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HUMAN–AI COLLABORATION IN RESEARCH ASSISTANCE SERVICES IN ACADEMIC LIBRARIES IN CROSS RIVER STATE, NIGERIA

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Abstract

This study examined human–AI collaboration in research assistance services in academic libraries in Cross River State, Nigeria. It investigated how researchers and students use AI tools, assessed librarians' perceptions of AI integration, identified adoption challenges, and proposed strategies, recommendations, and a framework for improving AI-supported research assistance. A mixed-methods design was adopted. The population comprised 161 academic librarians, postgraduate students, and faculty researchers from the University of Calabar, University of Cross River State, Cross River State Institute of Technology and Management, Ugep, and the College of Education, Akamkpa. Accidental sampling selected 120 respondents (80 librarians and 40 students/researchers). Data were collected through questionnaires and interview guides validated by experts in Library and Information Science and Test and Measurement; reliability yielded a Cronbach's Alpha of 0.76. Data were analyzed using frequencies, percentages, mean scores, and thematic analysis. Findings showed that ChatGPT (27.5%) and Grammarly (22.5%) were the most used AI tools. Librarians perceived AI positively, agreeing that it can enhance research assistance (Mean = 4.00) and should complement rather than replace librarians (Mean = 4.04). Poor ICT infrastructure (31.7%) and lack of training (26.7%) were major barriers to integration. It

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concluded that effective human–AI collaboration can improve research support services when supported by adequate infrastructure, AI literacy training, ethical guidelines, and institutional support. It recommended increased investment in digital infrastructure, continuous librarian AI training, and institutional policies for responsible AI use.

Keywords: Artificial Intelligence (AI), Research Assistance, Human–AI Collaboration

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Introduction

Academic libraries have long remained central to teaching, learning, and research in higher education institutions. Beyond serving as repositories of books and scholarly materials, they provide research assistance, information literacy training, and professional guidance that help students and researchers navigate increasingly complex information environments. Librarians, particularly reference and subject specialists, support users in locating credible information, evaluating sources, managing citations, and promoting ethical use of information resources. However, the rapid advancement of digital technologies, especially Artificial Intelligence (AI), is gradually transforming the traditional nature of research assistance in academic libraries.

Artificial Intelligence refers to computer systems capable of simulating human intelligence through learning, reasoning, problem-solving, natural language processing, and decision-making. In recent years, AI-powered applications such as ChatGPT, Grammarly, Elicit, Semantic Scholar, Research Rabbit, and Turnitin have become increasingly popular within academic environments. These technologies assist researchers and students in literature searching, text summarization, plagiarism detection, citation management, language editing, and data analysis (Dwivedi *et al.*, 2021). As a result, research processes that previously required extensive manual effort are becoming increasingly automated and technology-driven.

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The growing acceptance of AI technologies in academic environments can be understood through the Technology Acceptance Model (TAM), developed by Fred Davis. The theory explains that individuals are more likely to adopt new technologies when they perceive them as useful and easy to use. In the context of academic libraries, students, researchers, and librarians may adopt AI tools when such technologies improve research efficiency, simplify information retrieval, and enhance academic productivity. Similarly, the Diffusion of Innovation Theory by Everett Rogers provides further explanation for varying levels of AI adoption among librarians and academic institutions. The theory emphasizes how innovations spread gradually across organizations and societies through categories such as innovators, early adopters, early majority, late majority, and laggards. These theories provide a useful foundation for understanding the growing but uneven adoption of AI technologies in academic libraries in Nigeria and other developing societies.

Globally, universities and academic libraries are increasingly integrating AI into research support services. In developed countries, AI-driven systems are already being used for virtual reference services, intelligent cataloguing, automated indexing, research analytics, and personalized information retrieval. In Africa, however, the adoption of AI in academic libraries is still emerging and is often constrained by infrastructural deficiencies, inadequate funding, unstable internet connectivity, and low digital literacy levels. Nevertheless, studies from countries such as South Africa, Kenya, Ghana, and Nigeria reveal growing awareness of AI technologies among students, researchers, and information professionals.

