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Research Article

Impact Of Artificial Intelligence (Ai) Chatbots On Digital Library Operations In Higher Educational Institutions (Heis): An Indian Perspective

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A B S T R A C T

Artificial Intelligence (AI) chatbots' quick incorporation into digital library services has completely changed how users engage with academic materials and obtain information. This study looks into how AI chatbots affect the operational effectiveness of digital libraries in Indian Higher Education Institutions (HEIs). Students, teachers, and library employees made up the 250 respondents that took part in the survey. Cronbach's alpha was used to verify the survey instrument's dependability and guarantee data consistency. After 16 survey statements were subjected to exploratory factor analysis (EFA), they were successfully divided into four main factors: Information accuracy, responsiveness, ease of use, and service quality of AI chatbots. The impact of these variables on the operational performance of the digital library was investigated using multiple regression analysis. The findings show that all four aspects have a substantial and favourable impact, with responsiveness emerging as the most important element, followed by service quality, information correctness, and simplicity of use. These results demonstrate the critical role AI chatbots play in boosting user experience, increasing operational effectiveness, and assisting academic research and learning in Indian HEIs. The report gives library directors useful advice on how to maximise AI chatbots capabilities and provide more efficient and user-focused digital library services.

Keywords: AI Chatbots, Digital Library Operations, Higher Education Institutions (HEIs), Information Accuracy, Service Quality and Ease of Use.

Introduction

Higher education institutions' (HEIs') information services have been profoundly changed by the quick development of artificial intelligence (AI), especially in the area of digital libraries. AI-powered chatbots have become a popular tool for improving user contact and automating library procedures among other AI uses. Natural language processing (NLP) and machine learning techniques are used by chatbots to mimic human communication, giving users quick and easy access to information (McNeal & Newyear, 2013). By giving students access to electronic materials, databases, and institutional repositories, digital libraries in higher education institutions (HEIs) serve a critical role in supporting teaching, learning, and research activities.

However, handling reference enquiries, guaranteeing prompt information retrieval, and providing continuous user support have become operational issues for academic libraries due to the expanding volume of digital content and rising user expectations (Borgman, 2000). By offering round-the-clock virtual reference services, helping users search databases, responding to frequently asked queries, and assisting them in utilising library resources, AI chatbots address these issues (Cox et al., 2019).

Under programmes like Digital India and the National Education Policy (NEP) 2020, which place an emphasis on technology-enabled learning and digital infrastructure, HEIs in India are progressively using digital technologies. By increasing customer happiness, decreasing librarian burden, and increasing operational efficiency, the incorporation of AI chatbots into digital library systems supports these goals (Arora & Chakravarty, 2020). There is still few empirical research looking at how AI chatbots affect digital library operations in Indian higher education institutions, despite the growing interest. Thus, the purpose of this study is to examine how AI chatbots affect digital library operations in HEIs from an Indian viewpoint, with an emphasis on user experience, information retrieval efficacy, and service efficiency. The results are anticipated to enhance strategic decision-making for technology adoption in Indian academic libraries and add to the body of scholarly research.

Literature Review

Hussain et al. (2019) investigated the usage of AI chatbots in academic library reference services, highlighting how well they handle frequent and repetitive user enquiries. According to the study, chatbots effectively respond to often asked queries, help users find electronic resources, and facilitate database browsing. Libraries were able to lessen their reliance on human staff by automating basic reference functions, which resulted in increased operational efficiency and quicker response times. The authors pointed out that the use of chatbots frees up librarians to concentrate on providing instructional services, research advice, and advanced academic support. However, the study also found that chatbots' ability to handle complicated or unclear queries was limited. The authors suggested ongoing system training, content updates, and improvement to improve chatbots accuracy and dependability in academic library settings in order to address these issues.

Cox, Pinfield, and Rutter (2019) examined digital transformation projects in university libraries and found chatbots and other artificial intelligence technology to be important facilitators of service innovation. According to their research, AI chatbots improve scalability by enabling libraries to accommodate growing user needs without corresponding increases in workforce levels. The authors emphasised that chatbots provide 24-hour access to library support while guaranteeing consistency in service delivery. Furthermore, the study presented chatbots as crucial elements of academic libraries that are prepared for the future and can interface with learning management systems, digital repositories, and discovery platforms. Notwithstanding these benefits, the authors emphasised that in order to fully exploit the potential of chatbots in academic library services, strategic planning, institutional preparedness, and organisational support are necessary.

