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INDUSTRIAL REVOLUTIONS AND TECHNOLOGICAL TRENDS IN LIBRARIANSHIP: IMPLICATIONS FOR LIS CURRICULUM REVISITATION FOR GRADUATE EMPLOYABILITY IN NIGERIA

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ABSTRACT

This paper explores the intersection of industrial revolutions and technological trends in the librarianship field, examining its reflective impact on information environments. As libraries adapt to the digital age, the necessity to re-visit library and information science (LIS) curriculum becomes apparent for improved outcomes. The paper therefore, reviews related literature on industrial revolutions and evolving technologies considering its impact on librarianship, and the implication for LIS curriculum development and graduate employability in Nigeria. The analysis encompasses recommendations for curriculum re-visitation due to disruptive technologies. Emphasis is strongly placed on the integration of courses that focus on developing proficiency in emerging technologies, training of LIS graduates on technological skills, digital literacy, and the promotion of interdisciplinary learning experiences by encouraging collaboration with computer science, engineering and business departments, to provide students with a holistic understanding of technological role in information science. The incorporation of innovative technologies in LIS curriculum, especially those that dwell more on innovation, to encourage students to explore and implement creative solutions to challenges in library and information science, is also discussed.

Keywords: Industrial revolutions, Technological trends, Librarianship, Employability, LIS curriculum

Introduction

The industrial revolutions predominated by technological trends is currently having a massive impact on all professions including librarianship. It is occurring and changing economic systems and social structures of the world with increase in the rate of innovation, work related issues, businesses and employment status of people.

Many occupations are progressively becoming knowledge-centric, with a transition from low-skilled to high-skilled labor. Productivity and employment expansion are contingent upon the conditions facilitating the economy-wide dissemination of innovative products and processes, driven by industrial revolutions and technological advancements. Historical Industrial Revolutions have compelled society to navigate significant and often arduous adaptation processes, transitioning from predominantly rural agricultural communities to urban industrial societies, and subsequently to post-industrial societies grappling with the decline of traditional industries and employment sources.

The societal consequences of Industrial Revolutions are expected to be extensive, leading to both social and economic ramifications from the displacement of numerous existing jobs, as well as profound and increasingly unstable transformations in the nature of work and future employment, along with alterations in the delivery of public and private services. This study therefore investigates through literature review, industrial revolutions and technological trends in Librarianship and its implication for Library and Information Science (LIS) curriculum development and graduate employability in Nigeria.

This paper is significant, firstly, because existing innovative technologies indicate a pressing need to revisit current LIS curriculum for improved students learning outcomes. The intention is to potentially capture technological drifts and skills that could make LIS graduates employable in the industrial era. This research could present a robust impetus towards improving library and information science curriculum in Nigeria. Second, it will assist in reducing the disparity between employers' and graduates' employability perspectives. This disparity is seen as one of the primary obstacles that firms face when trying to recruit qualified graduates in the field of LIS, as employers look for graduates that possess requisite skills and competencies of the industrial era.

Industrial Revolution Perspectives and Influences

The Industrial Revolution (IR) marks the transition from pre-industrial societies to industrialized ones, shifting primary manufacturing from human labor to machine power. The first Industrial Revolution in the 18th century mechanised production using steam and water power. The second IR, in the late 19th century, saw the rise of mass production, expanding cities, and the widespread use of electrical technologies, which enabled more sophisticated machinery (Freeman, 2018). The third IR, beginning around 1969, also called the digital revolution or IR 3.0, introduced computers, electronics (microchips, transistors, processors), and digital communications technologies, fundamentally transforming communication and business practices (Humayun, 2021).

The Fourth IR (IR 4.0) introduced advanced digital technologies, including artificial intelligence (AI), robotics, the Internet of Things (IoT), cloud computing, big data, and 3D printing, enabling greater automation and connectivity (Satpathy, Dash, & Mohapatra, 2020; Prajapati, Arno, Dowling, & Moylan, 2019; Hassan, Aman, & Latiff, 2019). The fifth Industrial Revolution (IR 5.0) emphasizes collaboration between humans and machines to improve productivity and efficiency. Across all these phases, technological innovation has been the central driver, influencing social and economic structures and reshaping professions, including librarianship (Lukita, Suwandi, Harahan, Rahardja, & Nas, 2020).

