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Potentials of artificial intelligence (AI) in collection development in university libraries

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Abstract
The purpose of this study was to identify the potentials of Artificial Intelligence (AI) on collection development in the university library in Nigeria. The study used the research survey method and descriptive research analysis. The instrument for data collection was a structured questionnaire. The population of the study comprised a total of 574 librarians in Nigeria who attended the 2024 NLA conference/Annual General Meeting (AGM) that held at the University of Port Harcourt from 7th to 12th July, 2024. The result showed that AI technology has the potentials of effective prediction, automation, analysis, elimination of repetitive tasks, forecasting, budgeting and reviewing of collection development at the university library. The result further revealed that AI can reduce time and resource wastage in collection development thereby boosting library collection with ease. The adoption of AI would enhance the collection development unit while improving the overall services of the university library. The research recommended the adoption of AI for collection development unit to enhance the services in the unit.

Keywords: Artificial Intelligence, Collection development, Acquisition, University Library, Nigeria

Introduction

Over the years, the library collections have remained an envy and catalyst for effective information services to the library patrons. The development of the library collections is of great concern for librarians in every university library. The university library is the focal point for verification and accreditation visits to the university and the first port of call for students, staff and researchers in any university. Hence, the development of the library collections cannot be

overemphasized. Basically, librarians at the university crave to satisfy their patrons by improving the library collections. Among the five fundamental laws that were postulated by Ranganathan, the library collection is a key factor. As far back in 1931 Ranganatha highlighted in his fifth law that the 'library is a growing organism' (Haider, 2022). The postulation by Ranganatha puts collection development function of the library at a pedestal, making it one of the significant functions of the university library. Collection development otherwise known as library acquisition is defined as the systematic assessment, selection, and deselection of library resources (Alexander, 2003). According to Ozioko (2021), collection development is a planned, continuous, cost effective and preferential acquisition of qualitative, relevant materials to meet the needs of users and the objectives of the library.

A library is today not defined by size but by its collections that meet the needs of its users. The librarians have for a long time acknowledged the importance of collection development but have been facing several limitations on the technological tools that can guarantee a quick, prompt and error free process. Collection development is typically handled manually using publishers list, departmental list and Integrated Library Software's (ILS) generated list in most university libraries in Nigeria. Manual processing, selection and collection of information materials are usually rigorous and strenuous without the use of technology such Artificial Intelligence (AI). Innovative technologies such as AI, machine learning and big data analytics among others are contributing in several areas of human endeavours. Artificial intelligence (AI) is one of the emerging trends in libraries which involve programming a computer to do things, which if done by humans, would require a high level of intelligence (Omame & Alex-Nmecha, 2020). AI technologies emulate human cognitive abilities and thinking processes and can aid in collection development processes (Laskowski & Tucci, 2024). Similarly, AI-powered library management systems can optimize administrative workflows, improve resource allocation, and enhance operational efficiency in the management of collection development (Hanson & Okorie, 2024). AI has the ability of using predictive analysis to improve library collections without error. In this study, the author adopts the Evidence-Based Stock Management (EBSM) theory that focuses on effectiveness, more patrons focused, less wasteful, and more measurable to investigate the potentials of AI in collection development in the university libraries in Nigeria.

Collection development is the process of acquiring balanced, relevant, cost effective and equitable information materials for the library users. The whole essence of collection development is to gather all relevant information materials that are deemed necessary for the library patrons. The process of collecting materials in most university libraries in Nigeria involves a manual process of preparing a list of materials generated by publishers, departmental staff and computer. The intensiveness of collecting the needs of library patrons stem from the painstaking efforts of the librarians. While several processes and strategies have been employed for equitable collection across the board, study has shown that it is not free from human error and bias (Isiaka, 2023). One of the challenges affecting collection development at the university library over the years is juxtaposing cost effective and relevant materials with irrelevant collections with an increased cost and loss of man hour. This study therefore was set out to serve as framework for identifying the key factors, dynamism and tools in achieving equitable collections at the university library. The study is guided by two research objectives:

1. Find out how AI technologies can effectively manage collection development at the university Library.
2. Identify how AI can reduce time and resources wastage in collection development at the university library.