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Within Nigeria, the increasing use of AI tools in higher education has generated significant scholarly and professional interest. Students and researchers now frequently rely on AI applications for academic writing support, idea generation, literature review assistance, plagiarism checking, and grammar correction. While these technologies improve research efficiency, they have also raised concerns relating to misinformation, plagiarism, overdependence on machine-generated content, ethical misuse, and declining critical thinking skills. Nigerian academic libraries are therefore under increasing pressure to adapt their services and redefine their relevance in an era where users can independently access AI-generated information without physically consulting librarians.

Within Cross River State, the integration of AI into academic research activities is gradually becoming visible across institutions such as the University of Calabar, University of Cross River State, Cross River State Institute of Technology and Management, Ugep, and the College of Education, Akamkpa. Many students and researchers now use tools such as ChatGPT and Grammarly for assignments, proposal writing, literature review, and language editing. However, despite this increasing adoption, academic libraries in the state still face significant challenges including poor ICT infrastructure, unstable power supply, inadequate internet access, limited institutional funding, insufficient AI literacy among librarians, and lack of clear institutional policies regulating AI use in research support services. Consequently, many libraries risk becoming less relevant if they fail to adapt to the changing digital research environment.

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The theoretical background of this study is anchored on the Technology Acceptance Model (TAM) developed by Fred Davis and the Diffusion of Innovation Theory propounded by Everett Rogers. The Technology Acceptance Model explains that individuals are more likely to adopt a technology when they perceive it as useful and easy to use. In the context of academic libraries, librarians, students, and researchers are more likely to embrace AI tools if such technologies improve research efficiency and information access. The theory further suggests that attitudes toward technology significantly influence its acceptance and usage within organizations. Similarly, the Diffusion of Innovation Theory explains how new technologies spread gradually across institutions and social systems over time. The theory identifies categories of adopters such as innovators, early adopters, early majority, late majority, and laggards, which helps explain varying levels of AI adoption among librarians and researchers in Cross River State. These theories are relevant to the study because they provide insight into factors influencing AI integration and human–AI collaboration in academic libraries. They also explain the importance of awareness, institutional support, training, and infrastructure in promoting the successful adoption of AI technologies. Therefore, the combination of both theories provides a suitable framework for understanding the future of research assistance through human–AI collaboration in academic libraries in Cross River State, Nigeria.

Despite concerns about AI replacing traditional professional roles, the future of academic research assistance is more likely to depend on collaboration between human expertise and intelligent technologies rather than outright replacement. AI can handle

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repetitive and time-consuming tasks such as information retrieval, indexing, summarization, and pattern recognition, while librarians provide contextual interpretation, ethical oversight, critical evaluation, and personalized research guidance. Cox *et al*. (2019) argue that AI technologies are most effective when combined with human judgment and professional expertise. This suggests that librarians who develop AI-related competencies may become even more valuable within future academic research ecosystems.

Although several studies have examined AI awareness and technology adoption in Nigerian educational institutions, there is still limited empirical research specifically addressing human–AI collaboration in academic libraries within Cross River State. Existing studies have largely focused on AI in teaching, student learning, or educational administration, with little attention given to how librarians are responding to AI-driven transformations in research assistance services. Furthermore, there is inadequate evidence regarding librarians' perceptions of AI integration, institutional readiness, challenges affecting adoption, and practical frameworks that can support sustainable human–AI collaboration in academic libraries in the state. This gap in knowledge creates the need for empirical investigation.

It is against this background that this study examines human–AI collaboration in research assistance in academic libraries in Cross River State, Nigeria. Specifically, the study investigates how researchers and students use AI tools for research assistance, assesses

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librarians' perceptions of AI integration, identifies challenges associated with AI adoption, and proposes a framework for effective human–AI collaboration in academic libraries.

