



**ADOPTION AND UTILIZATION OF AI-POWERED CHATBOTS FOR USER ASSISTANCE
 BY ACADEMIC LIBRARIANS IN SELECTED UNIVERSITY LIBRARIES IN KANO STATE,
 NIGERIA**

Aliyu H. A¹, Sahabi, M. K², Adamu S. M³

¹The Academy Library, Nigeria Police Academy, Wudil, Kano State, Nigeria

aliyuhidar@gmail.com, ORCID 0000000291768212

²Department of Library and Information Science, Kaduna State University, Kaduna,
 Nigeria, sahabikabir@gmail.com

³Department of Library and Information Science, Federal University Dutse, Jigawa,
 Nigeria, asmadaki@fud.edu.ng

Corresponding author: Haidar Aliyu Abubakar - aliyuhidar@gmail.com, ORCID
 0000000291768212

Abstract

The emergence of artificial intelligence (AI) has created new possibilities for transforming information and reference services in academic libraries. AI-powered chatbots can provide conversational assistance, answer routine enquiries, support resource discovery and extend library services beyond conventional service hours. However, successful implementation depends on technological readiness, librarian competence and institutional support. This study examined the adoption and utilization of AI-powered chatbots for user assistance by academic librarians in selected university libraries in Kano State, Nigeria. An explanatory sequential mixed-methods design was adopted. The population comprised professional librarians and library users in three universities representing federal, state and private ownership. A total of 110 librarians were selected through census sampling, and 240 library users were selected through systematic random sampling, yielding a total sample of 350 respondents. Six to ten library administrators and ICT personnel were additionally recruited for semi-structured interviews. Data were collected using the AI Chatbot Adoption and Utilization Questionnaire (AICAUQ) and a semi-structured interview guide. Quantitative data were analysed using frequency, percentage, mean, standard deviation, Pearson Product Moment Correlation and multiple regression, while qualitative data were analysed thematically. Findings indicated that technological readiness, AI-related digital competence and institutional support are significant factors associated with chatbot utilization. The study recommends investment in digital infrastructure, continuous AI competency development, institutional policies and phased implementation of AI-powered chatbot services in university libraries.

Keywords: *Artificial Intelligence; AI-Powered Chatbots; Academic Libraries; Technology Adoption; User Assistance; Digital Competence; Kano State; Nigeria*

Introduction

AI-powered chatbots are particularly relevant to library user assistance because they provide a conversational interface through which users can interact with library systems. Chatbots can potentially answer frequently asked questions, provide information about library opening hours and services, guide users to resources, support basic reference enquiries and direct users towards appropriate information sources. Systematic reviews of AI applications in academic library reference services have identified chatbots and conversational technologies as emerging tools for improving the accessibility and responsiveness of reference services, while also noting concerns relating to accuracy, privacy, bias, cost and staff expertise (Yan et al., 2023).

Artificial intelligence (AI) has become an important component of contemporary digital transformation. AI technologies are increasingly being applied to information retrieval, natural-language processing, recommendation systems, conversational services and automated assistance. Within academic libraries, these developments provide opportunities to complement conventional reference and information services with intelligent digital tools. The application of AI in libraries, however, is not simply a technological issue. Successful adoption requires adequate infrastructure, appropriate institutional policies, staff competence and management support. Research on AI adoption in academic libraries has identified technological infrastructure, human capital, digital competence, policy, funding and privacy as important considerations in implementation (Tornatzky & Fleischer, 1990; Venkatesh et al., 2003).

In Nigeria, academic libraries operate within an environment in which universities are increasingly adopting digital technologies while simultaneously confronting infrastructure and human-resource constraints. Nigerian studies have reported growing awareness of AI applications among librarians but have also identified challenges associated with skills, infrastructure, funding, policy and ethical concerns (Ilo et al., 2020; Okonedo & Popoola, 2022). Kano State presents a useful environment for investigating these issues because its university sector includes institutions with different ownership structures. Federal, state and private universities may differ in infrastructure, funding arrangements, management structures and institutional policies.

Such differences provide an opportunity to examine the conditions associated with AI chatbot adoption across different university environments.

The present study therefore focuses specifically on AI-powered chatbots for user assistance, rather than AI adoption in academic libraries generally. The study examines technological readiness, AI-related digital competence and institutional support as factors associated with chatbot adoption and utilization among academic librarians in Kano State.

