IMPACT OF ARTIFICIAL INTELLIGENCE IN LIBRARY OPERATIONS

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ABSTRACT

The study is an attempt to provide a guideline to interested libraries on how to improve their services through integrating AI technologies. The research would assist the libraries to stay current with technological advancement and explore new ways of delivering library operations. It can also be a guide to student and researchers by providing alternative ways of accessing library information resources. The research discuss on how AI can be in finding and using library resources, the study provides recommendation that will lead to increased user engagement and satisfaction.

INTRODUCTION

University library is an academic Library found in a University with the aim of supporting the curriculum and research activities of student and staff, it can be seen as a resource center for learning, teaching and research activities related to the operation and management of the University as a whole. These libraries provide a wide range of resources, services and facilities to support the academic programs and research activities of the institution (Ashikuzzaman 2023).

The eventual emergence of the Fourth Industrial Revolution (4IR) also known as 'Industry 4.0 (4.0IR)' and 'Digital-driven Industrial Revolution' is to support and promote advances in adoption and utilisation/exploitation of digital technologies (disruptive technologies) as derivatives of merger of physical, digital and biological technologies which include Artificial Intelligence (AI), Robotics, Big data analytics, Blockchain, Internet of Things (IOT) Biotechnology and Nanotechnology (Mohammed, 2021). Systematically, libraries information systems, centres and services are continually being transformed from the conventional physical library buildings to 'Smart Libraries' The inclusion of emerging technologies in libraries has made information professionals referred to libraries as 'Smart Libraries' (Baryshev et al 2018). Artificial Intelligence, Robotics, Internet of Things (IOT), Data mining have currently been introduced in libraries making the libraries smarter, thereby improving work capabilities of staff, satisfy customer needs, facilitate ease of location, access and irrespective of time and location and thus bridge the information gap, a tremendous positive impact as reported by (Massis, 2018; Gul & Bano, 2019) .

Hence the advancement in AI programming, creating a smart library is not only a possibility but a matter of time, Corke (2013) reported that researchers and experts in the field of AI are creating intelligent systems which can think and behave like librarians i.e library robots. Robots are being designed to navigate through library shelves to scan and retrieve information resources such as bookbot. BookBot technology is a robotics technology known as book retrieval system according to Stone (2019), this technology has been in existence and used in manufacturing for years, but now being applied in libraries. The BookBot is a book-delivery system that automatically retrieves books for users on demand through the library automated catalogue, within minutes of receiving a request. AI are much faster than human in terms of speed therefore can assist library clientele who are carrying out research by combing library database in an instant thus making the search much faster getting clientele the information they need right away Omame, (2020)

Libraries performs cataloguing, classification and indexing of information resources in the technical services division; select, acquire, weed and process newly acquired information resources in the collection development division; answer users' queries in the reference services division; and perform circulation duties like registering of library users, charging and discharging, taking of users statistics, user education, binding and so on, the emergence of AI technology has made the delivery these services faster and more efficient in a way to meet the dynamic information needs of library users (Bharat, 2015). Nevertheless, the time freed by AI, the University librarians

will have the opportunity to be expose to wider pool of ideas, knowledge, expertise and ambitions and this can change their mindset towards vision of developing services .
McGraw-Hill Encyclopedia of Science and Technology (2007) is of the view that AI is aimed at performing intelligent tasks such as logical thinking, learning new abilities and adopting to new situations and problems. In a nutshell, AI is making computers or machines intelligent just like human beings, in order to make them find solutions to complex problems .The Artificial intelligence of computers or machines could be strong or weak. A computer with strong AI can be able to think and make decisions like human beings, it is also capable of learning from experience and re-programme itself to improve on past mistakes. Weak Artificial Intelligent computers cannot think, learn or re-programme themselves, rather, they are specifically designed to respond to specific situations (Dogget, 2023).

According to Valluri, (2017) AI has made a huge impact on various aspects of human daily life. Below are some of the areas:
Healthcare: Companies are applying machine learning to make better and faster diagnosis than the human capability. AI is currently being applied for a range of healthcare needs, including data mining for identifying patterns and then carrying out the more accurate diagnosis and treatment of medical conditions, medical imaging, medication management, drug discovery, and even robotic surgery. The entry of technology giants such as Microsoft, Google, Apple, and IBM in the healthcare sector holds significant importance for the industry. One of the best-known technologies is IBM's Watson, a cognitive computing system that has a myriad range of applications in Healthcare, Finance, retail and other sectors (Forrest, 2020)15. Watson understands natural language and mines patient data and other available data sources to form hypothesis in Healthcare.

