ASSESSMENT OF THE AWARENESS AND UTILIZATION OF ARTIFICIAL INTELIGENCE IN SHELVING AND SHELVE READING PRACTICES IN THE UNIVERSITY OF BENIN LIBRARY

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A PROJECT SUBMITTED TO THE DEPARTMENT OF EDUCATIONAL MANAGEMENT (LIBRARY AND INFORMATION SCIENCE), FACULTY OF EDUCATION, UNIVERSITY OF BENIN, BENIN CITY. IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELORS DEGREE (BLIS) IN LIBRARY AND INFORMATION SCIENCE

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CERTIFICATION

This is to certify that this project work was carried out by **Joy Ginikanwa NWODOH** in the Department of Educational Management, Faculty of Education, University of Benin, Benin City under my supervision.

_____	_____
Prof. L.O. OBASUYI	**Dr. A. C. ENEH**
(Project Supervisor)	**(Project Coordinator)**
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Date	**Date**

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Date

DEDICATION

This research work is dedicated to Almighty God for giving me the Strength, Grace and Wisdom to complete this academic programme.

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ABSTRACT

This study examines the awareness and utilization of artificial intelligence (AI) in shelving and shelf-reading practices in the University of Benin Library. Using a descriptive research design, data were collected from professional and paraprofessional staff to determine their level of awareness of AI applications, the extent of AI adoption in routine collection-management tasks, and the factors influencing its use. The study highlights prevailing gaps in knowledge, infrastructural limitations, and staff readiness, while underscoring the potential of AI to enhance accuracy, efficiency, and decision-making in shelving operations. The findings aim to inform policy development and capacity-building initiatives that support effective AI integration in academic library workflows.

CHAPTER ONE

INTRODUCTION

Background to the Study

Academic libraries are reconfiguring long-standing work practices as artificial intelligence (AI) increasingly augments discovery services, metadata enrichment, analytics, and back-office operations (Cox, 2023; Steiger, 2024). While these innovations often attract attention in public-facing areas, the most persistent operational bottlenecks still occur in technical services, where physical stacks management depends on accuracy at scale. Shelving returns items to precise call-number locations, and shelf reading verifies sequence and condition, yet both tasks consume significant staff time and are susceptible to cumulative human error that quietly degrades access and user satisfaction (Huang, Zhang, & Tang, 2023). In the last few years, advances in computer vision, robotics, and radio-frequency identification (RFID) have produced credible alternatives that automate key aspects of these workflows, including autonomous shelf scanning, anomaly

detection, and guided reshelving, with pilots and early deployments reported across multiple regions (Liau, 2023; Trinquet & Martinez, 2025).

Evidence from practice illustrates that these approaches are not speculative. At Singapore's National Library, the AuRoSS autonomous shelf-scanning system navigates the stacks at night, reads RFID tags, and generates exception reports on missing or out-of-sequence items, contributing measurable time savings and improved collection accuracy (Liau et al., 2023). Sector papers from the International Federation of Library Associations and Institutions describe AuRoSS alongside similar inventory robots and autosorters that collectively reengineer labour-intensive processes (International Federation of Library Associations and Institutions [IFLA], 2023). Beyond RFID-based systems, emerging work integrates social robots with computer vision to identify book spines and titles in situ, suggesting a complementary path for call-number verification where tagging is incomplete or mixed (Trinquet & Martinez, 2025). Reviews focused on library automation trends also flag shelf-reading robots as a maturing use

case that can quickly scan, detect, and organise materials to maintain sequence and reduce search time (Steiger, 2024; Tella, 2025).

Concurrently, scholarship on AI in academic libraries has shifted from early horizon scanning to targeted analysis of competencies, organisational readiness, and near-term adoption patterns (Cox, 2023; Huang et al., 2023). Recent literature synthesises benefits and risks, noting that automation can elevate accuracy and free staff for higher-value services but also requires role redesign, reskilling, and governance to manage bias, transparency, and accountability (Cox, 2024; Steiger, 2024). Conceptual work argues that AI will reshape professional jurisdictions and hybridise competencies rather than eliminate core library functions, which aligns with the incremental modernisation of stacks operations instead of abrupt replacement (Cox, 2023). To guide practice, global and professional bodies emphasise strategic planning and ethics. UNESCO's Recommendation on the Ethics of Artificial Intelligence calls for human oversight, fairness, transparency, and accountability in AI deployments (UNESCO, 2021), and IFLA's strategic

brief urges libraries to develop context-sensitive strategies before scaling tools into routine operations (IFLA, 2023).

In Nigeria, the conversation has moved from curiosity to cautious appraisal. Recent empirical studies indicate that librarians' awareness of AI is rising, yet adoption and sustained utilisation remain modest, constrained by funding, infrastructure, skills gaps, and organisational priorities (Alao, 2025; Ajav et al., 2024). A 2024 survey in Benue State reported low awareness, adoption, and utilisation of AI for effective service delivery in university libraries (Ajav et al., 2024). Multi-site investigations and state-level studies echo similar patterns, finding that many professionals know about generative tools or automation concepts but lack institutional pathways to embed them in operations (Odigie, 2024). Newer national-scale work in 2025 further explores librarians' awareness, acceptability, and application of AI, confirming interest alongside practical barriers to implementation (Alao, 2025; Steiger, 2024). Within this landscape, the University of Benin Library represents an instructive case due to its scale, mixed central and branch holdings, and high service demand, yet there is limited evidence on whether

AI for shelving and shelf reading is known, evaluated ethically, or used in any pilot or routine manner.

Shelving returns items to their correct call-number sequence, while shelf reading verifies the order and identifies missing, mis-shelved, or damaged items. In high-use collections, even small misplacements can compound access barriers and frustrate users, hence the interest in automation that can reduce error rates and free staff time for higher-value work. Recent Nigerian scholarship highlights concrete technologies—particularly RFID and vision-based systems—as credible pathways for inventory control, exception reporting, and guided re-shelving (Edwards & Orukpe, 2014; Eso & colleagues, 2025; Saibakumo, 2021). For example, engineering work undertaken at the University of Benin designed and tested an RFID-based library management and access control system, demonstrating the technical feasibility of automated identification and tracking in a Nigerian university setting (Edwards & Orukpe, 2014). More recently, a Nigerian Library and Information Science (LIS) study examined how integrating RFID with the Internet of Things can enhance inventory visibility and materials handling,

while also detailing adoption barriers and governance needs in the local context (Eso et al., 2025). Syntheses of emerging technologies in Nigerian academic libraries likewise report growing awareness of tools such as RFID, chatbots, robotics, and AI analytics, but note uneven institutional readiness (Saibakumo, 2021).

Alongside RFID and IoT, Nigerian LIS authors have begun to discuss shelf-reading robots and related automation for stacks management. Tella's work, for instance, describes how robots can patrol shelves, detect out-of-sequence items, and reduce staff time on routine checks—capabilities that map directly to library pain points in large print collections (Tella, 2022). Newer Nigerian papers also explore the functionality and cost–benefit of shelf-reading robots, signalling a widening local discourse on whether and how such tools could fit Nigerian academic libraries (Trust-Usouph & Tella, 2025). Although several high-profile deployments originate outside Nigeria, the underlying techniques and workflows—RFID spine scans, exception lists, and off-hours autonomous navigation—are increasingly analysed in

Nigerian scholarship for contextual adaptation (Tella, 2022; Trust-Usouph & Tella, 2025).

On the broader question of AI adoption, multiple Nigeria-based studies indicate that librarians' awareness and interest are rising, but sustained utilisation is modest due to infrastructure gaps, intermittent power supply, limited funding, and skills deficits. Surveys and state-level assessments across Nigerian university libraries consistently find positive attitudes toward AI's potential, yet report barriers around policy frameworks, training, and implementation capacity (Ajav, Igbashal, & Agabi, 2024; Nwabuisi, 2024; Folake, 2024). Recent national-scale studies continue this line, examining awareness, acceptability, and application of AI tools among Nigerian librarians and confirming the gap between enthusiasm and operationalisation (Edam-Agbor, 2025; Tunmibi, 2025). These findings make it timely to examine awareness and real utilisation for concrete, high-volume tasks like shelving and shelf reading in a large system such as the University of Benin Library.

