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ARTIFICIAL INTELLIGENCE (AI) AND THE FUTURE OF LIBRARY AND INFORMATION CENTRES (LICs) IN THE 21ST CENTURY

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Abstract
This paper explores the impact of Artificial Intelligence (AI) on the future of Library and Information Centres (LICs). It examines current discussions among information professionals regarding the implications of incorporating intelligent automation into LICs, including how AI can be used to improve the performance and services offered by LICs. Related literatures were extensively reviewed through an exploratory approach which led to thorough explanation of concepts associated with the theme such as Artificial Intelligence, Library and information Centre in the 21st century; AI in the LIC context is accompanied by many challenges such as, replace human operations, potentially reducing job opportunities in the library sector among others. There is a need for greater understanding of how using AI impacts user privacy, data security and the ethical considerations on how AI systems are designed. This paper provides an overview of the advances in AI technology and its potential implications for LICs. It will explore how AI can potentially enhance access to existing library resources and create new ones. Furthermore, this paper discussed the potential challenges faced by LICs as they look forward in adopting AI and how human element can be incorporated into an AI-driven library system. The impact of Artificial Intelligence (AI) on Library and Information Centre (LIC) is a pressing issue which has the potential to transform how users' access and construct knowledge. AI has the potential to revolutionize the LIC sector with its ability to create more efficient library services and new types of library resource. ***Originality/Value:*** *this column is the original from the authors and does not reflect on any copyright materials. This paper concluded that, the potential challenges associated*

with the adoption of AI need to be addressed. The human element still has a role to play in an AI-driven library system, and the need to strike a balance between digital and physical library resources is of paramount importance.
Keywords: *Artificial Intelligence, Library, Information Centre*

Introduction

Artificial intelligence (AI) has augmented human activities and unlocked opportunities in many sectors of the economy. It is used for data management and analysis, decision-making, and many other aspects. The rapid development of AI and its widespread implementation poses new challenges to government and public structures and to international organizations. Artificial intelligence applications are now visibly present in almost every aspect of human civilization. It has brought about changes and new competitive advantages in numerous institutions and service organizations. As a result, AI has shown to be extremely useful and advantageous in a variety of industries, including banking and finance, marketing, running healthcare systems, and smart applications (such as facial recognition, voice recognition, location assistant, etc.). Like in many other fields as mentioned above, artificial intelligence (AI) may assist libraries in updating and expanding their services and in promoting their relevance in the contemporary digital environment. According to ExLibris (n's), libraries have the ability to utilize the practical benefits of artificial intelligence for their own goals, including streamlining workflows, enhancing operational efficiency, and creating new services.

The modern information environment is mostly driven by ICT. There is a great reliance on new technology advancements to supply creative and cutting-edge information services that fulfill the consumers' shifting needs. Libraries must adopt and incorporate cutting-edge technologies, such as artificial intelligence, to effectively provide information services that meet the demands of the modern world. Nonetheless, it is alarming that many academic libraries in Nigeria do not fully take advantages of AI for effective service delivery to both local and remote users. This column attempts to explore the possible applications of AI in academic libraries in order to support the provision of excellent and effective services to students, researchers, and staff.

Moreover, artificial intelligence technologies such as robots are employed in libraries to browse printed items live through a Web interface (Tella, 2020). Big data and data analytics are employed for both operational and service-oriented goals, with an emphasis on the influence of AIs (Garoufallou & Gaitanou, 2021). Libraries in underdeveloped countries can also adopt all of these with help from partners or funding organizations. In today's information-rich and digital

economy, this will help increase the efficiency and effectiveness of library service operations.

What is Artificial Intelligence?

Artificial intelligence is defined as the use of computer algorithms that think, work, and react like a human being. This technology has been under development for several decades, but it now seems to have reached a tipping point and is moving towards exponential growth. There are two types of AI:

Narrow or Weak AI: This is currently the most commonly used type of AI. It is programmed to perform a single task, like searching a database, processing verbal requests, or playing chess, and takes data from *a specific data-set.* Despite the name, it can be extremely powerful because it can complete routine tasks much faster than a human.

General or Strong AI: This is the next step in the development of artificial intelligence. It is expected to do many of the cognitive tasks that humans normally perform, solve problems, make judgments under uncertain conditions, learn, and integrate prior knowledge into decision-making.

Current Uses of Artificial Intelligence for Information Access in the Library and Information Centre in the 21s Century

Most people are already using artificial intelligence although they may not be aware of it. Currently, the most common way that library patrons encounter artificial intelligence is the use of a search engine . Search engines use artificial intelligence to help identify spam, improve the accuracy of the ranking of query responses, customize the query responses based on previous user activity, develop response to natural language questions, search images, and to better target advertisements. Although human judgment may still play some role in these activities, the addition of AI makes the process less dependent on human attention and more accurate.