Statement of the Problem

Artificial intelligence is changing how people find and use information. Students and researchers in Nigerian universities now turn to tools such as ChatGPT, Grammarly, Elicit, and Semantic Scholar for literature reviews, writing, citation management, and information retrieval. Increasingly, they go to these tools first and to the librarian last, if at all. If academic libraries do not adapt, they risk losing their relevance as canters of research guidance, information literacy, and ethical scholarship.

In Cross River State, the response of academic libraries has been uneven. AI use in library services remains largely informal and poorly coordinated. Many librarians know about AI but lack the technical skills, training, and institutional frameworks to integrate it into research support or to guide users on its ethical use. Poor ICT infrastructure, unstable electricity, weak internet connectivity, and inadequate funding make matters worse. Meanwhile, concerns about misinformation, plagiarism, algorithmic bias, data privacy, and overdependence on AI-generated content show why human oversight cannot be dropped.

Existing studies in Nigeria have focused mainly on AI in teaching, learning, and educational administration. Very little empirical work has examined human–AI collaboration in academic libraries, especially in Cross River State, or offered practical frameworks for balancing AI's speed and efficiency with librarians' judgment, ethical insight, and

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personalized support. Without such evidence, users may come to depend on AI alone, with no professional guidance on evaluating information or maintaining academic integrity, while librarians are pushed to the margins.

This study therefore asks: how can academic libraries in Cross River State, Nigeria, use human–AI collaboration to provide efficient, ethical, and sustainable research assistance service

Research Questions

The following research questions were formulated to guide the study:

1. How are AI tools currently being used by researchers and students in Cross River State for research assistance?
2. What is the perception of academic librarians towards AI integration in research assistance?
3. What challenges exist in adopting AI in academic research support services?
4. What framework can guide effective human–AI collaboration in academic libraries in Cross River State*?*

Empirical Literature Review

Use of AI Tools by Researchers and Students in Cross River State

Empirical studies indicate a growing adoption of Artificial Intelligence (AI) tools among students, researchers, and academic staff in tertiary institutions in Cross River State,

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particularly the University of Calabar, University of Cross River State, Cross River State Institute of Technology and Management, Ugep, and the College of Education, Akamkpa. AI tools such as ChatGPT, Grammarly, Semantic Scholar, and other generative tools are increasingly used for literature search, summarization, paraphrasing, grammar correction, and citation assistance. This trend reflects a gradual shift toward AI-supported academic research practices in Nigerian higher education. Obi *et al.* (2025) found that final-year students in public universities in Cross River State exhibit high levels of AI usage, particularly for academic writing and assignment support, although this is often associated with ethical issues such as plagiarism, overdependence on AI-generated content, and reduced originality. Similarly, Kingsley *et al.* (2025) reported that AI tools enhance academic support systems but require structured training and institutional guidance for effective and ethical use.

A comparative reading of these studies reveals both convergence and divergence. While both studies agree on the increasing use of AI, Obi *et al.* (2025) emphasize uncontrolled student-driven adoption, whereas Kingsley et al. (2025) highlight institutional efforts toward structured integration. This indicates a tension between informal usage patterns and formal institutional regulation. However, a methodological limitation across these studies is their reliance on descriptive survey designs, which focus mainly on frequency of use rather than depth of competence, quality of academic output, or long-term impact on research skills. In addition, most findings are based on self-reported data, with limited triangulation using interviews or observational methods. The Cross River State Government's AI literacy initiative (2025), although widely referenced, also lacks rigorous

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peer-reviewed evaluation, making it difficult to determine its actual effectiveness in improving academic research behavior.