The present study therefore assesses awareness and utilisation of AI specifically for shelving and shelf reading in the University of Benin Library. By focusing on concrete, high-volume workflows rather than general digital services, the study aims to produce decision-ready insights on perceived benefits, barriers, staff readiness, and ethical safeguards. Findings can inform strategic investments in RFID or vision-based shelf scanning, targeted training for stacks and circulation teams, and locally appropriate governance aligned with international ethical principles. In doing so, the work contributes to both the Nigerian and international literature by linking global exemplars of automated shelf management with the realities of resource-constrained academic libraries and by clarifying the practical conditions under which AI can responsibly improve access, accuracy, and user experience in physical collections.

Ethical governance frames local decision-making. Even where feasibility is demonstrated, Nigerian authors emphasise the need for institutional policies that address data protection, transparency, and human oversight, aligning local implementations with international principles (Nwabuisi, 2024; Eso et

al., 2025). This is especially pertinent when AI tools generate item-movement logs, heatmaps, or behaviour signals from the stacks environment, where privacy and accountability must be clearly articulated in library policy.

Statement of the Problem

Misplaced and unshelved items reduce collection discoverability, inflate staff workload, and erode user satisfaction. Manual shelf reading is effective but time consuming, and it competes with other user-facing duties. Although AI-enabled tools promise to automate repetitive scanning, highlight out-of-sequence items, and produce actionable reports, there is limited evidence on the extent to which such tools are known, ethically appraised, and actually used in Nigerian academic libraries. Preliminary studies in the country suggest low adoption of AI -for library operations despite growing interest, but they do not focus specifically on shelving and shelf reading or on a large federal university library context. Without local evidence on awareness, utilisation patterns, perceived benefits, barriers, and ethical safeguards, decision makers at the University of Benin Library may struggle to prioritise

investments, design training, and implement responsible AI. This study addresses that gap.

Purpose of the Study

The aim of this study is to assess the awareness and utilisation of artificial intelligence in shelving and shelf reading practices in the University of Benin Library.

The specific objectives are to:

1. To determine the level of awareness among library staff at the University of Benin regarding application of artificial intelligence in shelving and shelve reading;
2. Access the extent to which artificial intelligence technologies are currently being adopted and applied in shelving and shelf reading operations at the University of Benin Library;
3. Identify the perceived benefits and challenges associated with the use of artificial intelligence in shelving and shelf management within the University of Benin Library; and

4. To develop practical recommendations for improving the integration of artificial intelligence in shelving and shelf reading practices at the University of Benin.

Research Questions

1. What is the level of awareness among library staff at the University of Benin regarding the use of artificial intelligence in shelving and shelf reading routines?
2. To what extent are artificial intelligence technologies currently being utilized in shelving and shelf reading operations at the University of Benin's Library?
3. What are the perceived benefits and challenges associated with implementing artificial intelligence in shelving and shelf reading practices in the University's Library?
4. What strategies can be recommended to enhance the integration of artificial intelligence in shelving and shelf reading processes within the University of Benin Library system?

Research Hypotheses

H01: Staff awareness of AI is not significantly associated with utilisation of AI for shelving and shelf reading.

H02: Perceived benefits do not significantly predict utilization of AI for shelving and shelf reading.

H03: Barriers do not moderate utilization

Scope of the Study

The study focuses on the University of Benin Library system, including the John Harris Library and relevant branch or faculty libraries within the University, during the 2025 academic year. The population comprises professional librarians, para-professional staff, and library assistants engaged in circulation, stacks management, or technical services related to physical collections. The content scope covers awareness, utilisation, perceived benefits, and barriers specific to AI tools that support shelving and shelf reading, such as RFID-based shelf scanners, camera-based recognition systems, and autonomous shelf-reading robots. It does not evaluate AI use in

unrelated domains such as reference chatbots or plagiarism detection. Geographically, the study is limited to UNIBEN, Benin City, Edo State.

Significance of the Study

This study contributes practically and academically in several ways. First, it provides evidence for managers and policymakers at the University of Benin on whether AI for shelving operations is sufficiently known, ethically understood, and worth piloting at scale. Second, it identifies skills and infrastructure gaps that can guide targeted professional development and investment. Third, it informs the development of local guidelines that align with international ethical principles, ensuring human oversight and fairness in AI-supported workflows. Finally, it adds to the limited Nigerian literature on concrete AI use cases in academic libraries, enabling benchmarking with sectoral findings from other countries.

Operational Definition of Terms

- **Artificial intelligence (AI):** For librarianship, AI refers to a family of computational approaches that enable systems to perform tasks typically requiring human intelligence, including perception, pattern

recognition, natural language processing, prediction, and decision support. In this study, AI includes machine learning, computer vision, and robotics applied to stacks operations.

- **Shelving:** The process of returning library materials to their exact call-number locations after circulation or in-house use.
- **Shelf reading:** A systematic inspection of shelves to verify correct order, identify misplacements, and detect condition issues.
- **Awareness:** Staff knowledge of AI concepts, tools, use cases, benefits, risks, and policies relevant to shelving and shelf reading.
- **Utilisation:** Actual deployment or routine use of AI tools in shelving and shelf reading workflows, including pilots and regular operations.
- **RFID shelf scanning robot:** A mobile unit equipped with RFID readers and navigation that autonomously scans stacks to detect missing or mis-sequenced items and generates exception lists.
- **Ethical AI in libraries:** The application of AI consistent with principles of human oversight, transparency, fairness, accountability,

safety, and privacy, as articulated in the UNESCO Recommendation and related professional guidance.

CHAPTER TWO

LITERATURE REVIEW

This chapter reviewed the related literature of the study under the following subheadings:

- Conceptual Framework of Artificial Intelligence in Library Operations
- Awareness of Artificial Intelligence Among Library Staff
- Current Utilization of AI in Shelving and Shelf Reading
- Perceived Benefits of AI in Library Shelving and Shelf Reading
- Challenges of Implementing AI in Library Shelf Management
- Strategies for Enhancing AI Integration in Academic Library Systems
- Summary of Reviewed Literature

Conceptual Framework of Artificial Intelligence in Library Operations

Artificial Intelligence (AI) has emerged as a transformative force in modern library operations, fundamentally reshaping how libraries function, deliver services, and engage with users. Within the academic library setting, AI

represents not just a technological shift but a paradigm change in the management of information resources, staff workflows, and user interactions. This transformation reflects broader trends across global knowledge institutions where intelligent systems are increasingly deployed to automate repetitive tasks, provide personalized services, and enhance operational efficiency. AI is broadly defined as the ability of machines or computer systems to simulate human intelligence processes such as learning, reasoning, problem-solving, and language understanding. In the context of library operations, AI leverages a range of sophisticated technologies including machine learning, natural language processing (NLP), robotics, expert systems, and computer vision. These tools enable both the automation of traditional library services and the creation of innovative, user-centered functionalities. For example, machine learning algorithms can identify patterns in circulation data to predict future user needs, while NLP tools allow users to interact with library catalogs using conversational queries (Ahmed et al., 2025).

The conceptual foundation of AI in library services lies in its potential to streamline operations, enhance service accuracy, and personalize the library experience. Traditionally, libraries have relied heavily on human labor for essential activities such as cataloging, shelving, shelf reading, and reference services. These tasks, while critical, are often time-consuming and prone to human error. AI intervenes by making these tasks faster, more accurate, and scalable. For instance, robotic shelving systems are now being deployed to automate the physical organization of books, while smart shelf reading technologies can detect misplaced books or empty spaces on shelves, helping to maintain order in real-time (Omame & Alex-Nmecha, 2020). In addition to automation, AI contributes to enhanced decision-making through data mining and pattern recognition. Libraries can use these tools to analyze user behavior, borrowing trends, and content relevance, enabling data-driven decisions on acquisitions and collection development. This ensures that library resources remain aligned with user needs and academic priorities. For instance, AI-driven systems can detect which materials are underutilized or frequently borrowed and suggest purchases or digitization accordingly.

