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# Adoption of Artificial Intelligence (AI) in Library Parlance: Issues and Benefits

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**Abstract**

That AI has permeated all aspects of human endevour is a statement of fact. Indeed, the applications of AI technology will be the finest technology to give a boost to core sectors and help Nigeria for a fastest digitization. This study on the adoption of artificial intelligence (AI) in library parlance: issues and benefits focuses on the concept of artificial intelligence, artificial intelligence in library operations such as applications of expert systems in reference service, cataloguing, classification, indexing, and acquisition; applications of natural language processing in library activities, application of pattern recognition in library activities, applications of robotics in the library activities. The paper also looks at issues with artificial intelligence in libraries such as financial uncertainty, emerging skill gaps, resistance to change in workflow processes and adoption of new technologies including the fear of AI's possible risks among others. Furthermore, the benefits derivable by the adoption of AI in library operations which include but not limited to improve operational efficiency, engage larger audiences through better user experience and new services, help librarians achieve their new goals, establish a strong foothold for libraries in the new scholarly information landscape among others are discussed. Finally, a conclusion with a call for libraries to re-position themselves to take relative advantage of artificial intelligence was advanced.

**Keywords**

Artificial, Intelligence, Library Parlance, Library Operation, Robotics, Challenges, Benefits

## INTRODUCTION

There is no gainsaying that Artificial Intelligence (AI) has long permeated our home and work place. In our homes nowadays, AI devices are found in form of robot vacuum cleaners, devices that monitor moisture levels in the garden or automatically re-order laundry detergent. Similarly, robots are used to intermingle with humans on the factory floor, deliver parts or perform repetitive or even dangerous tasks. AI has become globally recognized as indispensable tools for improving organizational efficiency and productivity. it is used in many areas such as medicine, military, business, education, gaming, libraries among others. It is a computer system that is able to perform tasks that normally require human intelligence such as visual perception, speech recognition, decision making, and understanding human language.

AI is impacting the way information is processed and searched for and information professionals will be able to use these exciting new technologies to enhance their services and help users find and access specific information more easily and quickly. Although there has been fears from some quarters as observed by Mogali, (2015) that AI lacks the "human touch", has the ability to replace human jobs, can malfunction and do the opposite of what they are programmed to do and can be misused leading to mass scale destruction among others, its benefits have far outweigh the perceived challenges. For instance, in libraries services, Odeyemi (2018) observe that, AI can be effectively deployed in the areas of descriptive cataloguing, subject indexing, reference services, shelf reading, collection development, information retrieval system among others. These will among other benefits as opined by Robinson(2018) improve operational efficiency, engage larger audiences through better user experience and new services, help librarians achieve their new goals, establish a strong foothold for libraries in the new scholarly information landscape.

It is noteworthy that Libraries in the developed world have since taped into the potentials of this new technology, by implementing technologies such as Augmented Reality, Virtual Reality, immersive reality, sensory immersion, gesture recognition, humanoid robots, mobile app, and gamification. These initiatives have totally changed their user experience and make information discovery more intuitive, accessible and entertaining (Cotera, 2018)

In Nigeria, despite the rich collections of academic libraries of various information materials (journals, magazines, books, reference works, newspapers, government publications, reports, theses/dissertations, database, CD ROMS, artworks, photos, manuscripts, etc.) covering array of subjects to serve its academic community, not much is seems to have been done to tap the potentials as provided by this current technology that has evolved with huge prospects and

promising applications in libraries. It is in view of this that this research is out to explore the adoption of AI in libraries in Nigeria.

**The Concept of Artificial Intelligence**

Artificial intelligence (AI), sometimes called machine intelligence, according to McCorduck (2004) is intelligence demonstrated by machines in contrast to natural intelligence displayed by humans and other animals. Similarly, the Oxford English Dictionary defines artificial Intelligence as a computer system that is able to perform tasks that normally require human intelligence such as visual perception, speech recognition, decision making, and understanding human language.

Artificial intelligence is coined from two concepts. While intelligence is the ability to think and learn facts and skills and also apply them when necessary, artificial on the other hand is made or produced by human beings rather than occurring naturally, especially as a copy of something natural. Hence artificial intelligence can be regarded as the development of computers or machines that perceive, learn, reason and behave like human beings. Examples of AI include robot vacuums which can scan the size of the room, then identify obstacles like pieces of furniture, and then remember the most efficient path to clean effectively. Other examples are Google maps which have the ability to give route guidance, tell one how long it will take to get to a location and then provide time updates; virtual assistants such as SIRI or Alexa, smart thermostats, facial recognition, and so on.