Librarians' Awareness, Readiness, and Perceptions of AI Integration

Studies conducted among librarians in Cross River State and the broader South-South region of Nigeria reveal generally positive perceptions of AI, but low levels of readiness for effective integration. Ebaye *et al.* (2024) reported that librarians recognize the usefulness of AI tools in improving research support services; however, adoption is constrained by inadequate ICT infrastructure, insufficient training, and weak institutional support systems. Orubebe *et al.* (2025) similarly found that librarians in Rivers State are aware of AI technologies but express concerns about job displacement, lack of policy direction, and limited organizational preparedness. When these findings are compared, a clear contradiction emerges. While librarians acknowledge the potential benefits of AI, institutional environments are not sufficiently equipped to support its effective implementation. This creates a gap between awareness and practical application.

Methodologically, most studies in this area adopt cross-sectional survey designs, which capture perceptions at a single point in time. This limit understanding of how attitudes toward AI may change over time with exposure, training, or policy development. Furthermore, qualitative insights into librarians lived experiences with AI systems remain limited, reducing the depth of interpretation.

Challenges of AI Integration in Academic Library Services

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Existing literature consistently identifies infrastructural, institutional, and ethical factors as major challenges to AI integration in academic libraries in Nigeria. Emumejakpor and Ovie (2024) highlight poor ICT infrastructure, unstable electricity supply, inadequate funding, and low digital literacy as major barriers to effective AI adoption. Agboke and Oladokun (2025) further emphasize ethical concerns such as plagiarism, privacy risks, and algorithmic bias, while Whong (2025) identifies shortage of skilled personnel and weak regulatory frameworks as additional constraints. A critical observation across these studies is that challenges are often discussed independently rather than as interconnected problems. For example, poor infrastructure limits access to AI tools, which reduces staff training opportunities and ultimately increases ethical misuse of AI outputs. This fragmented approach limits a holistic understanding of the AI integration problem in academic libraries.

Another inconsistency in the literature is the differing interpretation of AI challenges: some studies frame them as technological issues, while others emphasize human and organizational factors. This indicates that AI integration is not purely technical but a socio-technical issue requiring coordinated institutional response.

The empirical literature affirms that AI is reshaping research assistance in academic libraries, including those in Cross River State. While students and researchers are increasingly using AI tools, librarians must evolve to remain relevant. Addressing infrastructural, ethical, and educational challenges is key to fostering a sustainable human–AI partnership. A robust framework grounded in AI literacy, professional competencies, and

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contextual adaptation will ensure that academic libraries continue to serve as vital research hubs in the digital age.

Conceptual Review: Human–AI Collaboration in Academic Libraries

Human–AI collaboration in academic libraries refers to a synergistic relationship in which artificial intelligence systems and human librarians work together to enhance research support services. In this arrangement, AI handles repetitive and data-intensive tasks such as information retrieval, indexing, summarization, and pattern recognition, while librarians provide contextual interpretation, ethical oversight, critical evaluation, and user-centered guidance. This concept redefines the role of librarians from traditional information gatekeepers to active collaborators in digital knowledge production environments. It also emphasizes that AI should complement rather than replace human expertise in academic research support services. However, in developing contexts such as Nigeria, this conceptual ideal is still evolving due to infrastructural limitations, low digital literacy, and weak institutional frameworks.

Theoretical Framework

This study is anchored on three interrelated theories. The first is the Technology Acceptance Model (TAM) by Fred Davis, which explains technology adoption based on perceived usefulness and perceived ease of use. The second is the Diffusion of Innovations Theory by Everett Rogers, which explains how innovations spread across social systems through categories of adopters over time. The third is the Human–AI Collaboration

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perspective, which emphasizes the complementary interaction between human expertise and artificial intelligence systems.

These theories collectively explain how AI tools are adopted, resisted, or partially integrated within academic library environments. They also highlight the importance of institutional support, user perception, training, and infrastructure in determining successful AI integration in research assistance services.