Literature Review

Artificial Intelligence (AI) is currently undergoing some level of development with series of validation in different areas of human endeavour cutting across medicine, engineering and education among others. There is an ongoing conversation for the adoption and use of AI for the management and delivery of information services in the university library and information centres (Akinyemi, 2023; Crawford & Syme, 2018). Librarians and information practitioners are becoming more conscious of the impact of AI in other sectors and discussion on its adoption for an improved library service delivery in academic libraries is gaining momentum (Moustapha & Yusuf, 2023; Oniovighai, Idiodi & Urhiewhu, 2023). The importance of collection development was revealed in a recent study where 197 (100%) of the respondents in a study reported that special collections, for instance, archival materials, government publications, inaugural lectures, rare books, technical papers and theses and dissertations exist at their library. There was evidence that Africana, video collections, United Nations publication and reports with a percentage of 52 and 79 were among the available special collections at the library (Omeluzor, et. al, 2023).

Can AI effectively manage Collection Development?

The collection development activity is a technical function of the library that can be integrated using predictive AI for effective and reliable result (Isiaka, 2023). AI technology powered on automation system can automate routine tasks such as inventory management, collection development, and interlibrary loan processing, reducing administrative burden and time wasting of library staff (Hanson & Okorie, 2024). AI algorithms can analyze circulation data to optimize collection placement and resource utilization, ensuring that popular materials are readily available to patrons (Huang, 2020). The use of AI tools can help to analyze library usage data to spot patterns, such as most popular resources, the subjects that are most in demand, or the times when usage is at its highest and decisions about resource allocation and collection development can be influenced by such information (Isiaka, 2023). According to Sivarajah et al. (2017) cited in Isiaka (2023), the use of AI in academic libraries enables and improves dataset analysis, particularly for large datasets that can emanate from library collections. Such analysis across multiple datasets can help in taking decision about what resources to gather for library users. AI tools would also help in narrowing volume of items and thereby eliminate tedious and repetitive tasks in collection processes. Similarly, AI can facilitate data-driven decision making, analyzing large volumes of data to provide valuable insights on usage trends and resource popularity. This can guide libraries in making informed operational decisions (Herrlich, 2023).

Evidence-Based Stock Management (EBSM) theory on Collection Development

The purpose of collection development at the university library and information centres aligns with the Evidence-Based Stock Management (EBSM) theory and framework for the integration of AI in the library. Such purpose include: fulfilling the responsibility of the library to its users, observing the need of readers, providing study materials by selecting and acquiring at the right

time as per requirements, using the library budget efficiently, and reviewing the library collection from time to time (Vandana, 2020). Hence this study highlights the EBSM theory and its relationship with AI in achieving collection development at the university library and information centres.

The EBSM theory is unique and in consonance with an integral part of AI tools. EBSM provides evidence-based result using technology for collection development. The EBSM is a methodology that was established in 2005 by George Kerr. The theory compared historical and current information about collection use with local target settings to assist librarians in making collection management more effective, more patrons focused, less wasteful, and more measurable (Crawford & Syme, 2018). The main focus of AI in every sector of human endeavour is in sync with EBSM in achieving efficiency, effectiveness and productivity. Hence, the EBSM theory aligns with the current reality on the use of technology such as AI in achieving a focused and effective collection development process at the university library. In achieving result oriented collection for the university library, study has shown that AI has the potential for cross-fertilizing with library's collection development that can transform the workings of the library for efficient and effective information services (Haffenden, Fano, Malmsten & Börjeson, 2023).

How can AI reduce time wastage on resources in Collection Development?

The collection development of the library is affected in many ways using manual process which is time consuming and can be streamlined with the adoption of AI tools and the EBSM theory for efficiency and effectiveness. The use of the tool and theory would identify repeated tasks in the collection process and subsequently under a double check using EBSM and AI tools eliminate errors. The study of Isiaka (2023) revealed that AI has the capacity to prevent repetition of task that had already been considered, carrying out function faster; reducing error, handling complex task and making retrieval of information easier for library patrons.

In the law sector, Keiser (2018) stated that new technologies based on artificial intelligence (AI) are transforming not only the legal information world but also the management of law libraries' collections and law firms. AI has moved from theoretical innovations in computer science departments to practical implementations, particularly in the legal field. The legal information vendors are now offering products that are ready to integrate with systems already in place for efficiency in collection development. These tools offer advances in managing library operations, such as collection development, particularly for electronic resources (Keiser, 2018). A group of scientists in Sweden had worked on how a novel AI technique can be used in the library, combining methods from data and library science. Their work focuses on natural language processing technologies (NLPT), especially in national libraries. The study explained how the National Library of Sweden's collections enabled the development of a new Bidirectional Encoder Representations from Transformers (BERT) language model for Swedish and outlined specific use cases for the model in the context of academic libraries. The study showed some strategies on how such model could make digital collections available for new forms of research, from automated classification to an enhanced searchability and improved OCR cohesion (Haffenden, Fano, Malmsten & Börjeson, 2023). The study highlighted the potential of cross-fertilizing AI with library's collection development that can transform the workings of the university library.