Emerging Technologies and their Integration in Libraries

Radio Frequency Identification: RFID is a wireless technology used for security and resource management in libraries (Sungkur, Ozeer, & Nagowah, 2021). It helps track and safeguard library materials, preventing theft and misplacement (Nisha, 2018), making it particularly useful in Nigerian academic libraries. Several studies have also highlighted the increasing adoption of advanced technologies such as RFID and cloud-based platforms in Nigerian academic libraries. RFID is steadily transforming routine library operations by automating circulation, speeding up inventory processes, and enhancing security. Omoadoni (2019) notes that RFID has significantly improved book tracking, cataloguing efficiency, and theft detection, while Abdulsalam and Dawha (2024) report that Nigerian university libraries implementing RFID experience faster service delivery and reduced staff workload.

Artificial Intelligence: AI is an area of computer science that focuses on the creation of intelligent machines that work and react more like humans. UK Government (2022) defines AI as machines that perform tasks normally requiring human intelligence, especially when the machines learn from data how to do those tasks. AI is the ability of a computer system to solve problems and perform tasks that would otherwise require human intelligence (US National Security Commission on AI, 2021). Andrews and Ward (2022) and Gujral, Shivarama, and Choukimath (2019) asserted that in libraries, AI supports data curation, digital preservation, collection management, cataloguing, and personalized user services.

Machine Learning: According to Clifford (2019), ML is a branch of AI that trains software to identify patterns and take appropriate action based on those patterns using collections of examples. It is a branch of AI, allows systems to learn from data and identify patterns without explicit programmeming (Clifford, 2019; Al-Mushayt, 2019). Applications in libraries include chatbots, predictive analytics, text and image recognition, and enhancing recommendation systems (Jesubukade, 2022; World Customs organisation/World Trade organisation, 2022).

Chatbots: These are AI-powered virtual assistants that simulate human conversation via text or voice (Jesubukade, 2022). They provide automated support for queries, reference services, and user guidance, complementing, but not replacing, human librarians (Hopkins & Maccabee, 2018; Mckie & Narayan, 2019; Karimova & Shirkhanbeik, 2019).

Robotics: A robot is an automated machine that is programmemed to carry out specific tasks. Robots are often configured to be used to complete particular activities with or without human assistance. This might entail the use of robots, such as the automated arm that can remove books from libraries, to extract them off shelves (McCaffrey, 2021). Robotics immediately affects libraries, as well as the greater informational (and social) environment in which libraries and librarians of all kinds operate (Owolabi, Okorie, Yemi-Peters, Oyetola, Bello, & Oladokun, 2022). Library activities involve plenty of manual work, which can be partially or fully done effectively with the help of robots. Technology has advanced libraries in many ways; robots are being used instead of humans in various library operations, especially those tasks which are hazardous and time-consuming (Jesubukade, 2022).

Robotics are now being used in most international libraries such as New York Public Libraries, Temasak Polytechnic Library, UMKC Library, University of Chicago Library, and Shanghai Library (Vysakh, & Babu, 2019); but in Nigeria, adoption has been uneven. While some universities have managed to adopt a few of these technologies, others have not. For instance, Owolabi, Okorie, Yemi-Peters, Oyetola, Bello, and Oladokun (2022) found that academic librarians in Nigerian university libraries are not yet fully ready to adopt robotic technologies. Robotics are currently utilised in library operations. Harisanty *et al.* (2020) affirm that some areas where robotic technologies have been integrated into library operations include shelving and finding library materials, security, inquiries and responding to repetitive reference and directional queries, outreach and public relation via library tours, and even information literacy training.

Big Data: Big data refers to large, complex datasets that can be analysed to improve decision-making, user services, and collection management in libraries (Fakiragouda, 2022; Bell, 2019). Libraries use big data tools to study user behavior, optimize resources, and enhance service delivery.

Blockchain Technology: Blockchain is a secure, decentralized ledger system originally developed for cryptocurrency (Nakamoto, 2008). In libraries, it can manage digital assets, track intellectual property rights, support resource sharing, and enhance metadata systems (World Customs organisation/World Trade Organisation, 2022).

Cloud Computing: Cloud computing provides remote access to computing resources, storage, and services, enabling libraries to host repositories, websites, and applications efficiently and cost-effectively (Alismaili *et al*., 2020; Borodako, Berbeka, & Rudnicki, 2021).

Mobile Technologies and Social Media: Smartphones, tablets, and social media platforms have transformed library user engagement. Libraries develop mobile-friendly applications and use social media for outreach, community engagement, and information sharing.

