

REVIEW

Artificial intelligence and robotics: Skills and strategies for library and information professionals in the 4IR

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Introduction

No doubt the recent transition to the fourth industrial revolution characterized by the digital economy and the concept of 21st century trends has adversely affected so many professions and their practices. The affected professions includes Library and Information Science and their practices just like other disciplines so much so that all fields of academic disciplines now transcend from the old analogue, myopic and theory based-strict-adherence practices to embrace the new trends of the fourth industrial revolutions and even working towards conceptualizing the prospects of the fourth industrial revolution into their individual professions. This has informed the opinion of the authors on exploring the prospects of the fourth industrial revolution before contemplating the application of the prospects into Library and Information Science practices in Nigeria particularly reviewing the evolving concept of the use of artificial intelligence and robotics in the library and information science practices and the skills and strategies in the profession.

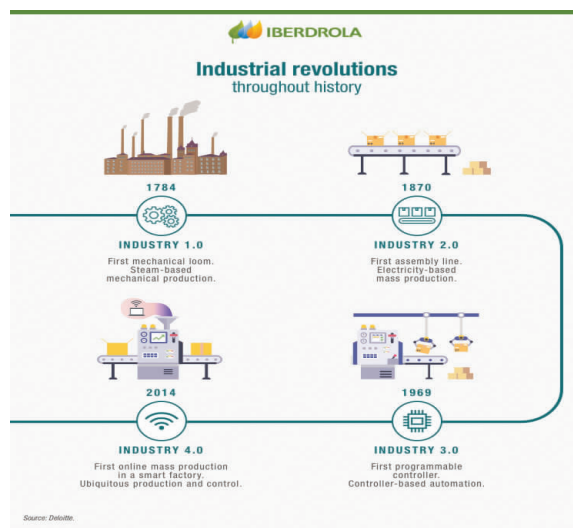
The fourth industrial revolution (4IR) is a developing concept usually used by scholars to describe the blurring of the unlimited boundaries between the physical, biological worlds and digital economy characterized by the fusion of hybrid advances in robotic engineering solutions, artificial intelligence (AI), the Internet of Things (IoT), genetic engineering solutions, Geo-spatial engineering, 3D Printing Solutions (3DPS), quantum computing and other emerging technologies in the 21st Century. Statistically, Africa as a whole has the speculations with reliable indications that we are yet to fully embrace the trends of the 21st century advances, let alone the utilizing the potentials of the 4IR in Nigeria. That notwithstanding, outside the professional disciplines, the 4IR has potentials of modernizing agricultural and agro-industries, increasing financial services and investment, reinventing labor, skills, and production, fighting poverty and inequality, encouraging economic growth and structural transformation, improving health care and human capital in any economy (Ndung'u & Signe, 2020).

Just like all businesses have the ability to redesign her products to operate and function online, as well people can operate financial services online while government is also migrating to online platforms to conveniently render public services to the citizenry, all professional bodies including Library and Information Science can leverage on the potentials of the fourth

industrial revolution to remain and retain relevance in the academic and labor market sectors by using artificial intelligence and robotics. Although doing this requires learning a whole lot of skills and strategies by the library professionals. Library and Information Science professionals and practices have so many areas including teaching and learning and services delivery in different categories of libraries and other information practicing jobs librarians could engage in which the 4IR has ushered the world into especially in the area under review; artificial intelligence and robotics. It is therefore these prospects of the fourth industrial revolution in the library and information science profession that this present discussion is focused on, as a way to solving major problems facing the profession in the world and in Nigeria in particular. Before doing this, the discussion is structured in such a way that the prospects of the fourth industrial revolution would generally be reviewed before contemplating the application of the prospects into Library and Information Science practices in Nigeria as a panacea for LIS professional practices.

Fourth Industrial Revolution: General Review

For a proper understanding, first industrial revolution between the end of 18th century in 1784 was characterized with 'water and steam power to mechanize production'; the second was between 1870 and was 'the concept of electric power to create mass production' while the third between 1969 used 'electronics and information technology to automate production' processes. Moving from these stages of revolution between 2014, the fourth industrial revolution introduced into the lives of the world the unlimited boundaries between the physical, biological worlds and digital economy characterized by the fusion of hybrid advances in robotic engineering solutions, artificial intelligence (AI), the Internet of Things (IoT), genetic engineering solutions, Geo-spatial engineering, 3D Printing Solutions (3DPS), quantum computing and other emerging technologies in the 21st Century. The difference between the later and the former revolutions is that today's fourth industrial revolution has no historical precedent. It is quite different from the former and cannot be compared with the formers.