AI is still developing and its adoption in different sectors is limited with scarce literature on its impact in library's collection development. However, there are several opportunities that abound on the use of AI in library services. For instance, Hanson and Okorie (2024) stated that AI-driven collaborative research platforms can connect users with similar research interests and facilitate knowledge sharing and collaboration. By analyzing user profiles and research outputs, AI systems can recommend potential collaborators, suggest relevant research articles, and facilitate discussions and knowledge exchange within virtual research communities. These platforms promote interdisciplinary collaboration and foster innovation in research and scholarship (Xu, 2021). According to Herrlich (2023) AI can help in optimizing collection development by analyzing usage patterns and predicting future demand for specific resources. And in the area of information needs and preferences, AI can predict future needs and preferences. This can help libraries plan their services and resources more effectively (Herrlich, 2023). The scientific world of today is relying more on data that can help in taking rational decisions. By analyzing user behavior, demand and trends, AI can provide valuable insights through predictive analysis that may help the library to take decisions on collections.

Methodology

The study adopted a survey research method using descriptive research analysis. A descriptive method has been adjudged by scholars to be suitable for social science study that seek to collect, describe, analyze and summarize empirical data for clarity and understanding (Omeluzor & Ojukwu, 2024). The population of the study comprised 574 librarians from various university libraries in Nigeria. The instrument for data collection was a structured questionnaire. Data were collected at the 2024 Nigeria Library Association (NLA) conference/Annual General Meeting (AGM) that held at University of Port Harcourt from 7th to 12th July, 2024. The researcher purposefully administered a total of 200 copies of questionnaire randomly on librarians who attended the conference/AGM. The choice of administering 200 questionnaires was to use it as sample since the attendees to the conference were too many to be used as sample for the study. From the 200 questionnaire that were distributed, a total of 158 (79%) were retrieved and found usable for the analysis of this study. Before the administration of the instrument, ten (10) copies were administered on 10 librarians at the Delta State University to ascertain its validity and reliability. The 10 questionnaires were all retrieved and analyzed using Cronbach's alpha correlation coefficient at 0.5 level of acceptance, which showed a result of r = 0.73. This result showed that the instrument was reliable and good for data collection for the study, since the test result was above the acceptance point of o.5. This research leverage SPSS for the generation of results in graph, frequency table and percentage for clarity and understanding.

Results and discussion

Demographic information of the Respondents

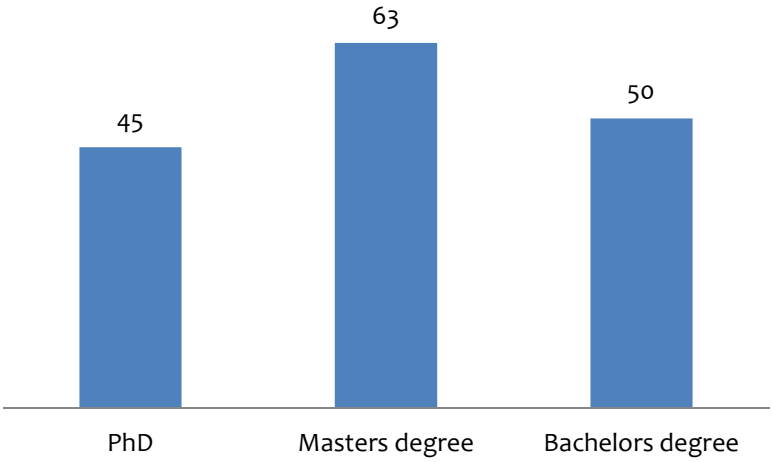

Figure 1: Academic qualification of the Respondents

The result with regards to the respondents' qualifications as shown in figure 1 reveals that 45 (28.4%) had PhD, majority or 63 (39.8%) had a Masters while 50 (31.6%) had Bachelors' degree in Library and Information Science. The result further reveals that among the respondents, 88 (55.6%) were female while 70 (44.3%) were male.