Statement of the Problem

Academic libraries are expected to provide timely and accessible information assistance to students, researchers and other members of the university community. Conventional reference services, including physical help desks and direct librarian–user interactions, remain important, but digital transformation has created opportunities for extending some forms of assistance through automated conversational technologies.

AI-powered chatbots offer potential support for routine enquiries, resource navigation and basic information assistance. However, the availability of chatbot technology does not automatically guarantee successful adoption or effective utilization. Libraries require adequate ICT infrastructure, reliable internet connectivity, technically competent staff, management support, appropriate policies and financial resources.

Research conducted internationally has identified challenges involving chatbot accuracy, privacy, system integration, natural-language understanding and librarian expertise (Yan et al., 2023). Nigerian studies have similarly identified infrastructure, funding, skills, institutional support and policy as important factors in AI adoption within academic libraries (Okonedo & Popoola, 2022; Ilo et al., 2020).

Despite increasing interest in AI in Nigerian university libraries, there remains limited empirical evidence specifically concerning the adoption and utilization of AI-powered chatbots for user assistance in university libraries in Kano State. Empirical evidence is required to establish the level of technological readiness, the competence of librarians, the degree of institutional support and the extent to which these factors relate to chatbot utilization. The problem addressed by this study is therefore the limited empirical evidence on the technological, human and institutional factors associated with the adoption and utilization of AI-powered chatbots for user assistance in university libraries in Kano State, Nigeria.

Objectives of the Study

The general aim of this study is to examine the adoption and utilization of AI-powered chatbots for user assistance by academic librarians in selected university libraries in Kano State. Specifically, the study seeks to:

- 1- assess the level of technological readiness for AI-powered chatbot adoption by academic librarians in selected university libraries in Kano State;
- 2- determine the level of AI-related digital competence by academic librarians in selected university libraries in Kano State;
- 3- examine the level of institutional support for AI-powered chatbot adoption by academic librarians in selected university libraries in Kano State;
- 4- determine the level of adoption of AI-powered chatbots for user assistance by academic librarians in selected university libraries in Kano State;
- 5- determine the extent of utilization of AI-powered chatbots for user assistance by academic librarians in selected university libraries in Kano State;
- 6- identify barriers affecting chatbot adoption by academic librarians in selected university libraries in Kano State

4.. Research Questions

The following research questions guided the study:

- 1- What is the level of technological readiness for AI-powered chatbot adoption among academic librarians in Kano State?
- 2- What is the level of AI-related digital competence among academic librarians in selected university libraries in Kano State?
- 3- What is the level of institutional support for AI-powered chatbot adoption in the selected university libraries in Kano State?
- 4- What is the level of adoption of AI-powered chatbots for user assistance by academic librarians in selected university libraries in Kano State?
- 5- What is the extent of chatbot utilization for user assistance in the selected university libraries in Kano State?
- 6- What barriers affect chatbot adoption in university libraries in Kano State?

Research Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

H₀₁: There is no significant relationship between technological readiness and utilization of AI-powered chatbots for user assistance among academic librarians in selected university libraries in Kano State.

H₀₂: There is no significant relationship between AI-related digital competence and utilization of AI-powered chatbots for user assistance.

H₀₃: There is no significant relationship between institutional support and utilization of AI-powered chatbots for user assistance.

H₀₄: Technological readiness, AI-related digital competence and institutional support do not jointly and significantly predict the utilization of AI-powered chatbots for user assistance.

Literature Review

Artificial Intelligence in Academic Libraries

AI refers broadly to computational systems capable of performing tasks that normally require aspects of human intelligence, including learning, language understanding, pattern recognition and decision support. In academic libraries, AI applications have expanded into information discovery, reference services, recommendation systems, metadata generation and conversational assistance (Dali & Raju, 2023; Yan et al., 2023).

The literature broadly suggests that AI can complement librarians' professional functions rather than simply replace them. Routine enquiries may be handled through automated systems while librarians concentrate on complex research consultations, information-literacy instruction and specialised reference work. Nonetheless, concerns about accuracy, bias and ethical implications remain prominent in the scholarly discourse (Siu & Martell, 2021).

AI-Powered Chatbots

An AI-powered chatbot is a software system that interacts with users through natural-language conversation. Unlike conventional static FAQ pages, conversational systems allow users to formulate questions and receive contextually relevant responses through a dialogue interface.

Library chatbots can be designed for specific purposes such as answering frequently asked questions, assisting with library orientation, providing opening-hour information, guiding users to electronic resources and supporting basic reference enquiries. The integration of large language models has significantly expanded the conversational capability of contemporary chatbot systems (Hoy, 2018; Yan et al., 2023).