Business, Retail and E-commerce:
Robotic process automation is being applied to highly repetitive tasks normally performed by humans. Machine learning algorithms are being integrated into analytics and Customer relationship management (CRM) platforms to perform analytics on how to better serve customers. Chatbots have already been incorporated into websites and ecommerce companies to enhance customer experience. Another example is the product recommendations on Amazon accounts, which are a real-time application of complex AI algorithms to determine which products consumers are more likely to buy. Automation of job positions has also become a talking point among academics and IT consultancies. Banking and Financial Services:

Banking and Financial Services industry is undergoing a massive transformation due to the onset of AI applications. Human agents are increasingly being replaced by intelligent software robots for processing loan applications in fractions of a second. Similarly, Robo-financial advisors sift through multiple levels of data in split seconds to recommend the right investment decisions for customers. Fraud detection is another important application of AI in the finance sector is. For instance, MasterCard uses AI-based Decision Intelligence technology to detect fraudulent transactions by analyzing various data points.

Autonomous vehicles: Just like humans, self-driving cars need to have sensors to understand the world around them and a brain to collect, processes and choose specific actions based on information gathered. Autonomous vehicles are equipped with advanced tools to gather information, including long range radar and cameras. Each of the technologies are used in different capacities and each collects different information. The AI system then processes the information from the various tech and provides further action. This is where AI can be compared to human brain.

Manufacturing: In manufacturing, AI is being employed across several lines and layers of operations, from workforce planning to product design, thus improving efficiency, product quality, and employee safety. In factories, machine learning and artificial neural networks are employed to support predictive maintenance of critical industrial equipment, which can accurately predict asset malfunction. It helps the management take timely measures to restore the equipment and prevent costly unplanned downtime.

According to Ex Libris, (2019) the benefits of AI in libraries can be summarized as follows:
1. Artificial Intelligence in libraries can make research more discoverable which can boost research productivity among faculty members,
2. Bridge in Time: Round the clock accessibility to information resources and services just in time.
3. Bridge in Space: The space occupied by piles of books, journals, bound newspapers and other information materials has been reduced by the introduction of digitization, electronic copies and use of robotic cranes that stores and retrieve books from a compact off-site storage location.
4. Maximization of Efficiency: This refers to efficiency in library operations: selection and acquisition of materials, technical services, circulation services, references services, serial management etc.
5. Maximization of effectiveness in form of improves services delivery and elimination of human errors in library operations.
6. Minimization of Effort: The effort expended by librarians in technical services, circulation services, references services, serial management etc, can been minimized by the use of artificial intelligence systems in libraries.
7. Enhanced and immersive user experience in library services delivery.

Musa, (2019) identified some types of AI technologies in libraries:

- Book delivery drone
- Smart Library card
- Library bookmark and guide
- Library utensils or Finger Link
- Augmented reality app
- Digital interface for print books
- Print on demand machines
- Turn-it-in, plagiarism checker, Dust ball,
- Li-Fi
- Google Balloons
- Open Source Software (Koha, Dspace, Evergreen Software, New Gen Lib, ABCD Software) and so on.

Book delivery drone: this is a flying machine that uses different application (mobile or computer application) that enable the library users to find a book and deliver it. It a system using haxacompers, drones with six rotors, to deliver ordered textbooks. This technology (drone) can find a user by the location of Smartphone or computers application and deliver the textbook. You don't need to give your fixed address You can be setting in a reading room doing some research work and you may need additional reference books, so you just stay where you are and use the application to order a book.. This is the latest library technology and we should be ready to accept them.

Library bookmark and guide: This is a mini or small device that would escort or assist library users when moving around the library by giving turn-by-turn direction to the books that the users want. This device is also used to keep track of all borrowed books as well as remind the library users of the returned date

Augmented reality application: Is an image based AR application that allows users to explore library. The software offer searching, locating and move with intuitive digital interface on physical space. It's a tool that provides additional information about the document (text, images, audio) to enrich the experience. Augmented Reality, or AR, is technology that provides digital overlays to reality that add information.AR applications exist for smart phones as well computer. AR is an Image based application that helps the users to clearly:

a. Highlight the best use of the library books and other resources.
b. Locating the book on the shelves.
c. Point the new arrival of the book.
d. Help to select the similar book.

Library Utensils: This a device that the library users can use in a reading room. it is a simple pen connected to the computer that would let the library user make use of digital highlight text from the books and print whatever they want: this is also save the life of information resources from damage as well as the time of users in order to save the life of library resource from photocopy treat as well as time of users, the library could provide more available utensils in the library that users could borrow to use in the reading room and also users will charge for the printing

Navigator Books: This is one of the modern technologies provided by the modern libraries to help user to find the books and other information resources they want in the library. User need to download an application that the library use and become a member of that library. User can search the books by title, authors, subject, by ISBN, ISSN and so on. The application will give the result that match with the type of your search.

Screen Reader application or NVDA: A screen reader is a software that allow the blind people to use the computer to get access to information by reading the text in a systematic voice. It can also be used for the Braille display, a screen reader enable blind people to get access in education and participates in world forces. NVDA (Non Visual Desktop Access) is a free screen reader application which enables blind and vision impaired people to use computers. It reads the text on the screen in a computerized voice.