Artificial Intelligence is playing an ever increasing role in the development of the smartphones and the Mobile Internet . AI is used to improve device performance, remove red eye from photos, do image searches, and manage facial recognition. In addition, many of the newer smartphones include AI-powered virtual assistants, like Siri, to do voice recognition and to search the internet. Voice access to the internet by means of a smartphone creates the mobile internet, which is becoming a popular way for users to access information. The mobile internet is easy to use, always available, and rapid response. This creates heightened user expectations for the availability of library services. The mobile internet is changing the way people use information. Smartphone users are more likely to be searching

in the context of a specific, immediate need rather than for an extended research project. A recent survey found that more than half of teenagers and adults used voice search every day . Even in a time of tight library budgets, there are already free resources available that allow librarians to introduce users to advanced search techniques based on AI. Machine learning has been used to create a new class of literature search applications called literatures mapping tools, such as Research Rabbit or Connected Papers (Tay, 2021). When these apps are seeded with a few key articles of interest to the user, they can be used to create literature maps that show the relationships of earlier, later, and similar works.

Future Applications of AI in the Library and Information Centre in the 21s Century

Librarians have traditionally collected large amounts of data regarding how library resources are used to improve internal decision-making and demonstrate the importance of the library to institutional goals. Several developments are combining to make the collection of library data more difficult but also more important. Libraries now offer far more different types of resources than the books, journals, newspapers, etc. that have been historical . This may include movies, tapes, DVDs, CDs, databases, eBooks, collections of digital images, music scores, and digitized audio files. Digitization of scholarship may mean users are tending to access library resources more often from offsite locations which can be harder to measure.

The Ithaka S+R library survey for 2019 reported that now most of a library's materials budget is spent on online digital journals, online databases and eBooks with less than 10% on print books . (Konkiel, 2016) points out that, 'it would come as no surprise to anyone who has worked with digital collections to say that digital library content is heterogeneous and, in many cases, complicated to measure (Konkiel, 2016) Analysis can be difficult if the data comes from different systems that are not easily compatible. Artificial intelligence may provide a way to organize and present this information better. It is becoming more critical to justify the allocation of scarce campus funds to library resources. These demands are especially important when campus budgets are tight.

With the increased popularity of open access materials, patrons may full be using resources beyond what is in the library. These measures, called altmetrics, are used as a supplement to traditional citation metrics . These new capabilities will allow librarians to monitor not just usage patterns from the past and present but also to provide information about how systems are changing and why these

changes are occurring. This latter function is called observability. It is hoped that this type of data analysis, facilitated by artificial intelligence, will allow the library to identify changing information needs earlier and respond faster and more efficiently to these changes.

Artificial Intelligence and Big Data

Large data sets with different formats that may change rapidly are a typical big data problem. Many commercial entities have found that big data analytics can provide valuable insights into their customers, and librarians also find this information to be useful . Big Data refers not just to the amount of information but also to the velocity with which it must be processed and the variety of formats being produced . More recent discussions have added *veracity*, *value* and *variability* to the description of Big Data. Almost every discipline and most commercial enterprises are increasingly dependent upon the analysis of Big Data sources. (Humby, 2020) observed in 2006 that data lubricates communications, builds reputations, and enables the creation of new knowledge and so has become the New Oil. In order for this to be true, raw data must be properly formatted, placed in context, and make available in a timely manner. Even a typical academic library that does not support an extensive research program might subscribe to several hundred databases. Most libraries give users access to a treasure trove of proprietary and open access databases and also serve as a gateway to the plethora of open government data provided by Presidential Executive Order . The library should become the digital data center for the entire campus, but there is an opposing trend. Many users may be accessing the library resources from a site where there is no librarian available or may feel that they don't need the help of a librarian. AI agents can provide user support at any time or place accessible by a smartphone or computer.

Big data and artificial intelligence are complementary. In the past, specialized tools were necessary to analyze Big Data; now cloud data warehouses can handle those issues that formerly made Big Data difficult to process . Artificial intelligence agents can also help users to identify the most useful databases to search and suggest the best way to format a query that is appropriate for a given database. They can rank the results of the search and even determine the extent of the search within the database. Artificial intelligence agents can be a life saver for those drowning in a sea of data. To continue to be relevant for modern research, librarians must continue to expand their support for Big Data resources.

Supporting Remote Library Services

The popularity of smartphones and the mobile internet has created the

expectation that information will be available anytime and anywhere. As a result some librarians have responded to the need to support remote classes by creating public online meeting rooms or by providing librarian services online . Even after the pandemic has passed, this still represent a way to achieve community outreach, although there are problems, like providing extra staff in cases where the library has already suffered budget cuts. Artificial Intelligence agents can help to fulfill this need by responding to standard library questions provide remote services on a 24 by 7 basis.