A systematic review by Yan et al. (2023) found that library chatbots are an expanding area of research but that their effectiveness varies according to system design, training data, integration, natural-language processing capabilities and the complexity of users' questions. Studies have also noted the importance of human oversight in quality control.

Technological Readiness

Technological readiness refers to the extent to which an institution possesses the infrastructure and technical conditions required to implement a technology (Tornatzky & Fleischer, 1990). For AI chatbots, technological readiness encompasses reliable internet connectivity, adequate computing facilities, compatible library-management systems, digital platforms, data resources, technical support and cybersecurity arrangements.

Without appropriate infrastructure, chatbot adoption may remain limited even where librarians demonstrate interest in the technology. This is particularly relevant in many Nigerian universities, where infrastructure constraints have been consistently documented as barriers to advanced digital service implementation (Ilo et al., 2020).

AI-Related Digital Competence

Librarians require appropriate knowledge and skills to use, evaluate and manage AI technologies effectively. Competence encompasses understanding AI concepts, interacting effectively with AI systems, evaluating AI-generated responses, identifying inaccurate or biased information and understanding ethical issues (Corrall, 2017; Dali & Raju, 2023).

Digital competence is particularly important for library chatbots because librarians remain responsible for ensuring that automated assistance does not compromise information quality or professional standards. The distinction between general AI awareness and operational competence for chatbot management is therefore critical.

Institutional Support

Institutional support encompasses management commitment, funding, policy, staff training, technical assistance and organisational encouragement (Tornatzky & Fleischer, 1990). Management support can facilitate technology adoption by providing resources, establishing policies and creating opportunities for staff development.

Conversely, inadequate funding or absence of institutional policy may delay or prevent implementation. In the Nigerian university context, institutional support has been identified as a critical moderating factor in the relationship between librarian awareness of AI and actual adoption (Okonedo & Popoola, 2022).

Chatbot Adoption

Technology adoption refers to the decision and process through which an organisation accepts and implements a new technology (Rogers, 2003). In the context of this study, chatbot adoption is operationalised through indicators such as awareness of chatbot technology, institutional consideration and decision to implement, actual deployment, integration with library services and organisational readiness to sustain the technology. The Technology–Organization–Environment (TOE) framework is particularly useful for explaining organisational-level adoption because it accounts for technological, organisational and environmental conditions simultaneously (Tornatzky & Fleischer, 1990).

Chatbot Utilization

Utilization concerns the actual use of chatbot technology in library operations. It may involve answering routine enquiries, providing library information, guiding users to resources, supporting reference questions, assisting resource discovery, providing research guidance and directing users to librarians when human intervention is required. Research has shown that adoption and utilization are distinct processes: a library may have adopted chatbot technology without utilizing it effectively, and utilization may differ substantially from mere deployment (Venkatesh et al., 2003).

Barriers to Chatbot Adoption and Utilization

The literature identifies several potential barriers to chatbot adoption in library settings, including inadequate infrastructure, poor internet connectivity, limited funding, insufficient AI competence among staff, concerns about accuracy and privacy, absence of institutional policies, resistance to technological change and difficulties integrating chatbots with existing library management systems (Yan et al., 2023; Okonedo & Popoola, 2022; Ilo et al., 2020).

Theoretical Framework

The study is anchored on the Technology–Organization–Environment (TOE) framework (Tornatzky & Fleischer, 1990) as the primary theoretical lens, supplemented by the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003).

Technology-Organization-Environment (TOE) Framework

The TOE framework explains organisational technology adoption through three interrelated dimensions. The technological context encompasses technological

readiness, infrastructure, system compatibility and complexity. The organisational context includes institutional support, management commitment, funding, training and formal policies. The environmental context encompasses the professional environment, external technological developments and regulatory conditions.

TOE is appropriate for this study because chatbot adoption is examined at the organisational level that is, within university library organisations rather than as an individual decision. The framework provides a structure for examining how institutional conditions mediate or moderate the relationship between technological availability and actual implementation.

Unified Theory of Acceptance and Use of Technology (UTAUT)

UTAUT (Venkatesh et al., 2003) supplements TOE by explaining the individual dimension of technology use. UTAUT identifies performance expectancy, effort expectancy, social influence and facilitating conditions as determinants of technology acceptance and use. In the present study, UTAUT provides support for examining librarians' AI-related competence, perceptions and confidence as factors associated with actual chatbot utilization. The combination of TOE and UTAUT allows the study to examine both organisational and individual dimensions of AI chatbot adoption.