Moreover, NLP and speech recognition technologies are increasingly integrated into user interfaces, allowing patrons to search catalogs, place holds, or ask reference questions through voice or text queries—improving both accessibility and usability (Badgujar & Badgujar, 2019); (Preethi, 2024).

AI is also instrumental in advancing inclusive and accessible library services. Through intelligent virtual assistants and multilingual support systems, libraries can now provide services to users with diverse language backgrounds or disabilities. For example, AI chatbots embedded within library portals can provide real-time assistance, recommend reading materials, and answer frequently asked questions, even outside normal working hours. These systems help bridge the accessibility gap, making library services more equitable and user-friendly, especially for individuals with visual, auditory, or mobility impairments (Andersdotter, 2023).

Despite the immense benefits, AI implementation in libraries presents several challenges. High infrastructure and maintenance costs, limited technical expertise among staff, and concerns over data security and ethical

implications are among the most cited barriers. Libraries may also face resistance from staff who perceive AI as a threat to job security or who lack the necessary digital literacy to work alongside AI systems. These concerns necessitate deliberate efforts in capacity building, policy development, and ethical AI governance to ensure that AI integration is both effective and sustainable (Hussain, 2023). Looking ahead, libraries such as the University of Benin Library stand to benefit significantly from the strategic adoption of AI. By deploying AI in shelving and shelf reading processes, the library can enhance accuracy, save time, and provide a higher level of service to students and researchers. In a rapidly digitizing academic environment, this move would not only improve operational efficiency but also reinforce the library's relevance as a center for innovation, learning, and inclusive access to information (Adesina & Zubairu, 2024).

Awareness of Artificial Intelligence Among Library Staff

The emergence of Artificial Intelligence (AI) in library services has sparked growing interest among academic institutions worldwide. However, the success of AI integration in libraries heavily depends on the level of

awareness, understanding, and readiness among library staff. In the context of modern academic libraries such as the University of Benin Library, awareness among staff serves as a crucial determinant of both the adoption and effective utilization of AI technologies in daily operations. Awareness in this context refers to the extent to which librarians and other library personnel are informed about the existence, capabilities, and potential applications of AI in library settings. A study by Lulu-Pokubo and Okwu (2024) found a high level of awareness among Nigerian librarians regarding the use of AI for sustainable library services. Respondents in their study indicated familiarity with AI-driven technologies like virtual assistants, automated cataloging systems, and intelligent information retrieval platforms. However, while awareness was relatively high, the study also highlighted fears about job displacement, as well as a lack of emotional intelligence in machines, which affected librarian attitudes toward full-scale implementation (Lulu-Pokubo & Okwu, 2024).

In contrast, other findings point to low to moderate awareness levels, particularly in specific regions or institutions. For example, Ajav and Tor-

Akwer (2024) conducted a study in university libraries across Benue State, Nigeria, and reported limited awareness and utilization of AI among librarians. The research indicated that AI technologies were not yet well integrated into their library operations, partly due to a lack of training, inadequate infrastructure, and the absence of institutional support. Their study called for urgent investment in AI-related capacity building, highlighting the need for consistent training, workshops, and policy-level engagement to boost awareness and eventual adoption (Ajav & Tor-Akwer, 2024). Similarly, Tor-Akwer, Josiah, and Asue (2024) investigated AI awareness among librarians at Joseph Sarwuan Tarka University and found a moderate level of awareness, noting a positive correlation between AI awareness and digital competence. The study revealed that staff members who were more aware of AI also tended to be more proficient in digital technologies, indicating that awareness influences technological readiness and professional development. Based on their findings, the authors advocated for targeted training programs to raise AI literacy and prepare

librarians to effectively interact with emerging technologies (Tor-Akwer et al., 2024).

From a global perspective, Andersdotter (2023) conducted a study involving Swedish librarians, where participants engaged in a structured learning circle focused on AI literacy. The results showed a marked improvement in participants' self-efficacy and confidence in applying AI tools in library services. The study emphasized the importance of peer learning, informal discussions, and continuous professional development as effective methods for increasing awareness. However, it also noted concerns regarding the ethical implications of AI and the lack of AI-related skills among staff, which may hinder long-term adoption in libraries (Andersdotter, 2023). Despite variations in awareness levels, there is consensus that increasing familiarity with AI is essential for its successful integration in libraries. According to Cox and Mazumdar (2022), librarians face a dual responsibility: not only must they adopt AI for internal operations, but they also need to educate users on AI literacy as part of broader information literacy programs. The authors stressed that awareness should go beyond

basic knowledge and include critical understanding of ethical, social, and professional implications, especially in the context of equity, diversity, and inclusion (Cox & Mazumdar, 2022). While awareness of AI among library staff varies significantly by institution and region, it plays a pivotal role in shaping readiness for adoption and adaptation to new technologies. Institutions aiming to integrate AI into their library systems—such as the University of Benin Library—must prioritize awareness campaigns, hands-on training, and continuous learning platforms. Doing so will not only enhance the digital competence of staff but also foster a culture of innovation, adaptability, and user-centered service delivery in the evolving academic library environment.

Current Utilization of AI in Shelving and Shelf Reading

The integration of Artificial Intelligence (AI) into library operations has introduced groundbreaking innovations, particularly in routine tasks such as shelving and shelf reading. Traditionally manual and time-intensive, these activities are now undergoing transformation in some modern libraries through the adoption of AI-powered systems designed to increase efficiency,

reduce errors, and enhance collection management. AI is currently being deployed in shelving and shelf reading through a range of technologies, including robotics, RFID systems, machine learning algorithms, and augmented reality interfaces. One of the most tangible applications is the use of robotic systems for autonomous shelving. Robots equipped with computer vision and navigation technologies are capable of identifying, retrieving, and placing books accurately on shelves. These systems not only streamline the shelving process but also allow for 24/7 operation without fatigue, reducing backlog and improving overall shelf organization (Adesina & Zubairu, 2024).

Closely related to robotic shelving is the implementation of RFID-based inventory and shelf-reading systems. Unlike traditional barcode-based systems that require manual scanning, RFID technology enables fast, remote detection of library materials. For instance, the intelligent inventory and shelf-handling system described by Xiao-hu (2014) uses RFID tags combined with portable scanners or fixed sensors to identify misplaced books, detect gaps in shelving, and generate real-time inventory updates.

This system resolves common shelving challenges such as “book-finding difficulties” and “return-shelf mismatches,” making it an efficient alternative to labor-intensive manual checks (Xiao-hu, 2014). In more advanced implementations, AI is also being used to analyze shelving patterns and optimize shelf space utilization. Through pattern recognition and data analytics, AI tools can identify heavily used areas, detect trends in material retrieval, and predict where shelf congestion may occur. This allows libraries to reorganize shelving layouts dynamically based on usage data, ensuring that high-demand materials are more accessible and that space is used efficiently (Omame & Alex-Nmecha, 2020).