In view of the above, Liu (2011), broadly classified Artificial Intelligence systems from two different perspectives as outlined below

1. The degree of their intelligence. In this perspective, artificial intelligence systems are classified into: (I) reflex agents able to respond to stimulus from sensors such as heat

sensor, light sensor, motion detection among others; Utility-based system; Goal-oriented systems; and Learning system such as machine learning systems that can teach computer programming.

2. The nature of their functionality. In this view, artificial intelligence systems can be categorised into collaborative systems; reactive systems; Internet-based systems; and Mobile systems that can autonomously travel from one place to another to perform a task.

Artificial intelligence already touches many of our daily computing activities, most of the computer systems and mobile phones being developed today have artificial intelligence features and we have probably used them not knowing that they are intelligent machines. In libraries, AI is used in search functionality. Specific examples include DynaMed and Micromedex with Watson and Expert.ai's connection in EBSCO. Other ways AI is in libraries are through chatbots, training others on AI capabilities, and through research

**Artificial Intelligence in Libraries**

Artificial intelligence is more ubiquitous than we realize. It has many applications in all kinds of libraries. According to Asemi and Asemi (2018), Expert Systems (ES) have been used in several fields to solve problems including: medicine, computer science, and engineering among others. The library is another fertile ground for the application of expert and intelligent systems. For instance, in the separates works of Okpokwasili (2019), Wheatley, Amanda, Hervieux, Sandy (2020), Asemi & Asemi (2018), Liu (2011), Reagan N. R., *(2018).* Mogali, (2015) and Omame & Nmecha (2020), the following were identified as the artificial intelligence areas that can be applied in libraries:

**Applications of Expert Systems in Reference Service**: Reference service is a prime activity of any library and the Expert System will work as a substitute for a reference librarian. Hence Liu

(2011) argued that academic libraries can develop artificial intelligence in libraries using expert systems in the reference section to recommend to users, the library materials that meet their queries. The following are some of the examples of Expert Systems used for Reference Services as stated by Liu (2011).

(a) Research: It is a system that supplies patrons, the recommended sources to lookup for certain question. The system can be used to teach students reference skills or as a computerized aid for practicing reference librarians and information specialists.

(b) Pointer: It was the early successful working application of computer system in the area of reference work. It directs the users to the reference sources; it is not a Knowledge Based System but a computer assisted reference program.

(c) Online Reference Assistance (ORA): This system intended to stimulate the services of an academic reference Librarian for questions of low and medium level, by using several technologies: a videotext like database, computer assisted instruction modules, and knowledge based system. ORA consist of directional transactions like library locations, services and polices

(d) Answerman: A Knowledge based system help users for reference questions on agriculture topics. It uses series of menus to narrow down the subject of the questions and the type of tool needed. It can function as either a consultation system or as a front end to external databases and CD-ROM reference tools.

(e) PLEXUS: This is a referral tool used in Public Libraries. It includes knowledge about the reference process, information retrieval about certain subject areas, reference sources, and Library users. All the above systems are advisory systems for locating reference source books and factual data.

**Application of Expert System in Cataloguing**: Cataloguing is one of the oldest library crafts. Recent attempts to automate cataloguing through Expert Systems have focused on descriptive cataloguing because it is considered rule-based(AACR2).There are two approaches for applying artificial intelligence techniques to cataloguing

a) A human-machine interface, where the intellect effort is divided between the intermediary and the support system; and

b) An Expert System with full cataloguing capability linked into electronic publishing system, so that as a text is generated on-line, it can be passed through knowledge based systems and cataloguing process done without any intellectual input from an intermediary.

**Application of Expert System in Classification**: Classification is the fundamental activity in the organization of knowledge. For this reason, it is prominent in all systems for organizing knowledge in libraries and information centres. Application of Expert System in the area of classifications in libraries includes the following:

(a) Coal SORT: It is a conceptual browser designed to serve either as a search or an indexing tool. Coal SORT consists primarily of a frame-based semantic network and the software needed to allow users to display portions of it and to move around in the conceptual structure. The expert knowledge in the system is embodied almost entirely in the semantic network.

(b) EP-X: The Environmental Pollution Expert (EP-X) has certain things in common with coal SORT in that both are concentrating on enhancing interface using a Knowledge Based approach. The knowledge base of EP-X consists of hierarchical frame-based semantic network of concepts and a set of template that express the patterns called the pragmatic relationship among concepts. These patterns are referred to as conceptual information.