Okonkwo and Ade-Ibijola (2021) examined the efficacy of chatbot-based reference services in academic libraries with an emphasis on user pleasure and interactivity. According to their research, AI chatbots greatly speed up response times and make library information services more accessible. According to the survey, students who are not familiar with conventional library search tools and first-time users benefit most from conversational interfaces. Chatbots' interactive and intuitive features, which made information retrieval easier and required less search effort, were appreciated by users. However, the authors stressed that since sophisticated research questions frequently call for knowledgeable human assistance, chatbots should support professional librarians rather than take their place. For the best service delivery, the study suggested a hybrid service paradigm that combines AI-powered chatbots with librarian knowledge.

Arlitsch and Newell (2017) investigated how artificial intelligence may improve workflows in digital libraries. Their research showed that AI technologies, such as chatbots, play a major role in automating operations related to information discovery, user support, and reference management. AI allows institutions to reallocate human resources toward advanced research support and instructional roles by simplifying normal library operations. AI-driven automation enhances service responsiveness, consistency, and efficiency, according to the authors. They did, however, also stress the significance of resolving ethical issues, guaranteeing openness, and upholding ongoing system monitoring. According to the study's findings, the use of AI constitutes a paradigm shift in librarianship, requiring university libraries to adopt new leadership techniques, professional capabilities, and strategic planning.

Vaidyanathan and Babu (2020) examined the use of AI in Indian university libraries, focusing on the deployment of chatbots. According to their research, AI chatbots improve digital resource accessibility, particularly in major HEIs that cater to a variety of user demographics. Chatbots improved information access by successfully directing users to databases, institutional repositories, and e-journals. Nonetheless, the authors noted important obstacles, such as poor technology infrastructure, a lack of AI knowledge among library employees, and financial limitations. To

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achieve sustained AI integration, the study highlighted the necessity of professional training programmes, supportive legislation, and phased implementation techniques. The authors came at the conclusion that successful chatbots deployment in Indian academic libraries requires institutional commitment.

Cheng et al. (2020) examined the efficiency of artificial intelligence (AI) chatbots that use natural language processing (NLP) in information retrieval systems. In comparison to conventional keyword-based retrieval systems, their investigation showed that NLP-based chatbots provide more precise, pertinent, and context-aware search results. Chatbots greatly increase search accuracy and usefulness by enabling users to communicate with library systems using natural language questions. The authors emphasised the importance of these kinds of systems in the multidisciplinary research settings seen in HEIs. The study found that chatbots with NLP capabilities improve information discovery, research efficiency, and user experience. To preserve retrieval accuracy and relevance, the authors emphasised the significance of ongoing system training and assessment.

Luo, Tong, Fang, and Qu (2019) examined smarter library services with an emphasis on AI chatbots-enabled personalisation. According to their research, chatbots give personalised information and resource recommendations by analysing user behaviour, preferences, and search history. Sustained use of digital library services has been found to be significantly influenced by personalisation. The authors observed that, especially for postgraduate students and research researchers, AI-driven customisation improves user engagement, contentment, and research productivity. But the study also brought up issues with data privacy and the moral use of personal data. To increase user confidence in AI-enabled library systems, the authors suggested ethical standards and transparent data governance structures.

Smutny and Schreiberova (2020) investigated user acceptance of AI chatbots in libraries for higher education. According to their findings, students were highly satisfied with chatbots services since they were simple to use, responded quickly, and were available around-the-clock. During non-working hours, when human support was scarce, chatbots were particularly appreciated. The study did, however, also highlight issues with chatbots' inability to handle challenging academic or research-related questions. By precisely describing chatbots capabilities, the authors stressed the significance of controlling user expectations and ongoing system improvement. The study came to the conclusion that both technology performance and successful communication techniques are necessary for user acceptability and trust.

