth Industrial Revolution (5IR):

1. The 5IR is pushing the integration of AI, big data, and automation into library services. LIS educators are expected to embrace and teach these technologies to ensure that future librarians are equipped to handle them. AI can assist in automating repetitive tasks like cataloging or information retrieval, and LIS educators need to prepare students to work with these tools in practice and in research contexts
2. LIS educators would need to update curricula and teaching methods to incorporate AI and big data and ensure students develop relevant skills such as data analytics, AI-assisted search, and digital archiving.
3. In the 5IR, LIS educators must focus more on data literacy, including teaching students how to collect, analyze, interpret, and store data responsibly.
4. LIS educators would need to integrate ethical considerations into their curricula and ensure students are prepared to navigate the complex landscape of information privacy, algorithmic biases, and responsible AI.
5. In the context of the 5IR, LIS educators are likely to continue embracing and refining online and blended teaching models. With students worldwide requiring flexible learning options, educators must be skilled in using digital platforms and tools to teach effectively, create interactive content, and support collaborative online learning environments.
6. The shift towards hybrid and digital learning will encourage LIS educators to further refine pedagogical strategies that are adaptable, accessible, and effective in a global context, making the discipline more inclusive.
7. The 5IR would require LIS professionals to collaborate with other sectors like technology, healthcare, and government to manage vast amounts of data. LIS educators need to prepare students for interdisciplinary work. Collaboration with computer science, engineering, and other fields will be essential for developing integrated systems, digital libraries, and collaborative tools for managing large-scale information networks
8. LIS educators would increasingly need to foster interdisciplinary learning environments where students can work alongside professionals from other fields, enabling them to understand and contribute to cross-sector initiatives.

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