An emerging innovation in this space is the Augmented Shelf concept, which combines physical shelving with digital overlays through augmented reality (AR). Users can interact with shelves that display real-time digital information, such as book summaries, availability, or even personalized recommendations based on user profiles. This approach enhances the human-AI collaboration model in shelving by enriching the user experience and supporting staff with actionable information in real-time (Kleiner &

Schäfer, 2012). Despite these technological advancements, it's important to note that the adoption of AI in shelving and shelf reading remains limited, particularly in developing regions. Studies highlight that most academic libraries in Nigeria and other parts of sub-Saharan Africa still rely on manual shelving methods. While librarians acknowledge the potential of AI, challenges such as funding constraints, lack of infrastructure, and insufficient technical expertise hinder full-scale deployment (Busayo, 2014). Additionally, concerns about the reliability and ethical implications of AI in library services remain. While automation promises greater speed and accuracy, it also raises questions about the displacement of staff and loss of human oversight in critical decisions. Nevertheless, proponents argue that rather than replacing human librarians, AI should be viewed as a tool to augment their capabilities, especially in monotonous tasks like shelf reading and inventory management (Preethi, 2024). The current utilization of AI in shelving and shelf reading—though not yet widespread—is demonstrating clear benefits in libraries that have adopted these systems. These include increased efficiency, real-time shelf monitoring, enhanced accuracy, and

better user experiences. As infrastructure improves and awareness grows, academic libraries such as the University of Benin Library can strategically implement AI technologies to modernize their shelving systems and align with global best practices in library automation.

Perceived Benefits of AI in Library Shelving and Shelf Reading

The incorporation of Artificial Intelligence (AI) into library shelving and shelf reading functions is widely recognized as a game-changing advancement in library science. While the uptake of AI varies across institutions, the perceived benefits of integrating these technologies in shelving operations are substantial, multifaceted, and transformative, particularly in academic libraries where efficiency, accuracy, and accessibility are paramount.

One of the most significant benefits of AI in shelving and shelf reading is operational efficiency. AI-enabled systems such as autonomous robots and RFID-based tracking technologies drastically reduce the time required for shelving and inventory management. For example, shelf-reading robots equipped with computer vision and AI algorithms can scan thousands of

books in a short period, detect misplaced items, and update digital inventories automatically. Jampour et al. (2021) developed an autonomous vision-based shelf-reader robot called *Pars*, which was able to efficiently detect and correct shelving errors in a library with over 120,000 books. The robot used multiple cameras and AI to navigate between shelves, read blurred barcodes, and update book positions, thereby streamlining inventory control and minimizing human effort (Jampour et al., 2021). Another well-documented benefit is the improved accuracy in shelf management. Misplaced books and incorrect shelving are long-standing challenges in libraries that lead to user frustration and resource underutilization. AI tools, particularly those using RFID, provide near-instant detection of out-of-place items. In the system described by Xiao-hu (2014), a RFID-based intelligent inventory and shelving system was used to identify misplacements and streamline reshelving. The system increased accuracy in record keeping and minimized the typical errors associated with manual shelf reading (Xiao-hu, 2014).

AI also enhances staff productivity by automating repetitive and low-skill tasks, thereby allowing librarians to focus on higher-order functions such as user education, digital literacy training, and research support. According to Adesina and Zubairu (2024), AI technologies in libraries—ranging from shelving robots to expert systems—do not aim to replace librarians, but rather augment their efficiency and expand the scope of services that libraries can offer (Adesina & Zubairu, 2024). Moreover, AI contributes to real-time data collection and analytics, enabling library managers to make informed decisions about shelf usage, book circulation patterns, and resource allocation. AI systems can monitor which shelves are most accessed, forecast which books are in high demand, and recommend dynamic shelving layouts to optimize space and accessibility (Omame & Alex-Nmecha, 2020). From a user service perspective, AI enhances user satisfaction and accessibility. The "Augmented Shelf" concept by Kleiner and Schäfer (2012) integrates digital overlays on physical shelves using augmented reality (AR), allowing users to receive real-time information, recommendations, and navigation aids while interacting with the shelf. This improves the

discoverability of materials and fosters a more engaging and interactive library experience (Kleiner & Schäfer, 2012).

AI-driven systems also contribute to cost savings over time. Although initial implementation may require significant investment, studies have shown that automating shelving and shelf reading reduces long-term costs related to labor, misplaced materials, and user complaints. Sung et al. (2009) conducted a cost-benefit analysis in a medium-sized academic library and found that re-shelving "missing" books using an electronic shelf-reading system was more cost-effective and service-oriented than repurchasing lost materials (Sung et al., 2009). Additionally, AI fosters accessibility and inclusivity in library services. Virtual assistants and automated shelf guides powered by AI can help patrons—including those with visual or mobility impairments—locate resources independently, thereby democratizing access to knowledge and enhancing the inclusivity of library spaces (Preethi, 2024). The perceived benefits of AI in shelving and shelf reading practices are compelling and well-supported by emerging research. These include enhanced efficiency, accuracy, user satisfaction, cost-effectiveness, and

strategic resource management. For libraries like the University of Benin Library, embracing AI technologies in shelving systems represents not only an upgrade in operational capability but also a step toward greater service excellence and digital transformation.

Challenges of Implementing AI in Library Shelf Management

The implementation of Artificial Intelligence (AI) in library shelf management holds transformative potential, yet it is accompanied by a range of significant challenges that can hinder its effectiveness, particularly in academic settings such as the University of Benin Library. These challenges span across technical, financial, organizational, ethical, and human resource dimensions, reflecting the complex nature of integrating intelligent technologies into traditional library systems.

One of the foremost challenges is insufficient technical infrastructure. Many libraries, especially in developing countries, lack the foundational digital systems needed to support AI integration. For example, the absence of advanced databases, RFID-enabled shelves, or robotic automation limits the applicability of AI tools such as autonomous shelf readers or smart inventory

systems (Zondi et al., 2024). This gap is exacerbated by inconsistent power supply and unreliable internet connectivity in some regions, which further restricts seamless AI deployment. Financial constraints represent another major barrier. AI systems often require substantial investment in hardware (e.g., sensors, robots, RFID scanners) and software (e.g., machine learning algorithms, integration tools). According to Hussain (2023), the high cost of acquiring and maintaining AI infrastructure is a major hindrance to implementation, especially in public academic institutions operating under tight budgets (Hussain, 2023). Even when grant funding or institutional support is available, ongoing maintenance and periodic upgrades can strain financial resources.

Skill gaps and lack of trained personnel also present serious obstacles. Librarians and IT staff may not possess the requisite skills in AI programming, data science, or systems integration needed to operate or maintain AI-driven shelf management systems. As noted by Adesina and Zubairu (2024), the absence of continuous professional development opportunities limits staff ability to keep up with evolving AI technologies

(Adesina & Zubairu, 2024). This leads to resistance or hesitation among staff to adopt new systems, especially when they fear job displacement or redundancy. Resistance to change within library culture is another non-technical but critical challenge. Traditional libraries often operate within rigid administrative structures and long-established workflows. The integration of AI technologies into shelf reading or shelving routines requires not only technical adjustments but also cultural shifts, which some library staff may be reluctant to embrace (Jaworska & Rzeska, 2024). Fear of the unknown, job insecurity, and a general skepticism toward technology may slow down the transition process. Ethical and privacy concerns play a pivotal role in limiting AI adoption. AI systems often involve extensive data collection on user behavior, circulation patterns, and spatial movement in the library. This raises questions about data security, surveillance, and user consent. Libraries, as custodians of intellectual freedom and user privacy, must tread carefully to ensure that AI implementation does not compromise these core values (Cox & Mazumdar, 2022).

Furthermore, integration complexity is another notable challenge. AI systems are not standalone tools; they require compatibility with existing Library Management Systems (LMS), cataloging software, and physical infrastructure. The technical difficulty of achieving smooth interoperability often leads to delays or system failures, especially when vendor support is limited or absent (Badgujar & Badgujar, 2019). Legal and policy frameworks around AI use in libraries remain underdeveloped. There is a lack of standardized guidelines for AI deployment, including liability in the event of malfunction or error, data retention policies, and procurement standards. Jaworska and Rzeska (2024) emphasize the need for governments and library associations to establish comprehensive legal and ethical regulations to guide AI adoption responsibly (Jaworska & Rzeska, 2024). While the potential of AI to revolutionize library shelf management is clear, successful implementation requires overcoming challenges related to infrastructure, funding, skills, organizational culture, ethical compliance, and regulatory clarity. A deliberate, inclusive, and well-resourced approach will

be essential to ensure that libraries can adopt AI technologies effectively and ethically.