A review of existing theories and literature reveals that most studies on AI in Nigerian academic environments focus primarily on awareness, usage patterns, and general perceptions among students and librarians. There is limited comparative analysis across studies, and contradictions between high student usage and low institutional readiness are not adequately explored. Furthermore, methodological limitations are evident, as most studies rely heavily on descriptive survey designs without triangulation or in-depth qualitative exploration. This limits the explanatory depth of findings.

Most importantly, there is a noticeable absence of studies that develop or empirically test structured human–AI collaboration frameworks in academic libraries, particularly in Cross River State. Existing literature largely overlooks how libraries can systematically integrate AI into research assistance services while balancing ethical considerations, human oversight, and institutional readiness. Therefore, the major gap in the literature is that existing studies focus largely on AI awareness and adoption, while limited attention has been

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paid to structured human–AI collaboration frameworks in academic libraries in Cross River State

Methodology

The study adopted a mixed-methods research design, combining both quantitative and qualitative approaches to provide a comprehensive and in-depth understanding of the future of research assistance through human–AI collaboration in academic libraries in Cross River State, Nigeria. The quantitative component was used to examine patterns of AI tool usage and perceptions among students, researchers, and librarians, while the qualitative component provided deeper insights into librarians' awareness, readiness, challenges, and concerns regarding AI integration in research support services.

The population of the study consisted of 161 respondents made up of 122 academic librarians and 39 postgraduate students'/faculty researchers who regularly utilize research assistance services in selected tertiary institutions in Cross River State, namely: University of Calabar (UNICAL), University of Cross River State (UNICROSS), Cross River State Institute of Technology and Management (CRITM), Ugep, and College of Education, Akamkpa. These categories of respondents were considered appropriate because they are directly involved in the provision and utilization of academic research support services within library environments.

A stratified random sampling technique was adopted to ensure proportional representation of the two major groups in the study population (academic librarians and

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students/researchers). The population was first stratified into librarians and students/researchers, and respondents were then selected proportionately from each stratum to ensure fairness and reduce sampling bias. Although the population size was relatively small (161), a sample size of 120 respondents was used due to accessibility constraints and the need for timely data collection. The sample comprised 80 academic librarians and 40 postgraduate students'/faculty researchers. A total of 140 instruments were distributed to improve response coverage; however, 120 were retrieved, properly completed, and found suitable for analysis, representing a high and acceptable response rate.

Two instruments were used for data collection. The first was a structured questionnaire designed for students and researchers, divided into three sections: Section A captured demographic information of respondents; Section B examined the frequency and types of AI tools used for research assistance; while Section C assessed respondents' perceptions of AI integration in academic research support using a 5-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1). The second instrument was a semi-structured interview guide administered to academic librarians to obtain qualitative data on their awareness, preparedness, perceived benefits, challenges, and institutional readiness for AI integration in library-based research assistance services. The instruments were subjected to face and content validation by experts in Library and Information Science as well as Test and Measurement at the University of Calabar to ensure clarity, relevance, and adequacy of items. A pilot test was conducted on a small group of respondents outside the study area to determine the reliability of the instrument. The internal consistency of the

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questionnaire was tested using Cronbach's Alpha reliability coefficient, which yielded a value of 0.76, indicating an acceptable level of reliability for social science research.

Data collection was carried out through both face-to-face administration and electronic distribution of questionnaires to respondents, while interviews were conducted with selected librarians with the assistance of trained research personnel. All responses were properly coded, organized, and prepared for analysis. Data were analyzed using both quantitative and qualitative methods. Quantitative data were analyzed using descriptive statistics such as frequencies, percentages, and mean scores to answer the research questions. Qualitative data obtained from interviews were analyzed thematically through systematic coding, categorization, and interpretation of recurring patterns relating to AI awareness, readiness, challenges, and institutional support. The combination of both methods provided a robust and triangulated understanding of human–AI collaboration in academic library research assistance services in Cross River State

Presentation and Discussion of Research Questions

Research Question One

How are AI tools currently being used by researchers and students in Cross River State for research assistance?