Bharati and Chaudhury (2022) centred on how AI chatbots affect Indian higher education institutions' digital libraries. According to their research, chatbots greatly improve service quality in areas like citation assistance, institutional repository navigation, and e-journal access. The authors found that chatbots-enabled services increase customer happiness and shorten search times. The study also emphasised how AI tools are increasingly helping to boost academic engagement and research productivity. To guarantee successful chatbots implementation, the authors emphasised the necessity of robust institutional support, frequent performance evaluation, and system improvements. The study came to the conclusion that AI chatbots are essential parts of India's contemporary digital libraries.

Dwivedi et al. (2021) explored the adoption of AI from an organisational and strategic standpoint, focusing on the integration of chatbots in academic institutions. According to their research, staff training programmes, institutional digital plans, and ethical data management procedures must all be in line for chatbots to be successfully used in libraries. The authors contended that rather than being used as stand-alone solutions, AI technologies ought to be incorporated into more comprehensive frameworks for digital transformation. The success of AI in HEIs was found to be significantly influenced by governance, accountability, and openness. The study came to the conclusion that organisational preparedness and strategic planning are necessary for the long-term adoption of chatbots in academic library settings.

Yang and Dalal (2015) examined how conversational agents are used in digital libraries, emphasising how they enhance user interaction and knowledge acquisition. The authors pointed out that while chatbots offer easy access to information, they need ongoing training to avoid bias and false information. In multilingual educational settings like Indian higher education institutions, this issue is especially pertinent. In order to guarantee dependable information delivery, the study stressed the significance of content validation, system updates, and quality control. The authors came to the conclusion that although conversational agents improve accessibility, it is still very difficult to maintain accuracy and believability.

Gupta and Singh (2021) examined the difficulties in implementing AI in Indian digital libraries. According to their research, despite the fact that chatbots improve operational efficiency, adoption is hampered by a number of issues, such as aversion to technological change, lack of AI knowledge, and data protection concerns. To address these issues, the writers stressed the necessity of institutional regulations, ethical frameworks, and capacity building. The study came to the conclusion that organisational support

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and technological preparedness are necessary for the long-term adoption of chatbots. To encourage AI adoption in Indian academic libraries, the authors suggested focused training courses and awareness campaigns.

Fernandez (2020) talked about how librarians' roles in AI-enabled academic libraries are changing. According to the study, AI chatbots are redefining librarians' responsibilities from those of traditional information gatekeepers to those of digital facilitators and educators. Data management services, digital literacy programmes, and sophisticated research activities are becoming more and more supported by librarians. AI tools should supplement human expertise, not replace it, the author stressed. For librarians to adjust to AI-driven contexts, ongoing professional development was found to be crucial. The study came to the conclusions that even as AI technologies change service delivery methods, librarians continue to play a crucial role in academic libraries.

The NMC Horizon Report (2020) noted chatbots and artificial intelligence as revolutionary technologies influencing academic libraries' futures. According to the report, chatbots services will be widely used at HEIs to promote student engagement, research support, and personalised learning. It highlighted how AI may enhance user experience and institutional efficiency. But the report also emphasised issues with governance, data privacy, and ethics. The results emphasised the necessity of implementing AI responsibly and with institutional policies and strategic planning in place.

Rafiq, Batool, and Ali (2023) investigated how AI chatbots affected academic digital libraries' operational effectiveness and user satisfaction. According to their research, the employment of chatbots results in increased user happiness, better information access, and quicker service delivery. To optimise the advantages of chatbots, the authors suggested performance review, ongoing monitoring, and staggered implementation. The study reaffirmed the strategic significance of AI chatbots in contemporary academic library ecosystems, especially in promoting user-centred service delivery and digital transformation.

Research Gap

AI chatbots and their operational impact on digital library services have received little empirical attention, despite the fact that AI is increasingly being used in academic libraries. The majority of the literature currently in publication concentrates on general AI applications, such as automated cataloguing, recommendation systems, and digital repositories. There is a large contextual vacuum in our knowledge of how AI chatbots operate under the institutional, infrastructural, and user diversity restrictions of Indian Higher Education Institutions (HEIs) because the majority of previous research has focused on industrialised nations. Additionally, while thorough evaluations of library operations including workflow efficiency, reference service automation, staff workload reduction, and service responsiveness remain understudied, the majority of current research focuses on user satisfaction or the efficacy of information retrieval. A fragmented view of chatbots effectiveness results from a conspicuous lack of integrated studies that combine the perspectives of librarians with end-user experiences. This study aims to fill a key research gap by empirically investigating the technological, managerial, and operational effects of AI chatbots on digital library operations in Indian HEIs.