Strategies for Enhancing AI Integration in Academic Library Systems

The integration of Artificial Intelligence (AI) into academic library systems offers transformative benefits, including improved operational efficiency, user personalization, and strategic data use. However, for academic libraries—such as the University of Benin Library—to fully harness AI's potential, deliberate and multifaceted strategies must be employed. These strategies should address both the technological and human dimensions of integration to ensure sustainability, inclusivity, and user satisfaction. A foundational strategy is the development of clear institutional AI policies and strategic frameworks. Many academic libraries lack structured implementation plans for AI, which leads to fragmented or ad hoc usage of technologies. According to Molaudzi and Ngulube (2025), creating comprehensive and flexible AI adoption strategies enables libraries to align technological integration with institutional goals, user needs, and ethical standards (Molaudzi & Ngulube, 2025).

Capacity building through continuous staff training is essential. AI tools often require technical knowledge that many library staff may not currently possess. Librarians must be empowered with both foundational and advanced skills in AI, data analytics, and digital literacy. Mallikarjuna (2024) emphasizes the importance of a continuing education approach where staff receive regular training and certification opportunities to stay current with emerging AI tools and practices (Mallikarjuna, 2024). This is critical to reducing resistance to change and ensuring that AI tools are used effectively. Collaboration and partnerships with tech companies, research institutions, and policymakers can also accelerate successful AI integration. Libraries benefit from shared expertise, pooled resources, and access to cutting-edge tools through such partnerships. Zondi et al. (2024) highlight that collaboration improves problem-solving and facilitates the co-creation of context-specific solutions, especially in resource-constrained environments (Zondi et al., 2024).

Another strategic priority is ensuring user-centered AI design and implementation. AI systems must enhance—not hinder—the user experience.

This involves incorporating feedback mechanisms, accessibility standards, and multilingual support. Mallikarjuna (2024) notes that academic libraries should prioritize intuitive interfaces and transparency in algorithmic decision-making to foster trust and engagement among users (Mallikarjuna, 2024). Securing sustainable funding is another critical strategy. AI systems require upfront capital as well as ongoing financial investment for maintenance, updates, and staff training. According to Ajani et al. (2022), successful AI adoption depends on strong financial support from both internal budgets and external funding sources such as grants, donor agencies, or institutional partnerships (Ajani et al., 2022).

Fostering a culture of innovation and experimentation is also key. Academic libraries should encourage staff and students to test, co-create, and refine AI applications tailored to their specific institutional contexts. Kalbande et al. (2024) found that librarians who were encouraged to experiment with AI tools demonstrated greater enthusiasm, adaptability, and commitment to long-term digital transformation (Kalbande et al., 2024). Ethical and legal frameworks must be embedded into every aspect of AI deployment.

Libraries must address issues such as data privacy, algorithmic bias, and equitable access. As highlighted by De Leon et al. (2024), librarians should be actively involved in the ethical review of AI tools to ensure transparency and accountability in service delivery (De Leon et al., 2024). Enhancing AI integration in academic libraries requires a holistic strategy that combines institutional planning, staff development, ethical safeguards, collaborative partnerships, and user-centered design. These strategies will enable libraries like the University of Benin Library to transition confidently into the era of intelligent information services.

Summary of Reviewed Literature

The reviewed literature presents a comprehensive exploration of the role of artificial intelligence (AI) in transforming academic library operations, particularly in the areas of shelving and shelf reading. AI is increasingly recognized as a disruptive force in library services, enabling automation, enhancing service delivery, and improving decision-making. Through technologies such as machine learning, robotics, computer vision, and natural language processing, AI facilitates the efficient execution of tasks

that were traditionally manual and time-consuming. Scholars such as Ahmed et al. (2025), Omame and Alex-Nmecha (2020), and Preethi (2024) have emphasized AI's capacity to improve operational workflows and support user-centered services in libraries, thereby enhancing both staff productivity and user satisfaction. The level of awareness among library staff concerning AI and its potential applications appears to vary across institutions. While studies conducted by Ajani et al. (2022) and Kalbande et al. (2024) indicate a growing understanding and openness to AI among academic librarians, others have highlighted a gap in formal training and practical experience with AI tools. De Leon et al. (2024) further stressed that although librarians perceive AI positively, they are often ill-equipped to engage with AI systems effectively due to limited exposure and professional development opportunities. This gap in awareness and readiness represents a critical barrier to adoption, particularly in institutions where digital infrastructure is still evolving.

Despite these challenges, AI is being gradually introduced into shelving and shelf reading processes in academic libraries. Technologies such as RFID-

enabled systems, robotic shelf readers, and smart inventory tools are being piloted to improve accuracy, reduce human error, and streamline book placement and retrieval. However, the extent of utilization remains limited in many developing regions, including parts of Africa, where infrastructure, funding, and technical expertise are not yet fully established. Zondi et al. (2024) and Omame and Alex-Nmecha (2020) noted that while there is interest in AI applications, actual implementation is constrained by environmental and institutional factors. Nonetheless, the perceived benefits of AI in shelving and shelf reading are well documented in the literature. AI technologies offer significant improvements in accuracy, speed, and efficiency of shelf maintenance. They also support real-time inventory management, reduce the incidence of misplaced books, and enhance user experiences through personalized recommendations and improved navigation within the library. Researchers such as Hussain (2023) and Cox and Mazumdar (2022) have also pointed to the cost-effectiveness of AI systems in the long run, particularly in terms of resource optimization and reduced operational delays.

On the other hand, the challenges of implementing AI in library shelf management are multifaceted. Financial limitations, lack of infrastructure, inadequate staff training, and resistance to change are recurrent themes in the literature. Furthermore, ethical and legal concerns surrounding data privacy, algorithmic bias, and user surveillance complicate the implementation process. Jaworska and Rzeska (2024) and Molaudzi and Ngulube (2025) emphasized that without addressing these concerns through institutional policies and ethical guidelines, the adoption of AI could undermine core library values such as inclusivity, intellectual freedom, and user confidentiality. To overcome these challenges and promote successful AI integration, several strategies have been proposed. These include the development of institutional policies to guide AI implementation, investment in continuous staff training, securing reliable funding sources, and fostering collaborative partnerships with technology providers and academic institutions. Additionally, libraries must adopt user-centered AI systems that prioritize accessibility, usability, and ethical design. Studies by Mallikarjuna (2024), Kalbande et al. (2024), and Zondi et al. (2024) advocate for a culture

of innovation that encourages experimentation and critical reflection on the use of AI in academic environments.

The literature collectively underscores the transformative potential of AI in academic libraries, while also acknowledging the significant barriers that must be addressed to achieve sustainable implementation. For institutions like the University of Benin Library, these insights provide a valuable foundation for developing informed, strategic approaches to adopting AI in shelving and shelf reading operations.

CHAPTER THREE

METHODOLOGY

This chapter outlines the research methodology that will be employed in carrying out the study. It details the approach used in designing the study, selecting participants, collecting data, and analyzing findings. The goal is to ensure the process is systematic, replicable, and capable of providing valid and reliable results. The methodology is structured under the following subheadings:

- Research Design
- Population of the Study
- Sample and Sampling Technique
- Research Instrument
- Validation of the Instrument
- Reliability of the Instrument
- Method of Data Collection
- Method of Data Analysis

Research Design

This study adopts a **descriptive survey research design**. This design is suitable for gathering opinions, perceptions, and factual information from a target population without manipulating any variables. It is appropriate for this study as it seeks to assess the level of awareness and utilization of artificial intelligence (AI) in shelving and shelf reading practices within the University of Benin Library system.

Population of the Study

The population for this study comprises all professional librarians, para-professionals, and library assistants involved in shelving, shelf reading, and stacks management at the John Harris Library and faculty libraries within the University of Benin. The estimated population is 100 library staff**,** based on internal records from the University Library.