Methodology

Research Design

The study adopted an explanatory sequential mixed-methods design. In the first phase, quantitative data were collected through a structured questionnaire and analysed statistically. In the second phase, qualitative data were collected through semi-structured interviews to explain and contextualise the quantitative findings. The explanatory sequential design was considered appropriate because the study aims to provide statistical estimates of relationships while also generating depth through interview-based interpretation.

Study Area

The study was conducted in selected university libraries in Kano State, Nigeria. Three universities representing the three major ownership structures in the Nigerian higher education system were selected:

Table 1: Selected Study Institutions

University	Ownership
Bayero University, Kano	Federal
North-West University, Kano	State
Skyline University Nigeria, Kano	Private

Note. The three institutions provide representation of federal, state and private university ownership structures in Kano State.

Population and Sampling

The target population comprised all professional academic librarians in the three selected university libraries, and undergraduate and postgraduate library users across the same institutions. Professional librarians were selected through census sampling because the total population was accessible and relatively small. Library users were selected through systematic random sampling. A total sample of 350 respondents comprising 110 librarians and 240 library users was obtained for the quantitative phase. In addition, 6 library administrators and ICT personnel were recruited purposively for the qualitative interview phase.

Instrument for Data Collection

The principal quantitative instrument was the AI Chatbot Adoption and Utilization Questionnaire (AICAUQ). The AICAUQ comprised seven sections: Section A (demographic information), Section B (technological readiness), Section C (AI-related digital competence), Section D (institutional support), Section E (chatbot adoption), Section F (chatbot utilization) and Section G (barriers to adoption and utilization). A four-point Likert response scale was used: Strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1). A semi-structured interview guide was used for the qualitative phase, with questions developed from the quantitative findings.

Validity and Reliability

The AICAUQ was subjected to face and content validation by three subject-matter experts, including specialists in Library and Information Science, Artificial Intelligence and ICT, and Measurement and Evaluation. Their observations were incorporated before pilot testing. Pilot testing was conducted with 30 librarians from a comparable university outside the main study area to establish the internal consistency of the instrument. Cronbach's alpha coefficients were computed for each sub-scale. Values of

0.70 and above were adopted as the minimum acceptable threshold for internal consistency, consistent with standard psychometric practice (Nunnally, 1978).

Method of Data Analysis

Quantitative data were analysed using IBM SPSS Statistics (Version 26). Descriptive statistics including frequency, percentage, mean and standard deviation were used to address Research Questions 1 to 5, with a criterion mean of 2.50 adopted as the decision threshold. Pearson Product Moment Correlation was used to address Research Questions 6 to 8 and to test H_{01} , H_{02} and H_{03} . Multiple regression analysis was used to test H_{04} and to determine the relative predictive contribution of technological readiness, AI-related digital competence and institutional support to chatbot utilization. The regression model was specified as follows:

$$CU = \beta_0 + \beta_1 TR + \beta_2 ADC + \beta_3 IS + \varepsilon$$

where CU = Chatbot Utilization; TR = Technological Readiness; ADC = AI-Related Digital Competence; IS = Institutional Support; β_0 = constant; β_1 – β_3 = regression coefficients; ε = error term.

Qualitative interview data were transcribed, coded and analysed thematically to contextualise the quantitative findings and to address Research Questions 6.

Results and Discussion

Response Rate

Table 2: Questionnaire Response Rate

Respondent Category	Distributed	Returned	Usable	Response Rate (%)
Librarians	110	104	102	92.7
Library Users	240	226	220	91.7
Total	350	330	322	92.0

A usable response rate of 92.0% was achieved, providing an adequate basis for quantitative analysis.

Research Question 1: Level of Technological Readiness

Research Question 1 asked: What is the level of technological readiness for AI-powered chatbot adoption? Table 3 presents the descriptive statistics.

Table 3: Level of Technological Readiness for AI-Powered Chatbot Adoption (N = 322)

Item	Mean	SD	Decision
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Adequate internet connectivity is available in my library	2.41	0.91	Low
Adequate ICT infrastructure exists to support AI systems	2.53	0.88	Moderate
Library digital systems are compatible with AI chatbot platforms	2.47	0.86	Low
Technical support personnel are available for AI implementation	2.38	0.94	Low
Adequate computing facilities are provided for staff and users	2.59	0.83	Moderate
Grand Mean	2.48		Low

Decision rule: Mean $\geq$ 2.50 = Moderate/High; Mean $<$ 2.50 = Low. Criterion mean = 2.50.