*<https://www.iberdrola.com/innovation/fourth-industrial-revolution>

Figure1

Schwab (2016) confirms the advances of the fourth industrial revolution as states that "we stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another". He went on to summarize the highpoint when he says "in its scale, scope, and complexity, the transformation will be unlike anything humankind has experience before". The fear of these prospects of the fourth industrial revolution is accumulating from the views of some scholars that "we do not know just how it will unfold, but one thing is clear: the response to it must be integrated and comprehensive, involving all stakeholders of the global polity, from the public and private sectors to academia and civil society".

The fourth industrial revolution has brought drastic growth on artificial intelligence in that self-driving cars, drones, virtual libraries and assistants are all around us. The issues of Big Data, digital fabrication technologies, synthetic biology, new human and material software and applications, and additive computing engineering has exponential increase in peoples' lives. On the prospects, one can summarize to say that there are four main areas the 4IR was be effective so much so that product and service enhancement, organizational structures, consumer expectations, and collaborative technologies. The mode of producing, delivery and providing services to the globe would change, human interface may be completely out of the scene, while organizational structures may also be redesign to invest on artificial intelligence, ICT experts other than knowledge managers increasing. The area of collaborative innovation would be highly felt such that the barriers of distance, physical travelling and meeting may become a thing of the past. The fourth industrial revolution has brought into the globe different software and application such as Hangouts, Eventbrite, Zoom, FaceBook Live Streams and other applications like Canvas Skype etc for people to attend conferences and participate live on the spot of the event. The fourth industrial revolution has also ushered in some technologies that can represent and act like a person including voice and actions for a virtual participant.

Finally, the fourth industrial revolution has exponential advantages like greater safety for humans by reducing dangers in the physical work environment, increased productivity in all sectors, efficiency in quality of service delivery, enhanced decision making based on data-analysis, among others. All these are not to say that the resultant effects are over looked such that the burgeoning cyber crimes, dizzying speed of change and the need to adapt, lack of expertise, high dependency on technology solving devices and other effects of digital gaps should not be considered.

Technologies of the Fourth Industrial Revolution

The fourth Industrial Revolution has ushered into the globe innovations and advances in technology beyond what is known as hybrid technologies. There are different concepts or terms to proscribe these arrays of technologies as some which are discussed below;

Artificial Intelligence

This is usually a concept to describe digital technologies designed to work like humans.



Figure 2

Internet of Things

A set of network architecture designed to aid communication and productivity. Today the network has made the world a global village in that people can communicate easily, shop, demand and pay for goods and services from the comfort of their zones. Producers advertise their products online and meet with their customers via the Internet enabled platforms.

Robots

Robotics is constantly evolving designed to interact physically with humans. Robotics is the branch of technology that deals with the design, construction, operation, and application of robots. These robots perform human operations with a figured structure. Especially, one can say is a machine capable of carrying out a complex series of actions automatically, which is programmable by a computer, resembling a human being and able to replicate certain human movements and functions automatically (Oxford Dictionaries).

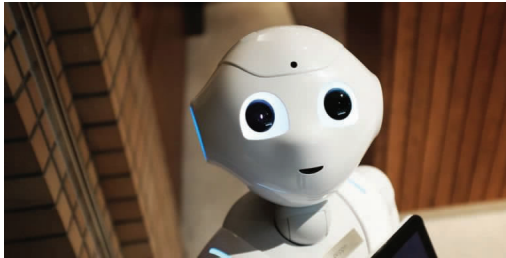


Figure 3

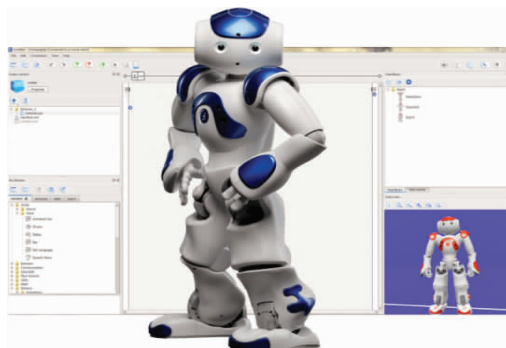


Figure 4

Augmented and Virtual Technologies

The fourth industrial revolution brought virtual solutions to the economy. Today people can sit in the comfort of their zone to access a whole range of resources, borrow, buy and return items in the information industry.

Big Data

The saying that 'Information is power' is on the increase in the fourth industrial revolution. Today the emergence or transition into the fourth industrial revolution has generated a lot of data for analysis and decision making. Many organizations do no longer to worry about data to make effective decisions. In the cloud are billions of data available for organization to import and analyze based on what is relevant to their organization.

3D and 4D Printing Solutions

Mechanized printing of information materials are rapidly facing off. The commercialization of digital content, the bogging, websites and database sites have changed the nature of printing. Not only in that dimension, digital technologies used for printing has repositioned the quality of images, background changing applications and Photoshop applications produces images like heaven on earth.