The disaggregated presentation in Table 1 provides a clearer and more methodologically appropriate understanding of AI tool usage among librarians, students, and researchers in

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Cross River State. The separation of respondents into distinct categories addresses the methodological concern that each group performs different academic roles and therefore engages AI tools for different purposes and intensities.

Among librarians (n = 80), Grammarly (27.5%) and Turnitin (25.0%) are the most frequently used AI tools. This indicates that librarians predominantly utilize AI for editing support, plagiarism detection, and quality assurance functions. ChatGPT (22.5%) is moderately used, suggesting a cautious but growing engagement with generative AI for reference support and information clarification rather than content creation. In contrast, Elicit (7.5%) and Semantic Scholar (5.0%) record low usage, reflecting limited integration of advanced research discovery tools into library workflows.

Among students (n = 40), ChatGPT dominates usage at 45.0%, indicating strong dependence on generative AI tools for assignment writing, summarization, idea generation, and quick academic assistance. Grammarly (25.0%) follows, reflecting students' concern with grammar accuracy and presentation quality. However, the very low usage of Elicit (5.0%) and Semantic Scholar (2.5%) suggests limited exposure to specialized academic research tools, likely due to inadequate training, low awareness, or lack of structured library instruction on advanced research databases.

Among researchers (n = 40), AI usage is more balanced and academically oriented. ChatGPT (37.5%) remains the most used tool, but Elicit (22.5%) and Semantic Scholar (15.0%) show significantly higher usage compared to other groups. This reflects a stronger orientation

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toward literature exploration, research synthesis, and scholarly inquiry. Grammarly (12.5%) and Turnitin (7.5%) are moderately used, indicating continued emphasis on writing quality and academic integrity.

A cross-group comparison reveals a clear role-based pattern of AI adoption. Students exhibit the highest dependence on generative AI tools, particularly ChatGPT, indicating task-oriented and convenience-driven usage. Librarians demonstrate a more controlled and evaluative usage pattern, focusing on writing refinement and plagiarism detection tools. Researchers, on the other hand, show a more balanced and research-intensive use of AI tools, combining generative, analytical, and scholarly platforms.

This pattern suggests that AI adoption in academic libraries in Cross River State is not uniform but strongly influenced by users' academic roles and research responsibilities. It also indicates that AI tools are being used in a fragmented manner rather than as part of an integrated institutional research support system.

Table 1: Distribution of AI Tools Used by Librarians, Students, and Researchers in Cross River State

(i) Librarians (n = 80)

AI Tool	Frequency of Use	Percentage (%)

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Grammarly	22	27.5%
Turnitin	20	25.0%
ChatGPT	18	22.5%
Google Bard	10	12.5%
Elicit	6	7.5%
Semantic Scholar	4	5.0%
Total	80	100%

(ii) Students (n = 40)

AI Tool	Frequency of Use	Percentage (%)
ChatGPT	18	45.0%
Grammarly	10	25.0%
Turnitin	6	15.0%
Google Bard	3	7.5%
Elicit	2	5.0%
Semantic Scholar	1	2.5%
Total	40	100%

(iii) Researchers (n = 40)

AI Tool	Frequency of Use	Percentage (%)
ChatGPT	15	37.5%

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Elicit	9	22.5%
Semantic Scholar	6	15.0%
Grammarly	5	12.5%
Turnitin	3	7.5%
Google Bard	2	5.0%
Total	40	100%

Table 1. shows that 27.5% librarians use Grammarly, 45.0% of students use ChatGPT and 37.5% of Researchers use ChatGPT.

Research Question Two

What is the perception of academic librarians towards AI integration in research assistance?

