ASESSEMENT OF APPLICATION OF ARTIFICIAL INTELLIGENCE (AI) IN ACADEMIC LIBRARY SERVICES IN POST COVID 19: A CRITICAL REVIEW OF LITERATURE

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Abstract

Technology continues to evolve, and as it does it is becoming more and more integrated with society. Artificial intelligence-based education tools are regarded as the most innovative among newly developed education tools. This study was carried out to assess the application of artificial intelligence (AI) in academic library services in post covid 19. In this article, the study explored the need for artificial intelligence in academic libraries services, application of artificial intelligence in academic libraries such as automatic cataloguing and classification using optical character recognition (OCR), automatic translation of foreign language materials using natural language processing (NLP), Automatic indexing using expert systems, intelligent gateways to online sources and many more. In addition, the study explore the reasons why Artificial intelligence systems are generally not in operational use in most libraries today due to lack of technical know-how to use and operate artificial intelligence systems among the library staff, lack of adequate funding , erratic power supply, limited amount of artificial intelligence experts among library automation vendors. Based on this it was recommended that, government and parent body of academic libraries should ensure and provide adequate artificial intelligent hardware and software to aid in the delivery of libraries' services to users for quality education and there must be proper policy formulation and implementation from the government prior to, during and after the adoption of AI in academic libraries.

Keywords: Artificial Intelligence, Academic Library, Services, Covid 19.

Introduction

The world is changing, and technological paradigms of AI are quickly being adopted in the world of libraries and information management. With a newly approved 2022 IFLA Special Interest Group in AI, it introduces libraries and information professionals around the globe engaging with these new leading-edge AI paradigms (Kay and Lauricella, 2011). This emerging issue brings together authors, researchers, and practitioners emphasised the need to promotes and advances the application of information and computing technologies to library and information services in all societies, through activities related to best practices and standards, education and training, research, and the marketplace.

The Covid-19 pandemic has caused unprecedented disruption in all walks of life. It was firstly discovered in Wuhan, China, in December 2019. Additionally, a substantial number of descriptive and opinion-based studies conducted by senior library experts demonstrate that Covid-19 certainly affecting and transforming libraries, their services, and management. The library services during Covid-19 pandemic mainly fell under three categories:

i.   Creating awareness during the physical closing of libraries;

ii.   Instant transformation of library services, and

iii. Trending remote working.

According to WHO (2020) the challenges brought by corona Virus were human and infrastructural, workplace anxiety and stress, infodemic and changed information seeking behavior, and leadership and planning. The emerging roles of libraries were to develop infrastructure, accessibility and outreach, awareness and wellbeing, leadership and policy-making, and human capacity building. Whereas library websites, social media platforms, streaming video apps, emails, telephones, video tutorials, and micro-blogging were preferred communication tools.

Therefore due to the experience from the Covid-19 pandemic and lockdown calls for an embrace of Artificial Intelligence (AI) and robotics in the 'new normal' library and information services. However, this poses the question: what does this all mean for academic libraries to support the 'new normal' learning, teaching and research at universities? To address this, AI needs to be placed in context as to what AI is and why it cannot be ignored in higher education. The shift towards smart learning environments implies embracing emerging technologies such as AI in higher education. Based on this, this article seek to provide a systematic review on the application of artificial Intelligence (AI) in academic library for promoting quality education in post covid 19.

Subsequently, the COVID-19 pandemic compels educational institutions such as libraries to explore and implement methods of digitalized services on a larger scale than ever before. Although providing remote access and digital information services in academic libraries in place before the COVID-19 pandemic, it was uncommon, and most teaching and learning activities happened in the educational environment.

Initially, when schools were closed in March 2020, most educational institutions together with academic libraries postponed their services for a certain period. When this period was prolonged, these schools initiated distance learning practices and digital information services that, at that point, were quickly becoming the new standard. Artificial Intelligence (AI) is one of the way gradually being incorporated in higher education. According to the report, provided by Educause Horizon (2021) AI is the opportunity for redesigning curricular across programmes that will accommodate "Generation AI." The Institute of Electrical and Electronics Engineers (IEEE) explains that "the next generation of children will be born into a world surrounded by technology, including solutions powered by artificial intelligence (AI). Generation AI will rely on artificial intelligence to assist them through all the milestones in their lives".