Drones: Drones, or unmanned aerial vehicles (UAVs), are increasingly used for book delivery and logistics in libraries, as seen in Dubai Libraries, New York Public Library, and Florida Library (Rouse, 2018).

Internet of Things: IoT is a network of physical objects ("things") that are embedded with sensors, software, and other technologies that enable them to collect, exchange, and act on data over the Internet. These "things" can be anything from everyday household devices (like smart fridges or thermostats) to industrial machines, wearable devices, or library equipment. IoTs are now increasingly used in libraries for inventory management, tracking book usage, environmental monitoring, and security, greatly enhancing operational efficiency and user experience (Asim & Arif, 2023; Pamungkas, Sofiyani, Hamidon, Arifin & Abu Bakar, 2025). IoT-enabled systems also raise data privacy concerns that libraries must address through careful design and policy (Bal Ram, Kumar & Pal, 2023).

LIS Graduate Employability in Technological Era

The technological transformations brought about by industrial revolutions have disrupted traditional occupations and created new, technological driven roles. The demand for digital skills continues to rise, while routine jobs become automated. Without re-skilling and up-skilling, graduates may face unemployment. Unemployment in Nigeria remains a concern, as highlighted by the National Bureau of Statistics (2019), and may worsen if LIS graduates lack the skills required for the evolving job market. Experts predict that one-third of current jobs will disappear due to technological automation, while millions of new technology-driven roles will emerge (Brougham & Haar, 2017). LIS graduates must therefore acquire competencies aligned with digital and automated information environments. Universities must adopt instructional methods that integrate advanced technologies to prepare students for the shifting job landscape (Wang *et al.,* 2023). Librarianship as a career in the industrial age, need to respond rapidly to these emergent disruptions and transformations brought about by industrial revolutions and also adjust to its dynamic demands that requires re-skilling, up-skilling for graduate employability.

Implication of Technology Drifts to LIS Curriculum Development in Nigeria

Graduate employability is increasingly tied to the relevance of curriculum content. Most LIS departments offer regular courses, while few are providing LIS education through distant learning mode (Abubakar, 2022) In Nigeria, LIS education is offered under various faculties and through multiple degree programmes (Abubakar, 2016; 2022). However, most departments of LIS in Nigeria have continued to lay more emphasis on the teaching of traditional subjects that are basically engulfed in collection development, organisation of knowledge and knowledge management, serials and serials management, reference services, preservation of information resources, information literacy while giving limited attention to cutting-edge technologies. To address the growing gap between industry expectations and graduate competencies, LIS curriculum must integrate:

a. AI, ML, robotics, IoT, big data analytics, blockchain, 3D printing, drones, and augmented reality;
b. practical digital literacy and automation skills;
c. programming and data science basics;
d. digital ethics and cyber-security; and
e. innovation and entrepreneurship.

LIS curriculum in Nigeria must align with global standards and practices to ensure that after graduation, students will be able to face global competitiveness in the job market. global standards and professional benchmarks, ensuring graduates remain competitive in the international job market. According to Peters (2017), choosing a curriculum that will fit into the 4th IR should be a key concern of every library school. The National Universities Commission (NUC, 2023) has taken steps to modernise higher education through the transition from BMAS to CCMAS, emphasising 21st Century skills. LIS education must be re-engineered to reflect evolving knowledge societies, adapt to industrial revolutions, and prepare graduates for technologically advanced information environments (Mole *et al*., 2017). This calls for a curriculum that is flexible, dynamic, and continuously updated.

Conclusion

Industrial revolutions and technological advancements continue to transform librarianship, emphasizing the need for adaptability, innovation, and digital competency. For LIS graduates to thrive, curriculum development must prioritise technological fluency, ethical awareness, soft skills, and global relevance. Revisiting the LIS curriculum in Nigeria is therefore a strategic investment in strengthening graduate employability and ensuring that library professionals can lead in an increasingly digital world.

Recommendations

1. LIS schools should integrate technology-focused courses such as user experience design into their curriculum to equip students with practical digital skills needed in modern libraries.
2. Lecturers should collaborate with industry and technological experts through seminars and guest lectures to ensure students gain relevant, employable skills aligned with real-world demands.
3. Interdisciplinary learning should be promoted by encouraging collaboration with departments such as computer science, engineering, and business to broaden students' technological understanding.
4. Regular conferences and workshops on digital literacy should be organised to help students stay updated on technological advancements and maintain a culture of continuous learning.
5. Innovation-focused coursework should be incorporated into the curriculum to encourage students to develop creative solutions to challenges in library and information science.

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