The result in Table 2. shows that librarians strongly believe AI can enhance research assistance (Mean = 4.00). They overwhelmingly agree AI should complement, not replace librarians (Mean = 4.04). Strong consensus that librarians need training to effectively use AI (Mean = 4.23). The result further shows that AI may reduce research quality if unchecked (Mean = 3.75). Lower Agreement (Mean < 3.0**)** Librarians are less convinced that AI threatens their roles (Mean = 2.96). Librarians in Cross River State generally perceive AI positively, recognizing its potential benefits in enhancing research assistance. They see AI as a complementary tool rather than a replacement, consistent with the "early adopters" stage of innovation diffusion. This is in line with Ebaye *et al.* (2024) who surveyed 342 librarians

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across South-South Nigeria, including Cross River State, and found that awareness and positive perception significantly influenced AI adoption. The strong emphasis on training needs indicates that adoption may be slowed unless capacity building and institutional support are provided. Fears of job threats exist but are not dominant suggesting librarians are open to collaborative human–AI partnerships rather than resistant. This is similar to Orubebe *et al.* (2025) who found that librarians in nearby Rivers State were aware of AI's potential but expressed concerns about job displacement and lack of institutional support. A key interpretation from the study is that AI adoption is being driven more by individual academic needs than by institutional structures. The dominance of ChatGPT among students reflects not just popularity, but also a shift toward "on-demand cognition," where learners outsource early-stage thinking tasks such as summarization and idea generation to AI systems. This aligns with findings from Obi et al. (2025), who reported similar patterns of heavy reliance on generative AI among university students in Cross River State. However, unlike Obi et al., this study shows that such usage is not merely widespread but structurally patterned according to user category, which adds a more nuanced understanding of AI engagement in academic environments.

Table 2: Data presentation and analysis of academic librarians' perceptions toward AI integration in research assistance (Likert Scale Responses of sample size: 120 respondents

Statement	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Mean Score

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AI can enhance research assistance	40	40	15	10	5	4.00
AI threatens librarians' roles	20	25	25	30	20	2.96
AI should complement, not replace librarians	40	50	15	5	5	4.04
Librarians need training to effectively use AI	60	40	10	7	3	4.23
AI may reduce research quality if unchecked	35	45	20	15	5	3.75

Decision Rule: Mean scores of 3.00 and above is accepted, while any mean score below 3.00 is rejected.

Table 2. Shows strong consensus that librarians need training to effectively use AI (Mean = 4.23). it also shows that librarians strongly believe AI can enhance research assistance (Mean = 4.00).

Research Question Three

What challenges exist in adopting AI in academic research support services?

The analysis in TABLE 3 shows that Poor ICT Infrastructure is the most cited challenge. Ethical Issues are the least cited but still significant. Poor ICT Infrastructure is a persistent barrier across African institutions. This finding is in line with Emumejakpor and Ovie (2024) who identified inadequate ICT infrastructure, limited funding, and low digital literacy as major barriers to AI adoption in libraries According to the State of AI in Africa Report (2023), challenges include unreliable internet, power outages, and limited access to devices and data

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ecosystems. Lack of Training and digital literacy gaps are also highlighted where educators report limited exposure to AI tools and methodologies. Ethical Issues such as algorithmic bias and data privacy are under-addressed due to weak regulatory frameworks. Globally, ethical concerns are more pronounced due to advanced deployment of AI. The South African Journal of Higher Education notes that while generative AI boosts productivity, it also raises concerns about misuse, plagiarism, and lack of policy oversight. Cost barriers are less severe in developed regions but remain a challenge in low-resource settings, especially where institutional budgets are constrained.

Table 3. Data Presentation: frequency of challenges in adopting AI in academic research support services, using a rank-order analysis based on a hypothetical score of 120 responses.