The Concept of Covid-19
A COVID-19 death is defined for surveillance purposes as a death resulting from a clinically compatible illness in a probable or confirmed COVID-19 case, unless there is a clear alternative cause of death that cannot be related to COVID-19 disease (e.g. trauma). It is a diseases which there should be no period of complete recovery between the illness and death. Coronavirus is a disease caused by the transmission of the SARS-CoV-2 virus (COVID-19) through contact, droplet, airborne, fecal-oral, bloodborne, fomite, mother-to-child, and animal-to-human transmission (WHO, 2020). COVID-19 is a Common disease with symptoms to include fatigue, shortness of breath, cognitive dysfunction but also others and generally have an impact on everyday functioning. Symptoms may be new onset following initial recovery from an acute COVID-19 episode or persist from the initial illness. Symptoms may also fluctuate or relapse over time.

Concept of Artificial intelligence (AI)
AI is a new technology of 21st century that aid and broght opportunity for librarians and libraries to provide digitised information services without physical barrier. Although the term 'artificially

intelligence' (AI) was introduced in mid- 20th century, the pillars of this concept were erected throughout many earlier centuries. Out of the pléiade of philosophers and scientists, let us mention a few, whose earlier contributions were crucial. The Greek philosopher Aristotle (384 - 322 BC) developed in his Analytica Priora the first principles of reaching a conclusion from a set of premises, guided by rules known as syllogisms. Okunlaya, Abdullah and Alias (2022) describe AI as being an "allinclusive discipline" drawing from computer science, linguistics, information science, neuroscience, cognitive science and many more other disciplines. They further explain that AI makes sense of a vast amount of data. Through analysis, AI also personalise the user experience in various environments

Features of artificial intelligence (ai)
a. Machine learning is the science of training a device or software to perform tasks. Its capabilities may be fine-tuned by feeding it more data, so it can 'learn' over time.
b. Deep learning is a subset of machine learning. Several layers of neural networks are connected in order to make a prediction. Deep learning is used in areas from autonomous cars to robotics.
c. Computer vision (CV) is the process of analyzing visual images, so that computers can 'see'. When you use Google search for images now, the engine searches the metadata associated with the images, but this will change with the development of Computer vision CV.
d. Speech Recognition or speech-to-text, is a capability which enables a program to process human speech into a written format 4. Analyzing and transcribing speech faces different problems, like separating 'signal' from noise. As you might have discovered when learning a new language and listening to native speakers, there is no obvious break between words.
e. Natural Language Processing (NLP) focused on codifying word categories and syntax. It wasn't fully successful though due to the many exceptions existing in any language.
f. An artificial neural network is a computer program inspired by certain principles of a real neural network, such as human brain. Multiple types of robots have been developed ranging from pre-programmed to humanoid to autonomous, teleoperated and augmented. Robots have various uses in industry, social work, elderly care, police, libraries and even as composers of music

The need for artificial intelligence (ai) in academic libraries
Among the reasons why academic libraries need Artificial intelligence (AI) in the services they provided was motivated by Raganathan's five laws of librarianship, which express the core values of librarianship, particularly the belief that new technology enables more direct, convenient, and timely access to information. This showed that library as growing organism AI is relevant and useful as innovative technology due some reasons to include

i. Most educational institutions have temporarily closed schools in an attempt to contain the spread of COVID-19. Provision of information in remote access using AI is now the obvious option for librarians because by using AI information resources is accessible remotely, and there are even educational technologies (or EdTechs) which are developed and shared to assist learning.

In recent years, there has been rapid innovation in EdTechs. Current EdTechs are mainly a utilization of new IT devices and the digitization of textbooks and teaching materials. Although such EdTechs improve the efficiency of education, they do not increase the effect of education and, therefore, do not fundamentally transform the education service.

ii. Another reason for academic libraries to ponder is the adoption of "AI thinking" or "AI literacy". Scholars speak about AI literacy developing due to algorithms and artificial intelligence being closely connected. What is common in these literacies are references made to "computer, internet, information, computation, and algorithmic" literacy. There is "an especially strong and

complementary connection between computational literacy and information literacy" (Ridley and Pawlick-Potts, 2021)