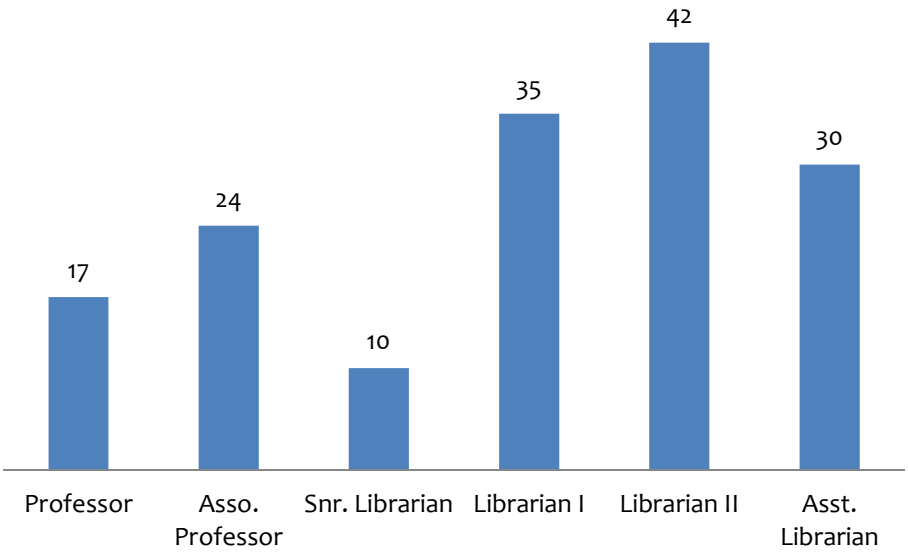

Figure 2: Designation of the Respondents

The result on the designation of the respondents as shown in figure 2 reveals that 17 (10.7%) of the respondents were Professors, 24 (15.1%) of the respondents were Associate Professors, 10 (6.3%) of the respondents were Senior Librarian, 35 (22.1%) of the respondents were Librarian 1. The result also shows that 42 (26.5%) of the respondents were Librarian II while 30 (18.9%) of the respondents were Assistant Librarians. The result indicates that all categories of librarians at the university library were represented in this study.

Findings

Research Objective 1: The first objective was to find out how AI technologies can effectively manage collection development at the university library. The result is shown in Table 1.

Table 1:

Statement	SA	A	D	SD	Decision
Predictive AI tools can predict quality collection development results for the library	102 (64.5)	56 (35.4)	-	-	Agreed
AI powered on ILS can automate routing inventory management for collection development unit	46 (29.1)	50 (31.6)	39 (24.6)	23 (14.5)	Agreed
AI powered on ILS can automate interlibrary loan for collection development	60 (37.9)	54 (34.1)	28 (17.7)	16 (10.1)	Agreed
AI tools can help to analyze library usage data to spot patterns for collection development management	128 (81.1)	30 (18.9)	-	-	Agreed
AI can harness large datasets that can help library collections development	122 (77.2)	24 (15.1)	12 (7.5)	-	Agreed
AI tools could help in narrowing volume of items and thereby eliminate tedious and repetitive tasks in collection development process	110 (69.6)	25 (15.8)	23 (14.5)	-	Agreed
AI has the ability to fulfill the responsibility of library's collection development to the library users	56 (35.4)	53 (33.5)	21 (13.2)	28 (17.7)	Agreed
AI can observe the needs of readers, provide study materials by selecting and acquiring at the right time as per requirements	67 (42.4)	42 (26.5)	31 (19.6)	18 (11.3)	Agreed
AI can help librarians to use library budgets efficiently	78 (49.3)	35 (22.1)	25 (15.8)	20 (12.6)	Agreed
AI can review the library collections from time to time	56 (35.4)	72 (45.5)	12 (7.5)	18 (11.3)	Agreed
AI has the potential for cross-fertilizing with library's collections that can transform the workings of the library	65 (41.1)	44 (27.8)	20 (12.6)	29 (18.3)	Agreed

N = 158

The result in Table 1 reveals that 100% of the respondents strongly agree that predictive AI tools can predict quality results for the collection development. It also shows that 60.7% strongly agree and agree that AI powered on ILS can automate routing inventory management for collection development unit. It is evident in Table 1 that 72% of the respondents strongly agree that AI powered on ILS can automate interlibrary loan for collection development unit. Similarly, majority or 100% of the respondents agree that AI tools can help to analyze library usage data to spot patterns for collection development management and 92.3% of the respondents also agree that AI can harness large datasets that can help library collections development while 85.4% of the respondents agree that AI tools can help in narrowing volume of information thereby making it easier for collection development unit to acquire their needs. The results in Table 1 further shows that 68.9% of the respondents agree that AI has the ability to

fulfill the responsibility of library's collection development to the library users and can observe the needs of readers, provide study materials by selecting and acquiring at the right time as per requirements. Also, the result reveals that 71.4% of the respondents agree that AI can help librarians to manage library budgets efficiently. Another 80.9% of the respondents strongly agree and agree that AI can review the library collections from time to time while a 68.9% of the respondents agree that AI has the potential for cross fertilizing with library's collections that can transform the workings of the library. The results in Table 1 show that the respondents agreed on all the items which implies that AI technologies can effectively manage collections of the university library.