Using Virtual Assistants Powered by Artificial Intelligence in the Library and Information Centre in the 21s Century

The development of virtual assistants powered by artificial intelligence, like Amazon Alexa or Google Nest, represents an opportunity and a challenge for libraries . As of the date when this is written, over a third of U.S. consumers own some form of virtual assistant, with Amazon's Alexa being by far the most popular. These agents can answer straight-forward questions that in the past might have been expected to be directed to a reference librarian, like, what is the population of Fargo, ND? What is the melting point of lead? or What is the average annual precipitation in Seattle, Washington? Several voice assistants can be placed in strategic positions around the library to supplement professional staff. This will free up human librarians to handle more complicated situations.

Alexa can be programmed to create a skill, which is similar to an app on a smartphone, and librarians have been active in creating skills that are useful in the library. Voice assistants are already being used to share information about library collections, support library displays, publicize coming events, and catalog or perform searches of library resources by title, author, or genre . Voice assistants can recognize commands in languages other than English, and so voice search can be valuable for non-English speakers, as well as people with disabilities and the elderly. Thus far, tasks assigned to voice assistants have been kept fairly simple, but it is hoped that soon more complicated skills will be available.

Since many people on campus may soon have virtual assistants in their offices or rooms, librarians can provide AI skills that create lists of digital resources, e-books, databases, etc., that are individualized to each person's interests and past browsing history.

AI-powered information systems, like chatbots or voice-activated systems are not without potential problems. Questions to a virtual assistant are more likely to be in informal language and poorly structured. These habits are not good preparation for in-depth research and suggest that there may be a need for more

support for the novice searchers; most especially that some users may overestimate their ability to run searches. Unlike a librarian, who can interact with a user to clarify a user's search needs, an AI-powered information system may send the searcher to an unreliable source or even misunderstand the purpose of the search and send it in an unproductive direction.

Use of Artificial Intelligence for Reading of Library Shelves and Creating Subject Tags

One of the onerous but essential jobs in a library is reading the shelves to find misshelved items. One study found that 5.6 percent of the collection in a major university was not shelved correctly . The Agency for Science, Technology and Research (A*STAR) in Singapore has developed a robot that can check the stacks at night using Radio Frequency Identification (RFID) tags to identify misplaced books, then alert the librarians in the morning to reshelve the items . Another critical task where artificial intelligence can be of assistance is subject indexing for books and databases. Currently, most indexing is provided by authors, publishers, or freelance writers who are hired specifically for the task. AI agents can make indexing faster, cheaper, and more accurate.

Use of Artificial Intelligence for Citations

Few academic articles are written in isolation; each article is a piece of an intellectual jigsaw puzzle of ideas formed by articles from the past. The reference section in an article is intended to identify the previous articles that have formed the foundation of ideas that underlay the work in hand. It has become increasingly difficult for humans to identify these sources as the written record becomes too vast, and human activities are enclosed in an increasing number of smaller and smaller disciplinary silos. An artificial intelligence agent could survey a huge database of the relevant literature and create a more accurate reference list by correlating the key concepts in an article with related ideas from other articles, including those from other sub disciplines.

AI might also create so many references that the author would have to manually winnow the list, which would defeat the whole idea.

Factors Affecting the Adoption of AI in Libraries and Information Centre in the 21s Century

Some of those who study technology predict that AI will change the nature of human work. For example, Merisotis claims that, "If a task is repetitive, it can be automated – this much has been clear since the first robot replaced an assembly line worker." On the other hand, others would argue that artificial intelligence is

not valid because it may not provide the context of the original data, may simply propagate human biases in ways that are less visible in the algorithm, and may simply determine correlations instead of causative relationships , Despite these concerns, AI is beginning to affect many different types of human activity, and this will probably include libraries. It seems probable that remote access will be a significant component of the library in the future not only because it has been normalized by the pandemic but also because the mobile internet, powered by smartphones, has become such an important component of information management. Several other obstacles may prevent libraries from using AI to provide digital resources remotely. This includes the complicated licensing rules and copyright restrictions for digital materials, which may be compounded by budgetary restrictions. Many libraries suffered from budget problems even before the onset of the pandemic despite the generous relief funding's, this continues to be a problem. As a result it is difficult for libraries to compete with commercial enterprises for staff that have AI expertise.