This is the view of Bouthillier and Shearer (2017) who stressed that librarians are required in the digital age grasped the literacy and skills such as people-centered skills (communication, facilitation, coaching, mentoring, networking, negotiating, consensus building and team working skills), skills associated with the management of organization as a whole (cultural, leadership,strategic and restructuring skills), information processing and management skills (developing knowledge taxonomies, organizing knowledge resources on Websites and portals and understanding of information and knowledge need of users) and skills related the use and application of Information Technology.

iii. Another reason why academic libraries need AI it is because certainly it plays a part in higher education institutions building smart learning environments. The role of a smart learning environment is to incorporate technology in such a way that the learning experience becomes simpler and enriched. In Helsinki for example, smart learning environments introduce learners to virtual reality applications.

Mehtelä, (2021) elaborated on the adoption of AI in creating enabling and smart learning environment. The author indicated that application of AI in academic libraries allow learners to navigate places like the sea floor. Augmented reality technologies enable pupils at school to design their own school grounds

Applications of ai in academic libraries

The application of artificial intelligence involves the areas such as artificial intelligence, expert system, artificial neural network, fuzzy logic, image processing, natural language processing, speech recognition, robotics etc. Though these areas are not separate, at times two or more applications are contributes to enrich the library services. Educause Horizon Report (2021), Rapid advances in information technologies have revolutionized the role of libraries, as a result, libraries face new challenges, competitors, demands, and expectations, libraries are redesigning services and information products to add value to their services and to satisfy the changing information needs of the user community.

Traditional libraries are still handling largely printed materials that are expensive and bulky and information seekers are no longer satisfied with only printed materials, They want to supplement the printed information with more dynamic electronic resources. 21st century is commonly regarded as the era of "Technology" which has simplified the day-to-day activities of humans. Libraries are not away from technological adoption have been started to be used for various services in the libraries ranging from service delivery to security. The application of Artificial Intelligence is a developing technology in the field of librarianship has promising potential for ease and improved provision, processing, use, as well as security of information materials in the library (Ocholla & Ocholla, 2020).

Technological advancement provides academics the opportunity to facilitate innovative problem-based learning. This advancement calls for universities to embrace the Fourth Industrial Revolution to enhance the learning experience. Considering the positive outcomes reported in basic education, AI has the potential to complement teaching and learning activities. This is because the application AI is mainly used in higher education to address challenges in teaching and learning that will improve student success.

Educause Horizon Report (2021) highlighted and described how AI incorporated in higher education support student success, enabled "student engagement platform" improve the student enrolment experience and acts as a digital assistant for helping students. In the report id also showed AI has

shown promise in supporting students with problem-based learning activities. Most students that engage with the robot session indicated that the guidance received could be applied to solve study challenges faced (Robinson, Ward & Kavanagh, 2021).

Artificial Intelligence (AI) offers exciting possibilities for library and information professionals and our users. It promises to increase access to knowledge by offering new ways to automatically describe and retrieve information from collections (Cordell, 2019; Cox, 2021). It could enable adaptivity and personalisation in information provision. AI driven chatbots and voice agents provide dialogic and supportive ways of accessing information. AI could also be applied to the analysis and prediction of user behavior. However, AI has raised a storm of public ethical concern, especially relating to bias, intelligibility and privacy (AINow 2018)

Another practical application of artificial intelligence in libraries is subject indexing. This task requires the technical expertise of the librarian or indexer and his intellectual judgement to peruse, analyse and suggest the appropriate terms to be used as index terms or keyword of a given document. Any computer system or machine that can undertake this task can be said to be intelligent. Isaiah Michael Omame and Juliet, Alex-Nmecha (2020) An Expert System can be designed to handle subject indexing or reference services

Apart from the above mention Artificial intelligence has gained tremendous application in library information services, these include but are not limited to:

1. Automatic cataloguing and classification using Optical Character Recognition (OCR)
2. Automatic translation of foreign language materials using Natural Language Processing (NLP)
3. Automatic indexing using Expert Systems
4. Retrieval of audiovisuals materials
5. Optical Character Recognition and
6. Speech Recognition. Music and pictures in the library's collections can be called up as fast as printed records – a new dimension to knowledge storage and management.
7. Interactive bibliographic instruction using various media
8. Intelligent gateways to online sources,
9. User-structured information environment
10. Portable computer reader services for the handicapped
11. Intelligent Document Delivery Services (DDS)