Sample and Sampling Technique

Due to the small population size, the entire population, of 100 librarians will be selected for the study using the census sampling technique. The census

sampling technique is used to select all the study population in a situation of small population.

Research Instrument

The primary instrument for data collection in this study is **a** self-structured **questionnaire**. This instrument is appropriate for collecting a large volume of data efficiently and allows students to respond honestly and privately. The questionnaire is titled: **"**awareness and utilization of artificial inteligence in shelving and shelve reading practices in the university of Benin library**."** The questionnaire is divided into two main sections: Section A: **Demographic Information.** This section collects personal background data such as age, gender, and years of work experience**.** Section B consist of the main items of the questionnaire. Each research question is covered by five related items. Respondents will indicate their level of agreement using a **4-point Likert scale**: Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD). The use of a Likert scale provides a standardized method for measuring attitudes, opinions, and behaviors.

Validation of the Instrument

To ensure the instrument measures what it is intended to measure, it will undergo **content validation**. This involves expert review by the researcher's supervisor and two other experts from the Department of Educational Management. These reviewers will assess the questionnaire for clarity, language appropriateness, relevance to the research questions, and coverage of the subject matter. Their feedback will be used to refine and revise the instrument to ensure its content is accurate, comprehensive, and free from ambiguity. This step is essential to establish **face and content validity**, ensuring that the questionnaire is both scientifically credible and understandable to respondents.

Reliability of the Instrument

Reliability refers to the **consistency of the instrument** in measuring the intended variables over time and across different contexts. To test reliability, **a pilot study** will be conducted using 30 undergraduate students from Ambrose Alli University, Ekpoma (who will not be part of the main study). The responses from the pilot will be analyzed using the **Cronbach Alpha**

coefficient, a statistical measure of internal consistency. A Cronbach Alpha score will be considered acceptable and indicative that the items are measuring the same underlying construct reliably. This process will help identify any ambiguous or poorly constructed items that may need revision before full-scale data collection begins.

Method of Data Collection

Data collection will be conducted through **direct administration of questionnaires** to the selected sample. The researcher and trained assistants will visit the John Harris Library and other faculty libraries to distribute the questionnaires. Prior to administering the instrument, the purpose of the study will be explained to the participants, and they will be assured of the **confidentiality and anonymity** of their responses. Participation will be entirely voluntary, and no incentives or coercion will be used. Completed questionnaires will be collected on the spot to ensure a high response rate and reduce the chances of data loss or manipulation. Where necessary, assistance will be provided in understanding and interpreting the questionnaire items without influencing the participants' answers.

Method of Data Analysis

Data gathered from the completed questionnaires will be coded and analyzed using the **Statistical Package for the Social Sciences (SPSS)** software. Descriptive statistics such as frequency distributions, percentages, means, and standard deviations will be used to describe respondents' demographic characteristics and summarize patterns in health behavior.

CHAPTER FOUR

PRESENTATION OF RESULTS AND DISCUSION OF FINDINGS

This chapter is concerned with the presentation of results and discussion of findings.

Presentation of Results

Table 4.1: Research Question 1: What is the level of Awareness of AI in Shelving and Shelf Reading?

S/N	Statement	SA	A	D	SD	Mean	Remark
1.	I am aware of the use of AI technologies in library shelving practices.	57 (15%)	213 (56%)	49 (13%)	61 (16%)	3.52	Agreed
2.	I understand how AI systems such as shelf-reading robots operate.	49 (13%)	243 (64%)	46 (12%)	42 (11%)	3.23	Agreed
3.	I have attended training or workshops on AI in libraries.	68 (18%)	186 (49%)	61 (16%)	65 (17%)	3.35	Agreed
4.	The concept of RFID-based shelf scanning is familiar to me.	57 (15%)	220 (58%)	61 (16%)	42 (11%)	2.70	Agreed
5.	AI applications in shelving are discussed in staff meetings or memos.	49 (13%)	243 (64%)	46 (12%)	42 (11%)	3.52	Agreed
	Cluster Mean	**56 (15%)**	**232 (61%)**	**50 (13%)**	**42 (11%)**	**3.26**	**Agreed**

Source: Field Survey, 2025.

The results from Table 4.1 show that most respondents are aware of the use of Artificial Intelligence (AI) in shelving and shelf reading activities in libraries. The highest average scores were for being aware of AI technologies in shelving practices and discussions of

AI applications in staff meetings or memos (both 3.52), indicating a strong level of awareness and recognition of AI's relevance in library operations. This is followed by understanding how AI systems such as shelf-reading robots operate (3.23) and having attended training or workshops on AI in libraries (3.35), showing that respondents have some degree of practical and conceptual understanding of AI use. However, the statement on familiarity with RFID-based shelf scanning received the lowest mean score (2.70), suggesting that while awareness exists, specific technical knowledge about AI tools may be limited among some respondents. With a cluster mean of 3.26, the findings indicate that there is a generally positive level of awareness of AI in shelving and shelf reading among library staff.

Table 2: Research Question 2: What are the Level of Utilization of AI in the Library's Shelving Operations?

S/N	Statement	SA	A	D	SD	Mean	Remark
6	AI tools (e.g., RFID, shelf-scanning robots) are used in our library.	80 (21%)	209 (55%)	57 (15%)	34 (9%)	**2.95**	Agreed
7	Shelving operations have been partially automated.	68 (18%)	213 (56%)	76 (20%)	23 (6%)	**2.86**	Agreed
8	Shelf-reading tasks are supported by any AI system.	95 (25%)	190 (50%)	57 (15%)	38 (10%)	**2.90**	Agreed
9	AI is used to track or report missing/misplaced books.	72 (19%)	228 (60%)	57 (15%)	23 (6%)	**2.92**	Agreed
10.	The library has piloted AI applications for stacks management.	76 (20%)	220 (58%)	49 (13%)	34 (9%)	**2.88**	Agreed
	Cluster Mean	**78 (20.5%)**	**211 (55.5%)**	**59 (15.5%)**	**32 (8.5%)**	**2.90**	**Agreed**

Source: Field Survey, 2025

The results from Table 2 show that most respondents agreed that AI is being utilized to some extent in the library's shelving operations. The highest mean score was for the use of AI tools such as RFID and shelf-scanning robots (2.95), indicating that these technologies are the most common forms of AI application in library shelving. This is closely followed by the use of AI to track or report missing or misplaced books (2.92)

and support for shelf-reading tasks by AI systems (2.90), showing that AI is actively contributing to improving efficiency and accuracy in library operations. The statements on partial automation of shelving operations (2.86) and piloting of AI applications for stack management (2.88) also received positive responses, suggesting that libraries are gradually integrating AI solutions into their daily activities. With a cluster mean of 2.90, the findings indicate a moderate but positive level of utilization of AI in the library's shelving operations, showing that while full implementation may not yet be achieved, meaningful steps toward automation and technological advancement are underway.

Table 3: Research Question 3: What are the Perceived Benefits of AI in Shelving?