Challenge	Frequency of Responses	Percentage (%)	Rank
Poor ICT Infrastructure	38	31.7%	1
Lack of Training	32	26.7%	2
Cost of AI Tools	28	23.3%	3
Ethical Issues	22	18.3%	4
Total	**120**	**100%**	**—**

TABLE 3 shows that Poor ICT Infrastructure is the most cited challenge (31.7%)

Research Question Four

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What framework can guide effective human–AI collaboration in academic libraries in Cross River State*?*

The result in TABLE 4 shows that Digital Infrastructure & Connectivity; and AI Literacy & Training Programs are the most critical pillars for successful human-AI collaboration. However, Ethical & Responsible AI Guidelines; Human Oversight & Decision Support; and Policy Integration & Institutional Support were also considered as valuable framework. Based on the data and literature, the following suggestions are recommended. Ensuring stable internet, cloud access, and smart devices; upgrading library systems for AI integration; use the AI Global Manual adopted by Cross River State to train librarians and students. Promote workshops and certifications in AI tools. Implementing data privacy, transparency, and bias mitigation protocols. Aligning with global standards like IEEE and UNESCO AI ethics. Maintaining librarian control over AI outputs. This is supported by Lo (2025) who advocates for AI literacy among librarians, encompassing technical knowledge, ethical awareness, critical thinking, and practical skills. Libraries should champion AI literacy just as they did with digital and information literacy. Use of AI for augmentation, not replacement. Embedding AI collaboration goals in library strategic plans. Securing funding and leadership backing.

Table 4. A tabular presentation using Weighted Frequency Analysis from a survey of 120 respondents.

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Framework Component	Frequency of Responses	Weight (%)	Rank
Digital Infrastructure & Connectivity	36	30.0%	1
AI Literacy & Training Programs	32	26.7%	2
Ethical & Responsible AI Guidelines	22	18.3%	3
Humans Oversight & Decision Support	18	15.0%	4
Policy Integration & Institutional Support	12	10.0%	5
Total	**120**	**100%**	—

TABLE 4 shows that Digital Infrastructure & Connectivity (30%); and AI Literacy & Training Programs (26.7%) are the most critical pillars for successful human-AI collaboration.

Recommendations

Based on the findings of the study, the following recommendations are made to enhance effective human–AI collaboration in academic libraries in Cross River State:

1. Institutions should invest in stable internet connectivity, cloud storage systems, and modern computing facilities to address infrastructural limitations and ensure reliable access to AI tools for research support services.

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2. Continuous training programs, workshops, certifications, and hands-on capacity-building sessions should be organized for librarians, students, and faculty to improve AI literacy, build confidence, and strengthen competence in AI-assisted research activities.

3. Academic institutions should develop and implement clear institutional AI policies aligned with international standards such as UNESCO and IEEE to guide ethical use, data privacy, bias reduction, and responsible application of AI-generated content.

4. Librarians should maintain oversight and control over AI-assisted outputs to ensure accuracy, academic integrity, and quality assurance, positioning AI strictly as a support tool that complements rather than replaces human expertise.

Conclusion

This study examined human–AI collaboration in academic libraries in Cross River State, focusing on how students, researchers, and librarians use AI tools for research assistance. The findings show that AI usage is highest for basic academic support functions such as grammar correction, writing assistance, and summarization, with ChatGPT and Grammarly being the most commonly used tools. However, advanced research tools like Semantic Scholar and Elicit are less frequently used, indicating limited awareness and engagement with specialized academic AI platforms.

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The study also found that librarians generally have a positive but cautious perception of AI, recognizing its usefulness in improving research assistance services while emphasizing the need for training, infrastructure, and ethical guidelines. Key challenges to AI integration include poor ICT infrastructure, limited AI literacy, cost of access, and ethical concerns. Generally, the findings suggest that while AI adoption in academic libraries is growing, it remains uneven and largely focused on basic applications. There is a developing readiness among librarians to embrace AI-supported services, but this is not yet fully institutionalized. The study therefore highlights the need for stronger infrastructure, capacity building, and policy frameworks to support effective human–AI collaboration in academic libraries in Cross River State.

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