Despite the potential usefulness of artificial intelligence programs for libraries, a recent survey found that only five major university libraries out of the twenty-seven sampled offer artificial intelligence short courses, workshops, etc., and these results included workshops on topics like Arduino kits, robotics, and 3D printing that were not directly related to improving library services . It should be noted that all the universities in the study offered courses in AI, usually in the mathematics or computer science departments. This is understandable since artificial intelligence is not normally considered under the libraries' purview and there are limits on the financial and staff support available to explore new directions. Also, colleges are generally losing IT staff because of the COVID pandemic (Smalley, 2022).

Based on this, it seems society is probably moving towards a human-computer interaction model moderated by artificial intelligence. The mobile internet is a step in this direction and literally thousands of start-up companies are currently working to bring this to reality in both the workplace and for research. Currently, the data analysis occurs mainly in the human mind and the computer merely supplies supporting information. As artificial intelligence learning evolves, it seems easier to let the computer do the data analysis. This may seem attractive, but, hides the context of the information from the eventual user and allows biases to lurk in the algorithm and that can corrupt the decision (O'Neil, 2016).

Implication of Artificial Intelligence (AI) and the Future of Library and Information Centre (LICs) in the 21st Century

The advancement of artificial intelligence (AI) has had a major impact on the way library and information centres (LICs) operate. By leveraging AI, Library and information Centre have been able to increase their efficiencies and improve the quality of the services that they provide. This paper seeks to explore the implications of AI on the future of LICs, and how AI can be used to further improve services and enable new business models. The possibilities of AI are limitless, and have the potential to revolutionize how LICs operate. AI can be used to automate mundane tasks, such as cataloguing and organizing information, as well as to provide personalized recommendations to patrons. AI can also be used to develop innovative services, such as virtual assistants, automated Chabot's, and more. Moreover, AI can be used to offer predictive analytics and help identify patron needs and preferences. In addition to the potential for enhanced services, AI also has the potential to enable new business models and revenue streams. For example, AI can be used to develop personalized learning paths for patrons, and to create targeted marketing campaigns. AI can also be used to create new licensing models and help monetize content. The implications of artificial intelligence on the future of library and information centres are limitless. By leveraging AI, LICs can increase their efficiencies, improve the quality of their services, develop new business models, and monetize content. Ultimately, AI holds the potential to transform the way libraries operate, and further empower patrons with personalized, tailored, and safe information resources. The 21st century has seen unprecedented advances in Artificial Intelligence (AI), with AI now being used in a wide variety of industries and applications.

Prior to now, it was challenging for many university libraries in Nigeria to integrate cutting-edge technologies like artificial intelligence into their core services. The need for the deployment of cutting-edge technologies to support library service operations has grown following the outbreak of a global pandemic in 2020 (Owolabi, Ibrahim, & Layi, 2022). So, there are a variety of reasons why academic libraries in Nigeria should use AI, including:

1. User behavior and the information environment are changing,
2. Rising global health crisis leading to physical interaction; and
3. Further developments in the technological age include the use of intelligent Internet-connected devices, the use of digital high-tech items in households, and the integration of AI assistants into everyday situations (Poole, 2020).

There are a lot of discussions among librarians about the need to offer new services to users because technology is changing user expectations. A comprehensive analysis of the AI literature shows that the use of artificial intelligence has many

benefits, especially in the library and information work. Ridge (2019) lists several benefits, including the improvement of user experience, partnerships, system improvements, mastery of processes and digitization, collecting of current descriptive metadata as a byproduct from project outcomes, and efficiency in library operations.

Challenges of Artificial Intelligence (AI) and the Future of Library and Information Centre (LICs) in the 21st Century

The development of Artificial Intelligence (AI) has presented new challenges and opportunities for Libraries and Information Centres (LICs) in the 21st century. AI is being used in a variety of ways to automate and improve different aspects of library operations, such as digital resource management, interface design, and access to data. While AI could potentially provide ways to enhance innovation in library operations, there are a number of challenges that must be addressed to ensure its successful application. Firstly, there is the need for libraries and information centres to regularly update their software and hardware capabilities to meet the demands of complex AI systems. Secondly, appropriate methods must be found to ensure the accountability, accuracy and security of data processed by AI systems. Finally, there is the need to ensure that library and information Centre staff is adequately trained and able to use the new AI systems and tools. While there are challenges to be addressed in the application of AI to library and information Centre operations, the potential benefits for library users and staff are considerable. Therefore, it is important that libraries and information centres develop strategies for addressing the challenges associated with AI, so that they can maximize its potential benefits in the 21st century.

Conclusion

In conclusion, AI is a powerful tool that has the potential to revolutionize the way LICs provide services to their users. However, it is important to consider both the potential benefits and challenges of AI to ensure that it is used ethically and effectively for LICs Services. With the right approach and investment in training and resources, AI can be a powerful tool and a great asset to LICs in the 21st century.

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