Challenges in the applications of AI in academic libraries
Despite artificial intelligence being applied in various aspects of the academic library activities, most of its applications are still in the theoretical stage, which is more or less limited and cannot be really implemented. Omame and Juliet (2020) posited that, Artificial intelligence systems are generally not in operational use in most libraries today. The limitations to implementing artificial intelligence systems in libraries are due to the following:

i.   Lack of technical know-how to use and operate artificial intelligence systems among the library staff.
ii. Lack of adequate funding to develop or procure artificial intelligence systems in libraries. Since the budgets for hardware and software are frequently tight, there's always constrain to the type of system the library can purchase or develop
iii. High system development and maintenance cost of artificial intelligence systems in libraries.
iv. Erratic power supply to power artificial intelligence systems in libraries especially in developing

countries.

v. Inherent complexities of expert/artificial intelligence systems' development.

vi. Limited natural language capabilities.

vii. Intelligent systems lack that common base of human knowledge, severely constraint the types of functions that they can perform.

viii.   Level of effort and technical expertise needed to create artificial intelligence systems in libraries. The level and nature of effort that must be invested to develop an intelligent library system is directly proportional to the power and complexity of the system. This implies that, the more intelligent the system is, the more the effort that must be invested therein. Currently, the required skilled personnel with expensive development tools or techniques, needed to develop sophisticated intelligent system in libraries are lacking or costly, hence, the lack of such systems in libraries.

ix. Limited amount of artificial intelligence experts among library automation vendors. The field of artificial intelligence is complex and thus, requires a specialized knowledge in that aspect far beyond the development of conventional library automation systems. Consequently, this will require hiring new personnel in that area before any significant, widespread work can be done in the area of artificial intelligence systems in libraries.

Idris, Adefunke, Alhaji; and Olusegun, (2022) identified some of the challenges in the adoption of AI in academic libraries to include

1. Financial uncertainty: When government funds are shrinking and political or economic changes are underway, cultural institutions are often the first to suffer cuts. In many ways, the struggle for institutional or government funding is much like the chicken and egg problem

2. Emerging skill gaps: The digitalization of information has impacted both library operations and systems. Today, the digital realm is just as important as the physical one, making it essential for libraries to develop new skills not only to stay competent, but to better serve patrons in the digital age

3. Competing with today's alternative sources of information: According to a 2017 Horizon report, a survey found that 68% of college students start their research with Google and Wikipedia. These free providers of information, along with the emerging open access trend in scholarly publication methods, are daring libraries to rethink their distribution of high-quality information in to the context of maintaining a vital presence in the new information landscape

Conclusion

Presently, Library Professionals are playing various integrated/Multiple roles beyond their traditional job. With the help of AI technologies library Professionals from around the world are now understanding the need of changing their roles from traditional practice to multidimensional roles to meet the demand and expectations of societies, organizations, institutions, libraries, etc. and this is the need of the present situation in Covid19. Where Digital technology is the best way to serve the whole community. It is perhaps the time to consider how AI literacies could complement Information Literacy training, some strategies to consider for enhancing the teaching and learning experience through AI could include:

a. Training for academics and librarians

b. Library schools and computer science departments collaborating more closely

c. Exploring Funding opportunities for conducting AI projects

d. Librarian-faculty collaboration remains fundamental in student success

e.   Coding for students should perhaps be considered in IL modules

Recommendations
The following recommendations were offered

Government and parent body of academic libraries should ensure and provide adequate artificial intelligent hardware and software to aid in the delivery of libraries' services to users for quality education.

i.   Management in the higher institutions of learning must come together to proffer the way forward for academic libraries in terms of meeting up with the latest standard of the use of AI in libraries

ii.   Library staff should be exposed to training and retraining in the use of artificial intelligence in delivering of libraries' services in order to achieve improved operational efficiency in libraries where the technology is to be adopted or already adopted.

iii.   There must be proper policy formulation and implementation from the government prior to, during and after the adoption of AI in academic libraries.

iv.   There is also need for evaluation and effective supervision after the adoption of AI in the academic libraries to ascertain the level of compliance

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