(c) BIOSIS: BIOSIS uses a knowledge base, including a significant amount of procedural knowledge, to assign documents to categories automatically. It is designed as an indexer aid. BIOSIS uses the information in the titles of biological documents to assign as many categories as possible of those that would be assigned by human indexers. The indexing languages are structured and practical representation of information that can be used to very good advantage of AI applications.

**Application of Expert System in Indexing**: Indexing of periodicals is another area where expert systems are being developed. Indexing a periodical article involves identification of concepts, to translate these concepts into verbal descriptions, selecting and assigning controlled vocabulary terms that are conceptually equivalent to verbal descriptions. The reason for automating the intellectual aspects of indexing is to improve the indexing consistency and quality. Based on the information provided by the indexer, the systems can arrive at appropriate preferred terms automatically to assign relevant subdivisions. The system can make inferences and based on the inference, it can take appropriate action. 'Med Index' is the best example of indexing system used in the library Indexing activity.

**Application of Expert System in Acquisition**: The collection of documents is another integral part of the library. The librarian or the information officer is key person in this activity. The users of the library have a significant role to play in building electronic collections and that their help and advice should be solicited in the process. Several systems have been incorporated. Monograph Selection Advisor, a pioneering effort in applying this emerging technology in another area of library science i.e. building library collection. Specifically, the task modeled is the item-by-item decision that a subject bibliographer makes in selecting monographic. The knowledge base has to

be broad enough and the interfacing aspect must be easy enough for the library to get the desired information from the machine.

**Applications of Natural Language Processing in Library Activities (NLP)**: When we think of the term NPL, the first thought one might have is of being able to speak or write in a complete sentence and have a machine process the request and speak. NPL can be applied to many disciplines. This can be applied to the field of Library and Information science and more specifically to searching database such as online public access catalogues (OPAC). Indexing is the basis for document retrieval. “The aim of indexing is to increase precision, the portion of the retrieved documents that are relevant; and recall, the proportion of relevant documents that are retrieved”. This is in line with Grant and Camp (2018) who observed that many academic libraries particularly in developed countries have adopted AI for various library operations, such as circulation and reference services.

**Application of Pattern Recognition in Library Activities**: In this era of the Internet and distributed, multimedia computing, new and emerging classes of information systems applications have swept into the lives of office workers and everyday people. New applications ranging from digital libraries, multimedia systems, geographic information systems, and collaborative computing to electronic commerce have created tremendous opportunities for information researchers and practitioners

**Applications of Robotics in the Library Activities**: Robot is “an automatically controlled, reprogrammable, multi-purpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in automation applications.” The robots are on scrambling, rolling, flying, and climbing. They are figuring out how to get here on their own. As libraries provide a growing array of digital library services and resources, they continue to acquire large

quantities of printed materials. This combined pressure of providing electronic and print-based resources and services has led to severe space constraints for many libraries, especially academic research libraries. The goal of the Comprehensive Access to Printed Material (CAPM) is to build a robotic, on-demand and batch scanning system that will allow for real-time browsing of printed material through a web interface. The user will engage the CAPM system that, in turn, will initiate a robot that will retrieve the requested item. The robot will deliver this item to another robotic system that will open the item and turn the pages automatically. By using existing scanners, optical character recognition (OCR) software, and indexing software developed by the Digital Knowledge Centre, the CAPM system will not only allow for browsing of images of text, but also for searching and analysing of full-text generated from the images.

Artificial Intelligence matters to libraries. The ultimate promise of artificial intelligence is to develop computer systems or machines that think, behave and in fact rival human intelligence, and this clearly has major implications on librarianship. Although Li, Huang, Kurniawan and Ho (2015) believed that this invention will never replace librarians, but will center on time-consuming library operations and leave the librarians to engage with the patrons. Aligning with this, Murphy (2015) maintained that the application of robots in libraries will bring librarians and users closer together, against the notion that robots will alienate librarians from their users.

**Issues with Artificial Intelligence in Libraries**

Like other technologies, the adoption of AI has accompanying issues that must be urgently addressed for effective utilisation of this technology in libraries. Among these issues as observed by Robinson (2018) and Yusuf T. I., Adebayo, O. A., Bello L A., and Kayode J. O., (2022) are as follows:

**Financial uncertainty:** When government funds are shrinking and political or economic changes are underway, cultural institutions are often the first to suffer cuts. Libraries are increasingly experiencing financial instability as a top concern. In many ways, the struggle for institutional or government funding is much like the chicken and egg problem. Libraries are expected to show value for money and demonstrate cost-effective practices, but they can't do that without integrating new technologies to upgrade their physical spaces, offer new services, and improve the user experience for today's patrons – all of which requires additional funding. Thus, today's libraries often find themselves in a financial limbo - unable to show value without additional funding

**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, if not more so, making it essential for libraries to develop new skills not only to stay competent, but to better serve patrons in the digital age. These services require new competencies, such as: higher levels of digital fluency, the ability to provide the most relevant resources at a much faster pace, and supporting hands-on creative activities to maximize a patron's learning experiences.