The grand mean of 2.48 indicates that the overall level of technological readiness among academic librarians in Kano State university libraries is low, though two items ICT infrastructure and computing facilities reached the moderate threshold. This finding is consistent with the TOE framework, which identifies technological readiness as a primary precondition for technology adoption (Tornatzky & Fleischer, 1990). It also aligns with Nigerian studies that have repeatedly identified infrastructure deficits as constraints on digital library service advancement (Ilo et al., 2020).

Research Question 2: AI-Related Digital Competence

Research Question 2 asked: What is the level of AI-related digital competence among academic librarians? Table 4 presents the descriptive statistics.

Table 4: Level of AI-Related Digital Competence among Academic Librarians (N = 102)

Dimension	Mean	SD	Decision
Basic AI knowledge and awareness	2.71	0.79	Moderate
Operational ability to use chatbot systems	2.48	0.86	Low
Ability to formulate effective prompts for AI systems	2.35	0.91	Low
Ability to evaluate and verify AI-generated responses	2.62	0.82	Moderate
Ethical awareness in AI use	2.76	0.77	Moderate
Grand Mean	2.58		Moderate

Criterion mean = 2.50.

The grand mean of 2.58 indicates a moderate level of AI-related digital competence. However, the pattern of results is noteworthy: librarians demonstrate relatively higher general AI awareness and ethical understanding, while operational skills such as prompt

formulation and chatbot operation remain at a low level. This distinction is important because awareness of AI does not necessarily constitute operational competence for chatbot management. The finding is consistent with Dali and Raju (2023), who noted that librarians globally are engaging with AI concepts but require targeted skill development in practical AI application.

Research Question 3: Institutional Support

Research Question 3 asked: What is the level of institutional support for AI-powered chatbot adoption? Table 5 presents the findings.

Table 5: Level of Institutional Support for AI-Powered Chatbot Adoption (N = 102)

Item	Mean	SD	Decision
University management supports AI adoption in the library	2.63	0.84	Moderate
Adequate funding is available for AI-related library projects	2.31	0.93	Low
AI training programmes are provided for library staff	2.42	0.89	Low
Formal institutional AI policy exists in my university	2.26	0.92	Low
ICT personnel provide technical support for digital library systems	2.57	0.87	Moderate
Grand Mean	2.44		Low

Criterion mean = 2.50.

The grand mean of 2.44 indicates that the overall level of institutional support is low, though management commitment and technical ICT support reached the moderate level. Funding, training and formal AI policy remain below the criterion threshold. This finding suggests that while university management may demonstrate general support for digital innovation, this does not consistently translate into concrete implementation mechanisms. The result is consistent with the organisational dimension of the TOE framework, which identifies funding, training and policy as essential organisational conditions for technology adoption (Tornatzky & Fleischer, 1990).

Research Question 4: Level of Chatbot Adoption

Research Question 4 asked: What is the level of adoption of AI-powered chatbots for user assistance? Table 6 presents the findings.

Table 6: Level of Adoption of AI-Powered Chatbots for User Assistance (N = 322)

Indicator	Mean	SD	Decision
Awareness of AI chatbot technology for library services	3.02	0.76	High

Institutional consideration of chatbot implementation	2.54	0.82	Moderate
Actual deployment of chatbot systems in the library	2.19	0.89	Low
Integration of chatbots with library services	2.14	0.91	Low
Availability of chatbot services to library users	2.07	0.93	Low
Grand Mean	2.39		Low

Criterion mean = 2.50.

The grand mean of 2.39 indicates a low overall level of chatbot adoption. The finding illustrates an important gap between awareness and operational deployment: while awareness of chatbot technology is high, actual deployment, service integration and user availability remain low. This gap between awareness and operational adoption is consistent with international literature on AI in academic libraries, which has noted that positive awareness and intentions do not automatically translate into implementation (Yan et al., 2023; Rogers, 2003).

Research Question 5: Extent of Chatbot Utilization

Research Question 5 asked: What is the extent of chatbot utilization for user assistance?

Table 7 presents the findings.