Research Objective 2: The second objective was to identify how AI can reduce time and resources wastage in collection development at the university library. The result is illustrated in Table 2.

Table 2:

Statement	SA	A	D	SD	Decision
AI has the capacity to prevent repetition of collection development task that had already been considered	96 (60.7)	25 (15.8)	23 (14.5)	14 (8.8)	Agreed
AI can carry out collection development functions faster	108 (68.3)	23 (14.5)	11 (6.9)	19 (12)	Agreed
AI can help in reducing errors thereby avoiding waste of time and resources	98 (62)	60 (37.9)	-	-	Agreed
AI can help in handling complex task for collection development unit	120 (75.9)	38 (24)	-	-	Agreed
AI can help in automating collections through enhanced searchability of information resources	67 (42.4)	45 28.4)	22 (13.9)	23 (14.5)	Agreed

N = 158

The result in Table 2 reveals the possibilities of AI in reducing time and resources waste in collection development at the university library. The result shows that majority or 76.5% of the respondents strongly agree that AI has the capacity to prevent repetition of collection development task that had already been considered. Another majority of the respondents or 82.8% of the respondents combined strongly agree and agree that AI can carry out collection development functions faster by reducing time wastage. The result in Table 2 shows that 100% of the respondents strongly agree that AI can help to reduce errors thereby avoid waste of time and resources and can also help in handling complex task for collection development unit respectively. The result also reveals that 70.8% of the respondents strongly agree that AI can help in automating collections through enhanced searchability of information resources. The result in Table 2 shows that the respondents agreed to all the items. The implication of the results is that AI can be used to monitor the collections of the university library that can lead to the reduction of time and resource wastages.

Discussion of Finding

The findings in this study in Table 1 shows a lot of evidence that AI tools can increase every aspects of collection development at the university library from predicting quality results that can be used by collection librarian to forecasting collections and automating inventory management of collection development unit. The findings corroborate with the study of Isiaka (2023) who found out that AI tools could achieve such feat. Similarly, findings in Table 1 also reveal that AI can analyze library usage data to spot patterns for collection development. The findings also align with the study of Hanson and Okorie (2024) on the potentials of AI in collection development and its impact in library services in the aspect of reducing administrative burden and time wastage. The findings in Table 1 further highlighted the ability of AI in managing library budgets and enabling judicious use of funds in acquiring relevant information resources for the library users (Vandana, 2020). These findings have a relationship with the EBSM theory which encourages effectiveness and being more focused on patrons. These findings correlate the EBSM theory with the potentials of AI in boosting collection development at the university library.

In Table 2, the findings revealed that AI has the capacity to reduce time and resource wastage in collection development. The findings also show that it can prevent repetition; avoids errors and handle complex tasks that otherwise could hinder certain achievements in collection development at the university library. These findings corroborate the findings of Herrlich (2023) which indicated that AI could help in searching for information quickly and help the library to plan its collections. These findings succinctly align with the EBSM theory in the area of reducing time and resources wastage to have more measurable results in collection development at the university library. Hence, the adoption of AI and invocation of EBSM theory will enhance the university library's collection development (Vandana, 2020). The adoption of AI and EBSM theory will further enable the library to fulfill its responsibility to the library users by observing their needs, providing study materials by selecting and acquiring at the right time as per requirements, using the library budget efficiently, and reviewing the library collection from time to time (Crawford & Syme, 2018).

Conclusion

The library's collections are critical for the advancement of the university library. The possible expansion of the library collections enables access to varied information sources and services for the library users. Emergence of AI and its adoption in some areas of human endeavour is increasing the need for its utilization for collection development at the university library to enhance quality collections, effectiveness, efficiency and timeliness. The adoption of AI for collection development at the university library would enable the prediction of quality results that can be used to forecast the needs of the library users for possible acquisition. The essence of adoption of AI and EBSM theory would lead to several positive implications for the library, including reduction in time and resources wastage, eradication of errors and improved services. This study indicates that adoption of AI at the university library for the collection of information resources and other library facilities will help to reduce pressure and enable librarians to have equitable collection without bias.

Recommendations

From the foregoing, the study recommend as follows:

1. The library management should pursue the effective use of AI in critical units such as the Collection Development Unit of the university library for result oriented services.
2. The library management should support the adoption of AI in collection development for quality, cost effectiveness, efficiency and timeliness that will enhance the work and services of the library.
3. AI is effective in minimizing errors in processing of figure, hence, the library management should utilize AI to minimize such errors in the selection process of information resources that are meant for acquisition.

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