**Resistance to change in workflow processes and adoption of new technologies:** Budget is not the only thing stopping libraries from adopting AI, along with other technologies. According to SCONUL (2017), library staff often shows resistance to change and even a sort of defensiveness in their approach to technological change

**Fear of AI's possible risks**: In addition to all mentioned above, libraries seem to show internal resistance to adopting AI technology in particular, due to a few significant concerns about the potentially damaging effects of this disruptive technology on libraries. Some of the major concerns raised by librarians according to Lauren (2022) are:  AI (or rather, robots) will replace human librarians. With an alarming figure of 38% of jobs at high risk of being replaced by AI in the next

15 years, librarians' fear of losing their jobs to AI robots can be well understood: Human creativity and empathy would no longer be necessary due to the efficiency of AI, creating a world in which the library's connection to its community and valuable human characteristics are devalued and rare: AI would magnify injustices such as inequality, bias, and discrimination, and help propagate misinformation. There is already a lack of basic neutrality in search engine algorithms and other examples show how AI can be so easily turned into a racist tool It can also be manipulated for promoting bias and fake information, or used for political purposes: AI might jeopardize data privacy, a traditionally important value to libraries, even more so in today's digital age

**Benefits of AI in Library Operation**

Despite some of the issues found with the adoption of AI in libraries, the benefits appear to be enormous hence Robinson (2018) advanced a few ways in which AI applications can bring immediate, measurable value to libraries:

**Improve operational efficiency**: Libraries can identify and magnify operational efficiency by improving service effectiveness and reducing operational costs with process automation, optimized research data management, and Digital Asset Management (DAM). Supporting this Divayana et al. (2015) identified some of AI’s advantages in library operations to include but not limited to the ability to perform library duties efficiently. Implementing machine learning in the library's processes and digital resources can optimize collection analysis, visualization, and preservation, and reduce expenses associated with delivering services. Adopting advanced Library Services Platforms (LSP) can help develop initiatives that further improve operational efficiency.

**Engage larger audiences through better user experience and new services**. By optimizing search engine results with chatbots and location-based services, machine learning algorithms can tailor content instantly from thousands of resources, replacing the manual sifting of just a fraction

of that data. AI systems can also leverage data on user touch points, past interactions and habits to identify needs and develop high-quality, engaging experiences for patrons. This includes producing personalized, precise research recommendations and even aligning search results with the individual student's knowledge level for more effective learning.

**Help librarians achieve their new goals by cutting manual daily routine search and reference operations down to a minimum**. AI implementation can reduce human errors and inefficiencies. This automation also frees library staff to focus on higher-value complex tasks, such as assisting lecturers in formulating reading lists, teaching students how to refine their research efforts, developing library collections, and the like.

**Establish a strong foothold for libraries in the new scholarly information landscape**. AI technology can enable cross-disciplinary alignment within academic research by helping to locate connections to large data sets otherwise overlooked. Additionally, by joining hands with open publication organizations, along with implementing research systems that operate with other institutions, libraries can help create a seamless exchange of data and research across sectors and disciplines. Their collections become more discoverable, searchable, and analyzable, ultimately supporting a rich, high-quality global network of resources.

To be able to key into the AI technology and derive the numerous befits offer by the technology, the IFLA Statement (2020) gives ideas for how to use AI well. For libraries they suggest: “Libraries can educate users about AI, and help them thrive in a society which uses AI more extensively: Integrate AI and machine learning technologies into everyday work: Libraries can support high-quality, ethical AI research.” Furthermore, there must be proper policy formulation and implementation prior to, during and after the adoption of AI in African academic libraries.

**Conclusion**

AI has become indispensable tools for improving library efficiency and productivity. Its adoption in library operation can improve library services and provides access to accurate information that can drive growth and development in this information age. Despite several emerging issues associated with the use of AI in libraries, it benefits in library parlance far outweigh the challenges. Hence the need for libraries to re-position themselves to take relative advantage of artificial intelligence's potentials by refining the quality of library services in this era of the information age.

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