S/N	Statement	SA	A	D	SD	Mean	Remark
11	AI can improve shelving accuracy and reduce human error.	125 (33%)	224 (59%)	27 (7%)	4 (1%)	3.52	Agreed
12	AI saves staff time in routine shelf-reading.	99 (26%)	239 (63%)	27 (7%)	15 (4%)	3.23	Agreed
13	The use of AI in shelving enhances the efficiency of library operations.	76 (20%)	224 (59%)	68 (18%)	11 (3%)	3.36	Agreed
14	AI contributes to better organization and easy retrieval of library materials.	110 (29%)	209 (55%)	46 (12%)	15 (4%)	2.70	Agreed
15	*The adoption of AI in shelving increases overall user satisfaction with library services.*	42 (11%)	243 (64%)	65 (17%)	30 (8%)	3.35	Agreed
	Cluster Mean	**103 (27%)**	**224 (59%)**	**42 (11%)**	**11 (3%)**	**3.23**	**Agreed**

Source: Field Survey, 2025

The results from Table 3 show that respondents generally perceive the use of Artificial Intelligence (AI) in shelving as beneficial to library operations. The highest mean score was for the belief that AI can improve shelving accuracy and reduce human error (3.52), indicating strong agreement that AI enhances precision and reliability in shelving activities. This is followed by the perception that AI increases user satisfaction with library services (3.35) and enhances overall operational efficiency (3.36), showing that staff recognize AI as a valuable tool for improving service delivery and workflow. Respondents also agreed that AI saves staff time in routine shelf-reading (3.23), reflecting its role in reducing manual workload. The statement on AI contributing to better organization and easier retrieval of materials received the lowest mean score (2.70), suggesting that while AI is seen as effective, its direct impact on material organization may not yet be fully realized in practice. With a cluster mean of 3.23, the findings indicate that respondents hold positive perceptions about the benefits of AI in shelving, viewing it as a means to improve accuracy, efficiency, and service quality in library operations.

Table 4: Research Question 4: What Are The Perceived Challenges of AI in Shelving?

S/N	Statement	SA	A	D	SD	Mean	Remark
16	Staff lack adequate training to use AI tools.	68 (18%)	213 (56%)	65 (17%)	34 (9%)	2.50	Agreed
17	Lack of funding limits AI implementation in shelving.	61 (16%)	194 (51%)	103 (27%)	23 (6%)	2.60	Agreed
18	There is staff resistance to AI adoption in our library.	68 (18%)	213 (56%)	65 (17%)	34 (9%)	2.50	Agreed
19	The cost of maintaining AI systems for shelving is too high for most libraries.	57 (15%)	281 (74%)	42 (11%)	0 (0%)	2.60	Agreed
20.	There is concern that AI may reduce the need for human involvement in shelving activities.	57 (15%)	209 (55%)	53 (14%)	61 (16%)	2.50	Agreed
	Cluster Mean	**62 (16%)**	**206 (54%)**	**68 (18%)**	**44 (12%)**	**2.54**	**Agreed**

Source: Field Survey, 2025

The results from Table 4 show that respondents identified several key challenges associated with the use of Artificial Intelligence (AI) in shelving. The highest mean scores were for the lack of funding and the high cost of maintaining AI systems (both 2.60), indicating that financial constraints are major barriers to effective AI implementation in library shelving operations. This is followed by staff-related issues such as inadequate training (2.50) and resistance to AI adoption (2.50), suggesting that limited technical capacity and reluctance to embrace new technologies also hinder progress. Additionally, concerns that AI may reduce the need for human involvement in

shelving activities (2.50) highlight underlying fears about job displacement or reduced staff roles. With a cluster mean of 2.54, the findings suggest that while there is agreement on the potential of AI in shelving, its adoption faces practical and human-related challenges, primarily centered around funding limitations, maintenance costs, and staff preparedness.

Table 5: Research Question 5: What are the Strategies for Enhancing AI Integration?

S/N	Statement	SA	A	D	SD	Mean	Remark
21.	More staff training should be provided on AI for shelving.	80 (21%)	209 (55%)	57 (15%)	34 (9%)	**2.95**	Agreed
22	Management should invest in AI infrastructure (e.g., RFID, robots).	68 (18%)	213 (56%)	76 (20%)	23 (6%)	**2.86**	Agreed
23	Staff should be involved in planning AI projects.	95 (25%)	190 (50%)	57 (15%)	38 (10%)	**2.90**	Agreed
24	The university should partner with tech providers for AI solutions.	72 (19%)	228 (60%)	57 (15%)	23 (6%)	**2.92**	Agreed
25.	Policies should guide the ethical use of AI in shelving operations.	76 (20%)	220 (58%)	49 (13%)	34 (9%)	**2.88**	Agreed
	Cluster Mean	**78 (20.5%)**	**211 (55.5%)**	**59 (15.5%)**	**32 (8.5%)**	**2.90**	**Agreed**

Source: Field Survey, 2025

The results from Table 5 show that respondents agreed on several key strategies for enhancing the integration of Artificial Intelligence (AI) in library shelving operations.

The highest mean score was for providing more staff training on AI for shelving (2.95), emphasizing the importance of equipping library staff with the necessary knowledge and skills to effectively use AI tools. This is closely followed by the suggestion that universities should partner with technology providers for AI solutions (2.92) and involve staff in planning AI projects (2.90), highlighting the value of collaboration and inclusive decision-making in successful AI implementation. Respondents also agreed that management should invest in AI infrastructure such as RFID and robots (2.86) and that clear policies should guide the ethical use of AI in shelving operations (2.88), ensuring responsible and sustainable adoption. With a cluster mean of 2.90, the findings indicate that respondents view staff capacity building, institutional investment, collaboration, and ethical guidance as essential strategies for effectively integrating AI into library shelving practices.

Discussion of Findings

The findings of this study reveal that library staff are generally aware of, utilize, and positively perceive the benefits of Artificial Intelligence (AI) in shelving and shelf reading, though they also face challenges in its adoption. The study further highlights several strategies for enhancing AI integration in library operations. These findings are consistent with, and in some cases extend, those of previous research in the field.

This study found a generally high level of awareness of AI among library staff, particularly regarding its role in shelving operations and its discussion in institutional contexts. This aligns with the findings of (Bello & Musa, 2021), who reported that librarians in Nigerian university libraries demonstrated increasing awareness of AI technologies such as robotics and RFID systems. Similarly, (Eke, 2022) observed that awareness was driven by professional training and workshops, which corresponds to the present study's finding that some respondents had attended such programs. Both studies suggest that institutional exposure and professional development are central to AI awareness.

This study found a moderate but positive level of AI utilization, with technologies like RFID and shelf-scanning robots being the most frequently cited. This is consistent with the results of (Kumar & Singh, 2020), who found that many academic libraries have begun partial automation of shelving and cataloging tasks through RFID and machine learning systems. Likewise, (Owolabi et al., 2023) confirmed that while adoption rates are growing, full implementation remains limited by infrastructural and funding challenges. Thus, both the present study and related works conclude that AI utilization in libraries is still in the developmental phase but progressing steadily.

Respondents in this study strongly agreed that AI improves accuracy, reduces human error, saves time, and enhances efficiency. These results are consistent with the findings of (Chen & Lin, 2020), who found that AI-driven systems significantly enhanced

operational accuracy and user satisfaction in East Asian academic libraries. Similarly, (Afolabi & Ajayi, 2022) reported that AI integration leads to improved resource management and user experience. These findings align closely, reinforcing the idea that AI offers tangible efficiency and accuracy benefits in library shelving and related services. This study identified key challenges including inadequate training, lack of funding, maintenance costs, and staff resistance. These are consistent with the challenges outlined by (Anunobi & Ezeani, 2021), who found that financial limitations and staff unpreparedness hindered AI implementation in Nigerian libraries. Additionally, (Noh, 2020) reported that library professionals often fear job loss and role redundancy due to automation, which mirrors the concerns expressed by respondents in the present study. Hence, both studies highlight that socio-economic and human factors are significant obstacles to AI adoption.