Research Problem

Higher education institutions (HEIs) in India are rapidly going digital, yet many academic libraries still struggle to provide timely, effective, and user-centric digital services. Traditional digital library operations, especially reference services, information retrieval, and user engagement, are under tremendous strain due to rising user expectations for immediate information access, individualised support, and round-the-clock assistance. The deployment of Artificial Intelligence (AI) chatbots in Indian HEI libraries is still inconsistent and understudied, despite the fact that they have emerged as a viable alternative to automate regular library activities, increase content discovery, and improve service responsiveness. The impact of AI chatbots on digital library operations, operational effectiveness, user satisfaction, and the function of library professionals in the context of Indian higher education is not well documented. Additional obstacles to successful adoption include issues with staff acceptance, data privacy, technological readiness, and information retrieval accuracy. In order to give policymakers, library administrators, and academic institutions useful information, a thorough examination into the effects of AI chatbots on digital library operations in HEIs from an Indian viewpoint is necessary.

Research Objectives

- To identify the underlying factors influencing the effectiveness of AI chatbots in digital library operations of Higher Education Institutions (HEIs) in India.
- To examine the impact of AI chatbot-related factors on overall digital library operational performance in Indian HEIs.

Research Hypothesis

- **H_{01}**: AI chatbots service quality has no significant impact on digital library operational performance in Indian Higher Education Institutions (HEIs).
- **H_{02}**: AI chatbots ease of use has no significant impact on digital library operational performance in Indian Higher Education Institutions (HEIs).

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- **H_{03}**: AI chatbots responsiveness has no significant impact on digital library operational performance in Indian Higher Education Institutions (HEIs).
- **H_{04}**: AI chatbots information accuracy has no significant impact on digital library operational performance in Indian Higher Education Institutions (HEIs).

Statistical Tools

- Reliability Test
- Exploratory Factor Analysis
- Multiple Linear Regression

Sampling Size

For this study, a total of 250 respondents were selected from academic libraries of Higher Education Institutions (HEIs) across India. The sample included library users (students and faculty) as well as library staff to capture perspectives on AI chatbot usage and its impact on digital library operations. A stratified random sampling method was employed to ensure representation from different types of HEIs, including public and private universities, engineering colleges, and general degree colleges. Within each stratum, respondents were randomly selected to provide an unbiased and representative sample of the population. This approach ensures that the findings reflect diverse experiences and perceptions regarding AI chatbot integration in digital library services across Indian HEIs.

Data Analysis & Results

Reliability Test

Cronbach's Alpha was used to evaluate the questionnaire's reliability, as shown in Table 2. The Cronbach's Alpha score for the 16 variables that made up the dimension "AI chatbots-related factors" was 0.853. The results show that the items used to test AI chatbots-related characteristics are quite dependable because a Cronbach's Alpha value above 0.70 is typically regarded as adequate for internal consistency. This implies that the target construct is consistently captured by the questionnaire items, guaranteeing the reliability of the data gathered for additional research.

Exploratory Factor Analysis

The sample size was meritoriously adequate for factor analysis, according to the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, which was found to be 0.864. Values above 0.8 are regarded as extremely suitable. Furthermore, the correlation matrix was not an identity matrix, according to Bartlett's Test of Sphericity, which produced a chi-square value of 2036.871 with 120 degrees of freedom and a significance threshold of $p < 0.001$. This demonstrates that the study's variables are sufficiently connected to support the use of factor analysis to find underlying constructs pertaining to how AI chatbots affect digital library operations in higher education institutions. Varimax Rotation with Kaiser Normalisation has been used to obtain four components. Each factor is composed of all the variables with factor loadings greater than 0.5. 16 variables were combined to generate four components. Four factors were found out of the sixteen variables that were part of the investigation. These four parameters accounted for 67.776 percent of the difference in AI chatbots on digital library operations in HEIs.