Table 7: Extent of Chatbot Utilization for User Assistance (N = 322)

Service Area	Mean	SD	Decision
Handling frequently asked questions (FAQs)	2.28	0.84	Low
Library orientation and induction assistance	2.16	0.87	Low
Resource navigation and discovery support	2.13	0.88	Low
Reference assistance for academic enquiries	2.09	0.91	Low
Research support and guidance	1.98	0.93	Low
User guidance and referral to librarians	2.20	0.86	Low
Grand Mean	2.14		Low

Criterion mean = 2.50.

The grand mean of 2.14 indicates a low extent of chatbot utilization across all service areas. The lowest utilization is observed in research support (Mean = 1.98), which requires the highest level of contextual intelligence from AI systems. This finding is consistent with the chatbot adoption level reported in Table 6 and reflects the broader infrastructure and competence gaps identified in the study.

Research Question 6: Barriers to Chatbot Adoption

Research Question 6 asked: What barriers affect chatbot adoption in university libraries in Kano State? Table 8 presents the barriers ranked by mean score.

Table 12: Barriers to AI-Powered Chatbot Adoption (N = 322)

Barrier	Mean	SD	Rank
Poor internet connectivity	3.31	0.76	1
Inadequate funding for AI infrastructure	3.27	0.79	2
Limited AI-specific training for library staff	3.22	0.81	3
Inadequate ICT infrastructure	3.18	0.83	4
Privacy and data security concerns	3.04	0.87	5
Absence of formal institutional AI policy	3.01	0.88	6
Accuracy concerns regarding AI-generated responses	2.96	0.89	7
Resistance to technological change among staff	2.73	0.92	8

Note. All items exceeded the criterion mean of 2.50, indicating that all barriers were perceived as significant. Scale: SA = 4, A = 3, D = 2, SD = 1.

All eight barriers exceeded the criterion mean of 2.50. Poor internet connectivity (Mean = 3.31), inadequate funding (Mean = 3.27) and limited AI-specific training (Mean = 3.22) emerged as the three most prominent barriers, consistent with the broader Nigerian AI-library literature, which has repeatedly identified infrastructure, financial resources and human capital as critical conditions for sustainable AI adoption (Okonedo & Popoola, 2022; Ilo et al., 2020). Privacy and policy concerns also scored above 3.00, indicating that ethical and governance dimensions are not insignificant among Kano State librarians.

Hypothesis Testing

Pearson Product Moment Correlation was used to test H_{01} , H_{02} and H_{03} , while multiple regression was used to test H_{04} .

H_{01} : Technological Readiness and Chatbot Utilization

Table 8: Pearson Correlation: Technological Readiness and Chatbot Utilization (N = 322)

Variables	Mean	SD	r	p-value
Technological Readiness	2.48	0.69		
Chatbot Utilization	2.14	0.74	.61	< .001

Correlation is significant at the 0.01 level (2-tailed). Decision: Reject H_{01} .

A statistically significant positive relationship was found between technological readiness and chatbot utilization ($r = .61, p < .001$). H_{01} is therefore rejected. This finding indicates that libraries with better technological conditions more reliable internet, stronger ICT infrastructure and greater system compatibility demonstrate higher levels of chatbot utilization. This supports the technological dimension of the TOE framework and is consistent with previous research on digital service implementation in Nigerian academic libraries (Ilo et al., 2020).

H₀₂: AI-Related Digital Competence and Chatbot Utilization

Table 9: Pearson Correlation: AI-Related Digital Competence and Chatbot Utilization (N = 322)

Variables	Mean	SD	r	p-value
AI-Related Digital Competence	2.58	0.64		
Chatbot Utilization	2.14	0.74	.58	< .001

Correlation is significant at the 0.01 level (2-tailed). Decision: Reject H_{02} .

A statistically significant positive relationship was found between AI-related digital competence and chatbot utilization ($r = .58, p < .001$). H_{02} is therefore rejected. This finding supports the proposition that staff capacity particularly the ability to operate, evaluate and manage AI systems is relevant to the practical use of AI-powered library technologies. The result is consistent with UTAUT, which identifies effort expectancy and facilitating conditions as important predictors of technology use (Venkatesh et al., 2003).

H₀₃: Institutional Support and Chatbot Utilization

Table 10: Pearson Correlation: Institutional Support and Chatbot Utilization (N = 322)

Variables	Mean	SD	r	p-value
Institutional Support	2.44	0.67		
Chatbot Utilization	2.14	0.74	.64	< .001

Correlation is significant at the 0.01 level (2-tailed). Decision: Reject H_{03} .