Automated Material Handling: This refers to any machine or automation that will reduce or elements the need for humans to check-in, check-out. A material handling systems can simply defined as library integrated systems, applications, machines for handling, processing, storing and controlling the library materials.

Plagiarism Detection tools: Today's many students copying others work and present it as either project or assignment. Therefore, it's library's duty to enforce the use of plagiarism detection tools so that in our institution in order to reduce the high level of copy and pest by the researchers.

Library User Print on Demand System: The essence of library print demand machine is allow users to search, access and make an instant print books version within a short period of time . The new machine combines the functionality of Kodak photo kiosks as well as the Espresso Book Machine, which allows users to upload a file and pick up a printed book, or print from the machine's library of more than 7 million texts.

Features of AI Technologies

All the types of AI technologies must have one or more of the following features, according to Valluri, (2017) AI has numerous features and characteristics, some of its basic features are:

Machine Learning: AI technology is characterised by machine learning capabilities which enable it to automatically learn and improve on previous experience without it being programmed explicitly. AI technologies improve on their results by learning the uniqueness of each case and the surrounding circumstances. The technologies observe from experience or from examples or instruction given to make better decisions in the future. The learning pattern in AI could be supervised learning, unsupervised learning or reinforced learning.

Cloud Infrastructure: AI and cloud computing convergence offers better and improved scalability and efficiency over manual method. In AI infused technology, acceleration, automation, and management features have become a core competitive differentiator. AI cloud infrastructures drive optimised, automated, and dynamic data storage and workload management across distributed fabrics. The infrastructure also leverages on platform such as the SAAS (software as a service) and PAAS (Platform as a service) to develop and store large amount of information in the cloud while reducing the risk of loss in the process.

Automation: Automation is the primary feature of AI, the technology automates jobs such that routine tasks are done by the system and in so doing, ensures greater efficiency and productivity. With AI, tasks such as the answering of directional questions, giving library tours, welcoming library users and locating an information source in the library can be done automatically (Karsten & West, 2015), thus, freeing up enough time for the librarians to perform other managerial tasks.

Natural Language Processing: The uniqueness of AI technology is its ability to speak to users. The natural language processing of AI technologies allow computers and people to interact with natural languages. The system processes large amount of natural language data like speech and text and analyzes it. Interactions with intelligent systems like robots are an evidence of natural language processing. However, two major components of natural language processing exist. While the first component refers to natural language understanding, the second component involves natural language generation such as text planning and realisation, as well as sentence planning. Furthermore, Kumar (2004) identified components such as machine translation, speech synthesis and recognition, linguistic approaches, information extraction and retrieval amongst others as the different components of natural language processing.

Pattern Recognition: This is an aspect of AI which is similar to machine learning and is effectively the process of recognising patterns by using machine learning algorithms. Bishop (2006) explained that pattern recognition uses computer algorithms to automatically identify regularities in data. Thus, actions are taken based on the regularities observed in the data. Such action could include organising or classifying the data into different categories. AI pattern recognition systems possess the ability to correctly recognise familiar patterns quickly and accurately, while also separating unrecognised or unfamiliar patterns by way of grouping them. It also has the ability to recognise shapes, objects and patterns from different positions and angles more accurately and automatically, hence, the name pattern recognition. AI pattern recognition takes place through first acquiring the data and then pre-processing the data before the extraction feature. It is only when this is done that the other components such as model selection and training, and evaluation are exercised.

Expert System: AI expert system is an interactive and reliable computer based decision-making system which uses both facts and heuristics to solve complex decision-making problems. The expert system of AI provides the highest level of expertise as it is known for its efficiency, accuracy and imaginative problem-solving ability. The expert system is widely regarded as a knowledge based system which gives expert advice, decisions or recommended solutions for a given situation. The basic components of an expert system include user interfaces, inference engines and knowledge bases.

CONCLUSION

This research sheds light on AI in libraries, if AI will be incorporated in libraries, it will enhance library operation and it will also improve service delivery to the users The outcomes of this research would be of beneficial to the management of the libraries by guiding them on how integrate emerging technologies like AI by setting the right standard that will provide back bone for robust integration. The study will be of immense benefit to NUC (National Universities Commission) by encouraging them to employ professionals and focus on latest technology. By and large the adoption of AI in University Libraries can change the visibility, profile, status and reputation of the library within the University and beyond.

RECOMMENDATIONS

Based on the findings this study recommended that:
The Libraries a structured implementation plan that prioritizes the integration of AI technologies listed as ready for deployment. Allocate resources for the acquisition, integration, and maintenance of these technologies to ensure seamless implementation across all university libraries.
The human resources unit of the libraries should identify skill gaps among library staff and organize training sessions to enhance their proficiency in areas such as data science, cyber security, and coding. Encourage continuous learning through workshops, online courses, and peer-to-peer knowledge sharing.

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