Fourth Industrial Revolution and LIS Professional Practices

Library and Information Science Professionals are qualified, licensed and practicing degree holders of Library and Information Science and other related research disciplines like Library Science, Information Science or Studies, Archives and Records Management, Knowledge Management, Publishing and Printing, and Digital Curators etc. The 4IR is believed to be wholly dependent on four specific technological advancements in any profession which are High-speed mobile Internet, Cloud Computing, Big Data Analytics and Artificial Intelligence.

A report by Mckinsey Global Institute reports that about one-fifth of the global workforce will be impacted by the adoption of Artificial Intelligence and Automation, with the most significant impact in developed countries like the United Kingdom, the United States and the German by 2022. He went on to predict that by 2022, 50% of the industries believe that automation will decrease their numbers of full-time staff and by 2030, robots will completely replace about 800 million workers across the world (Mckinsey, 2020).

What are the faiths of the Library and Information Science Professionals in the field at this time in question? Would the prospects of the Fourth Industrial Revolution push them off their job or would they remain relevant in the information industry since 'information is power?'

The position of this paper is in a contemplating mood on what would be the faith of this profession. Despite the depressing views of such prospects of the Fourth Industrial Revolution, it may also simply represent a change within the mindset that the workforce of Library and Information Science with the right skills would take the beneficial roles of the revolution. This is because; the World Economic Forum reports that 38% of the business believes Artificial Intelligence and automation technology will allow employees to carry-out new productivity-enhancing jobs while over 26% of companies think automation will result in the emergence of new roles (World Economic Forum, 2018).

Library and Information Science professionals should start rethinking over new roles and responsibilities, like remote workers due to new technologies and changing demands from

the library services and delivery. The practitioners may start looking into redesigning the Library and Information Science profession to become more of virtual, digital contents, online publishing, and ceasing free access to information by restricting access through library portals for only registered users.

Applications of Fourth Industrial Technologies in the Library Profession

Adeyinka (2020) identifies four types of robotics currently used in the libraries. These are

- i. Shelf reading robots
- ii. Telepresence robots
- iii. Humanoid robots
- iv. Chatbots

In the fourth industrial revolution, artificial intelligence and robots are used in the library and information science profession to automatically control, reprogrammable, multi-purpose manipulator programmable to function as librarians in the library or information centers in three or more axes, which may be either fixed in place or mobile for use in automation applications. In the library work and services, robots can be scrambling, flying, rolling or climbing as well as walking, talking and giving direction of books or other information materials. When books are coded with bar codes, robots are capable of shelf reading books and locating such materials easily than human by scanning them or contactless configurations. Robots in the library figures out how to locate materials and identifies which materials are not in the shelf and directs users to whereabouts in the library. Robots in the fourth industrial revolution would change the way people look information, at the expense of librarians just as the consumer search engines have already gone way to replicate the traditional role of librarians in helping to locate information materials.

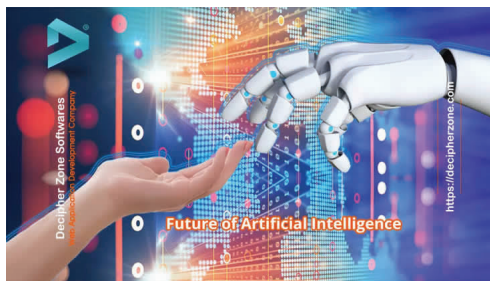


Figure 5



Figure 6

The above shows how robots can replace humans in any organization to perform job hitherto done by humans

Summary

This chapter summarizes by recommending that in the fourth industrial revolution, so many things are rapidly changing the way things are done. The paper has reviewed the current situation and how different professions would be affected by the prospects of the fourth industrial revolution. It is based on this exploits that the paper recommends the following to the Library and information Science profession in line with these technologies reviewed;

- i. The training institutions should redesign the curriculum to fit the trainees into practical knowledge of the prospects of the 4IR such artificial intelligence and robotics.
- ii. Practicing professionals should reconsider further training through staff development programmes on modern technologies for the LIS practices
- iii. Library management should consider effective services delivery by adopting the prospects of 4IR in order to make the library institution relevant going forward

Conclusion

This paper has discussed in details the concept of artificial intelligence and robotics as well as other technologies for the library profession in the fourth industrial revolution by trying to conceptualize the terms like Fourth Industrial Revolution, LIS Professional Practices, Prospects, 21st Century, Nigeria in an analytical review. This was done by contemplating how the prospects of 4IR would make Library and Information Science and professional practices instead of continuing manual service delivery for the profession to remains more relevant in the globe. The position of the paper remains that librarians in Nigeria should realign their professional practices in line with the prospects of the industrial revolution by accepting and adopting the skills and strategies which artificial intelligence and robotics can offer to the library profession while the curriculum of the trainee librarians should be redesigned to fit into the use artificial intelligence, Internet of Things, Big Data, Robotics, 4D printing, automation and virtual library in the library and information science practices.

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