A statistically significant positive relationship was found between institutional support and chatbot utilization ($r = .64, p < .001$). H_{03} is therefore rejected. This finding the strongest correlation among the three predictors suggests that management commitment, funding, training and formal policy constitute particularly important organisational conditions for actual technology use. The result reinforces the organisational dimension of the TOE framework.

H₀₄: Multiple Regression - Joint Prediction of Chatbot Utilization**Table 11:** Multiple Regression Analysis Predicting Chatbot Utilization

Predictor	B	SE	β	t	p
Constant	0.28	0.19		1.47	.14
Technological Readiness	0.29	0.07	.29	4.12	< .001
AI-Related Digital Competence	0.25	0.07	.25	3.67	< .001
Institutional Support	0.36	0.07	.36	5.08	< .001

Note. $R = .71$; $R^2 = .50$; Adjusted $R^2 = .49$; $F(3, 318) = 105.42$; $p < .001$. Decision: Reject H_{04} .

The multiple regression model was statistically significant, $F(3, 318) = 105.42$, $p < .001$. The model explains approximately 50% of the variance in chatbot utilization ($R^2 = .50$; Adjusted $R^2 = .49$). All three predictors made statistically significant contributions. Institutional support had the largest standardised beta coefficient ($\beta = .36$), followed by technological readiness ($\beta = .29$) and AI-related digital competence ($\beta = .25$). H_{04} is therefore rejected. The dominance of institutional support as the strongest predictor suggests that even where infrastructure and competence exist, without management commitment, funding and formal policy, chatbot utilization may remain constrained.

Discussion of Findings

The findings of this study indicate that AI-powered chatbot adoption and utilization among academic librarians in Kano State university libraries should be understood as a multidimensional process shaped by technological, human and organisational conditions. The discussion is organised around the three core predictors and the barriers identified by the study.

The finding that technological readiness is positively and significantly related to chatbot utilization ($r = .61$, $p < .001$) supports the technological dimension of the TOE framework. A library may recognise the value of AI chatbot services but lack the connectivity, computing resources or system integration required for effective implementation. The low overall grand mean for technological readiness (2.48) suggests that infrastructure constraints represent a priority concern for policy. This is consistent with Ilo et al. (2020) and with broader analyses of digital infrastructure in Nigerian higher education.

The moderate level of AI-related digital competence (grand mean = 2.58) and its significant positive relationship with chatbot utilization ($r = .58, p < .001$) indicate that librarian capacity is an important facilitator of technology use. The pattern of results reveals, however, that general AI awareness exceeds operational and practical skills, particularly prompt formulation and chatbot management. This distinction has practical implications: professional development programmes should focus not only on conceptual awareness but on the operational competencies required to configure, monitor and improve chatbot services. This aligns with Corral (2017) and Dali and Raju (2023), who have argued for targeted AI skill development within the library profession.

The strongest predictor in the regression model was institutional support ($\beta = .36$), which also had the strongest bivariate correlation with chatbot utilization ($r = .64, p < .001$). This finding is significant because it indicates that management commitment, funding, formal policy and staff training programmes are the most important single domain of conditions associated with chatbot utilization. Even where technological conditions and individual competence are present, without organisational support mechanisms, chatbot services may not be sustainably implemented. This is consistent with the organisational dimension of the TOE framework and with Okonedo and Popoola (2022), who identified institutional support as a critical moderating factor in AI adoption in Nigerian university libraries.

The barrier analysis corroborates the regression findings: infrastructure, funding, training and policy are the most prominent barriers, while resistance to change — an individual-level factor is ranked last. This pattern suggests that the primary constraints in Kano State university libraries are structural and institutional rather than attitudinal, and that targeted investment in infrastructure and organisational support structures is likely to yield greater returns than efforts focused primarily on attitude change.

The overall pattern high awareness, moderate competence, low adoption and low utilization reflects what the literature describes as an "awareness-to-adoption gap" (Rogers, 2003). Addressing this gap requires coordinated action across the technological, human and institutional dimensions simultaneously.

Conclusion

This study examined the adoption and utilization of AI-powered chatbots for user assistance by academic librarians in selected university libraries in Kano State, Nigeria.

Using an explanatory sequential mixed-methods design, the study found that technological readiness, AI-related digital competence and institutional support are significant predictors of chatbot utilization, collectively explaining approximately 50% of the variance in utilization. The findings indicate that while awareness of AI chatbot technology is relatively high among academic librarians, actual adoption and utilization remain low. The gap between awareness and operational implementation reflects infrastructure constraints, limited operational competence and insufficient institutional support particularly in funding, formal policy and structured training programmes.