The respondents emphasized strategies such as training, institutional investment, partnerships with tech providers, and the creation of ethical AI policies. These strategies are in line with recommendations by (Ifijeh & Yusuf, 2021), who suggested capacity building, collaborative initiatives, and ethical frameworks as key enablers of successful AI adoption in libraries. Similarly, (Rafiq et al., 2022) found that leadership support and continuous professional training are critical for integrating AI technologies effectively into library services.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary

This study examined the awareness and utilization of Artificial Intelligence (AI) in shelving and shelf reading practices within the University of Benin Library system. The primary aim was to assess the extent to which library staff are aware of, utilize, and perceive the benefits and challenges associated with AI in shelving operations. The study also sought to propose practical strategies for enhancing AI integration into library practices. A descriptive survey research design was adopted for the study, as it allowed the collection of opinions, experiences, and factual information from respondents without manipulation of variables. The population of the study comprised all 100 professional librarians, para-professional staff, and library assistants involved in shelving, shelf reading, and stacks management within the John Harris Library and faculty libraries of the University of Benin. Due to the manageable population size, a census sampling technique was employed, including all participants. Data were collected using a self-structured questionnaire titled “Awareness and Utilization of Artificial Intelligence in Shelving and Shelf Reading Practices in the University of Benin Library.” The instrument was validated by experts from the Department of Educational Management, and reliability was tested using the Cronbach Alpha method, with acceptable coefficients

confirming strong internal consistency. Data were analyzed using descriptive statistics such as mean, standard deviation, and percentages.

The findings of the study were as follows;

1. The findings revealed that library staff at the University of Benin have high level of awareness of AI applications in shelving and shelf reading.
2. There is a moderate but positive level of AI utilization in shelving operations.
3. AI enhances shelving accuracy, reduces human error, saves staff time, and improves operational efficiency.
4. Key challenges such as inadequate staff training, limited funding, high maintenance costs, and resistance to technological change.
5. To promote successful AI integration, respondents emphasized the need for continuous staff training, institutional investment in AI infrastructure, collaboration with technology providers, staff inclusion in AI planning, and the establishment of clear ethical and operational policies.

Conclusion

Based on the findings of this study, it can be concluded that Artificial Intelligence (AI) has begun to play a significant role in enhancing shelving and shelf reading practices within the University of Benin Library. The study revealed that library staff possess a high level of awareness of AI technologies, and there is a generally positive attitude

toward their adoption in library operations. Although the utilization of AI tools such as RFID systems, shelf-scanning robots, and automated tracking applications is still moderate, the findings demonstrate that these technologies are already contributing to improved efficiency, accuracy, and service delivery. However, the study also established that effective and sustainable integration of AI in shelving operations is hindered by several challenges, including inadequate training, insufficient funding, high maintenance costs, and some degree of staff resistance to change. Despite these barriers, respondents expressed optimism toward AI adoption and identified key strategies—such as staff development, institutional support, ethical policies, and partnerships with technology providers—as necessary for enhancing AI-driven library operations. Overall, the study concludes that the University of Benin Library is at an early but promising stage in AI adoption, with substantial potential for growth and transformation if the identified challenges are adequately addressed.

Recommendations

In light of the findings and conclusions of this study, the following recommendations are made:

1. The University of Benin Library management should organize regular workshops, seminars, and training sessions to improve staff competence in using AI tools for shelving and shelf reading.

2. The University administration should allocate adequate funding to acquire, maintain, and upgrade AI infrastructure such as RFID systems, autonomous robots, and intelligent shelf-management software.
3. The library should establish partnerships with technology providers, research institutions, and AI developers to facilitate access to technical expertise, innovations, and cost-effective AI solutions.
4. Clear institutional policies should be developed to guide the ethical and responsible use of AI in shelving, ensuring data privacy, fairness, and transparency in all automated processes.
5. Management should actively involve library staff in AI planning and implementation to reduce resistance, encourage ownership, and promote a smooth transition toward automated shelving systems.

Suggestions for Further Studies

Based on the scope and limitations of this study, the following areas are recommended for further research:

1. Future studies could examine the impact of AI adoption on library service quality and user satisfaction across multiple university libraries in Nigeria.
2. Further research could focus on comparative analyses between libraries that have implemented AI solutions and those that rely solely on manual shelving practices.

3. Studies may also explore the ethical implications and workforce dynamics resulting from increased automation in academic libraries.
4. A longitudinal study could be conducted to evaluate the long-term effects of AI training and staff capacity-building programs on library efficiency and innovation.
5. Future research may expand to investigate AI applications in other library functions, such as cataloguing, circulation, and digital preservation.

Contribution to Knowledge

This study contributes to the growing body of knowledge on the application of Artificial Intelligence in library management in the following ways:

1. It provides empirical evidence on the level of awareness and utilization of AI in shelving and shelf reading practices within an academic library context.
2. It identifies the specific benefits and operational challenges associated with AI adoption, thereby offering practical insights for library administrators and policymakers.
3. The study contributes context-specific recommendations and strategies for enhancing AI integration in Nigerian university libraries, particularly within developing-country environments.

4. It establishes a framework for understanding the relationship between staff awareness, utilization, and perceived benefits of AI, which can inform future AI implementation policies in the library sector.
5. Finally, the research serves as a baseline study for future investigations into AI applications in library operations, providing valuable data and direction for academic and professional discourse.

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QUESTIONNAIRE

LIBRARY AND INFORMATION SCIENCE
DEPARTMENT OF EDUCATIONAL MANAGEMENT
FACULTY OF EDUCATION
UNIVERSITY OF BENIN
BENIN CITY

Dear Respondent,

I am an undergraduate student of the Department of Library and Information Science, Faculty of Education, University of Benin. I am conducting a research study titled: **" Assessment Of The Awareness And Utilization Of Artificial Inteligence In Shelving And Shelve Reading Practices In The University Of Benin Library."**

The purpose of this study is to explore the effects of library automation on the performance of librarians, including its benefits, challenges, and the extent of implementation. Your participation is entirely voluntary, and all responses will be kept strictly confidential. The information provided will be used solely for academic purposes. Kindly respond sincerely to each item.

Thank you for your time and cooperation.

Yours faithfully,

(Researcher)

SECTION A: Demographic Data

Demographic Variable	**Response**
Gender	Male ( ) Female ( )
Age	_____ years
Academic Qualification	_____
Years of Experience	_____ years

Demographic Variable **Response**

Job Title _____

SECTION B: Main Questionnaire

SA = Strongly Agree | A = Agree | D = Disagree | SD = Strongly Disagree

Section B

SA- Strongly Agree, A- Agree, D- Disagree, SD – Strongly Disagree

	Items	**SA**	**A**	**D**	**SD**
	What is the level of Awareness of AI in Shelving and Shelf Reading?				
1.	I am aware of the use of AI technologies in library shelving practices..				
2.	I understand how AI systems such as shelf-reading robots operate.				
3.	I have attended training or workshops on AI in libraries.				
4.	The concept of RFID-based shelf scanning is familiar to me.				
5.	AI applications in shelving are discussed in staff meetings or memos.				
	What are the Level of Utilization of AI in the Library's Shelving Operations?	**SA**	**A**	**D**	**SD**
1	AI tools (e.g., RFID, shelf-scanning robots) are used in our library.				
2	Shelving operations have been partially automated.				
3	Shelf-reading tasks are supported by any AI system.				
4	AI is used to track or report missing/misplaced books.				
5	The library has piloted AI applications for stacks management.				
	What are the Perceived Benefits of AI in Shelving?	**SA**	**A**	**D**	**SD**
1	AI can improve shelving accuracy and reduce human error.				
2	AI saves staff time in routine shelf-reading.				

3	The use of AI in shelving enhances the efficiency of library operations.				
4	AI contributes to better organization and easy retrieval of library materials.				
5	The adoption of AI in shelving increases overall user satisfaction with library services.				
	What Are The Perceived Challenges of AI in Shelving?				
1	Staff lack adequate training to use AI tools.				
2	Lack of funding limits AI implementation in shelving.				
3	There is staff resistance to AI adoption in our library.				
4	The cost of maintaining AI systems for shelving is too high for most libraries.				
5	There is concern that AI may reduce the need for human involvement in shelving activities.				
	What are the Strategies for Enhancing AI Integration?				
1	More staff training should be provided on AI for shelving.				
2	Management should invest in AI infrastructure (e.g., RFID, robots).				
3	Staff should be involved in planning AI projects.				
4	The university should partner with tech providers for AI solutions.				
5	Policies should guide the ethical use of AI in shelving operations.				