The study positions AI chatbots as a potential complement to, rather than a replacement for, professional library services. Human oversight remains important for complex reference questions, information evaluation, ethical decision-making and situations requiring professional judgement. For AI chatbots to function effectively in university library environments in Nigeria, coordinated institutional investment in technology infrastructure, staff competency development and formal governance is required.

Recommendations

Based on the findings of this study, the following recommendations are offered:

- 1- University libraries should conduct formal technological-readiness assessments before initiating AI-powered chatbot implementation, identifying gaps in connectivity, hardware and system compatibility.
- 2- Structured AI competency training should be provided for librarians, with particular emphasis on chatbot operation, prompt formulation, response evaluation and ethical AI use beyond general awareness.
- 3- University management should translate general support for digital innovation into concrete institutional mechanisms, including dedicated AI budgets, formal institutional AI policies and technical support appointments.
- 4- Libraries should adopt a phased chatbot implementation strategy, beginning with high-volume, low-complexity services such as FAQs, opening hours, library orientation and basic resource navigation before extending to more complex reference assistance.
- 5- Human escalation mechanisms should be built into all chatbot systems so that complex or sensitive enquiries can be seamlessly transferred to professional librarians.
- 6- AI-generated responses should be systematically monitored for accuracy and appropriateness, particularly where users rely on chatbots for academic or research information.

- 7- Privacy and data-protection procedures should be established and communicated to users before any personal data is incorporated into chatbot systems.
- 8- Libraries should develop and publish AI-use policies covering acceptable use, data protection, accuracy standards, accountability and professional responsibility.
- 9- Pilot chatbot projects should be subject to continuous evaluation using indicators such as response accuracy, user satisfaction, usage frequency, resolution rates and unresolved enquiries transferred to human librarians.
- 10- Pilot chatbot projects should be subject to continuous evaluation using indicators such as response accuracy, user satisfaction, usage frequency, resolution rates and unresolved enquiries transferred to human librarians.

References

- Association of College and Research Libraries. (2016). *Framework for information literacy for higher education*. American Library Association. <https://www.ala.org/acrl/standards/ilframework>
- Corrall, S. (2017). Crossing the threshold: Reflective practice in information literacy development. *Journal of Information Literacy*, 11(1), 23–53. <https://doi.org/10.11645/11.1.2241>
- Dali, K., & Raju, J. (2023). Artificial intelligence in library and information science education: A scoping review. *Journal of Education for Library and Information Science*, 64(3), 201–224. <https://doi.org/10.3138/jelis-2022-0062>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- Hoy, M. B. (2018). Alexa, Siri, Cortana, and more: An introduction to voice assistants. *Medical Reference Services Quarterly*, 37(1), 81–88. <https://doi.org/10.1080/02763869.2018.1404391>
- Ilo, P. I., Nkiko, C., Ugwu, C. I., Izuagbe, R., & Fagbe, A. (2020). AI awareness and adoption among academic librarians: A synthesis of research evidence from developing countries. *Library Hi Tech*, 38(2), 373–389. <https://doi.org/10.1108/LHT-07-2019-0147>
- National Information Technology Development Agency. (2020). *National Digital Economy Policy and Strategy for a Digital Nigeria (2020–2030)*. Federal Government of Nigeria.
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). McGraw-Hill.
- Okonedo, S., & Popoola, S. O. (2022). Awareness, perception and challenges of artificial intelligence adoption among academic librarians in Nigerian federal universities. *Annals of Library and Information Studies*, 69(1), 48–57. <https://doi.org/10.56042/alis.v69i1.60032>

- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.
- Siu, N., & Martell, C. (2021). Chatbots and AI in reference services: A systematic review of the literature. *Reference Services Review*, 49(3–4), 289–312. <https://doi.org/10.1108/RSR-06-2021-0025>
- Tornatzky, L. G., & Fleischer, M. (1990). *The processes of technological innovation*. Lexington Books.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478. <https://doi.org/10.2307/30036540>
- Yan, S., Zhao, X., & Mazumdar, S. (2023). Chatbots in libraries: A systematic literature review. *Library Hi Tech*. <https://doi.org/10.1108/LHT-07-2023-0332>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education: Where are the educators? *International Journal of Educational Technology in Higher Education*, 16(39). <https://doi.org/10.1186/s41239-019-0171-0>