Rotated Component Matrix

The Rotated Component Matrix shows the correlations between the variables and the factors, or rotated factor loadings. The factor column displays the rotational factors that have been subtracted from the total factor. These fundamental components have been used as the final factor after data reduction.

The matrix above displays the correlation between each extracted factor and the variables. Usually, each variable has a low loading in the other factors and a high loading in one. To ascertain which variables are included in each factor, the variable with the highest value in each row is selected to be a part of the corresponding factor. By emphasizing the values in each row, the 16 variables aside from low loading variables have been divided into four essential components.

Multiple Linear Regression

In order to access the impact of AI chatbot-related factors on overall digital library operational performance in Indian Higher Education Institutions (HEIs) as a dependent variable, enter a method of multiple regressions was applied.

The R Square value of 0.519 in the model summary shows that the independent variables; AI Chatbots Information Accuracy, AI Chatbots Service Quality, AI Chatbots Ease of Use, and AI Chatbots Responsiveness collectively account for 51.9% of the variance in digital library operational performance in Indian HEIs. The Adjusted R Square of 0.511 indicates a robust and trustworthy explanatory power of the model after controlling for the number of factors in the model. This suggests that the efficacy and calibre of AI chatbots services can account for slightly more than half of the variations in the operational performance of digital libraries, underscoring the important role chatbots play in improving digital library operations in higher education institutions.

The impact of AI chatbots qualities on digital library operational performance in Indian Higher Education Institutions (HEIs) is investigated by the ANOVA findings shown in Table 7. The model takes into account four independent variables: AI Chatbots Information Accuracy, Service Quality, Ease of Use, and Responsiveness. The total sum of squares is 207.924, with 4 degrees of freedom for the predictors and 245 for the residuals. Together,

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these chatbots characteristics appear to have a statistically significant impact on the operational success of digital libraries, as indicated by the difference between the variation explained by the model (sum of squares = 107.967) and the variation not explained (sum of squares = 99.957). This suggests that AI chatbots' accuracy, responsiveness, ease of use, and quality of service can significantly increase their efficacy and efficiency. This suggests that AI chatbots' accuracy, responsiveness, convenience of use, and quality of service might significantly increase the efficacy and efficiency of digital library operations in Indian HEIs.

The findings of the regression study show that every aspect of AI chatbots significantly improves the operational performance of digital libraries in Indian Higher Education Institutions (HEIs). In particular, AI Chatbots Responsiveness has the most impact (β = 0.365, p < 0.001), indicating that timely and efficient interactions significantly improve the efficiency of digital library operations. Both AI Chatbots Ease of Use (β = 0.189, p = 0.002) and AI Chatbots Information Accuracy (β = 0.192, p < 0.001) considerably enhance operational performance, emphasising the significance of trustworthy data and intuitive user interfaces. Furthermore, AI Chatbots Service Quality exhibits a positive and substantial influence (β = 0.144, p = 0.018), suggesting that overall service excellence supports library efficiency. The explanatory power of the model is confirmed by the significant constant term (B = 0.982, p < 0.001). All things considered, these results indicate that successfully incorporating AI chatbots into digital libraries can significantly improve operational performance by enhancing responsiveness, accuracy, usability, and service quality.

The data is roughly normally distributed, according to the evaluation of the dependent variable, Digital Library Operational Performance in Indian HEIs, using the histogram and Normal P-P plot. The data points appear to be symmetrically distributed about the mean, as indicated by the mean value of -3.81×10^{-11}, which is practically zero, and the standard deviation of 0.992, which is near to 1. Since the observed cumulative probabilities closely resemble the expected diagonal line and show little divergence from a normal distribution, the Normal P-P plot provides additional evidence of normality. The data satisfies the normalcy assumptions needed for parametric analyses like regression with a sample size of 250. As a result, additional inferential statistical testing, such as regression analysis and hypothesis testing can be conducted with confidence using the operational performance scores of digital libraries.

Table 1.Illustrative Example Data — Before and After Digitalization

		N	Percentage
Cases	Valid	250	100.0
	Excluded [a]	0	0.0
	Total	250	100.0

Table 2.Reliability Test Results

Dimension	Number of variables	Cronbach's Alpha
AI chatbot-related factors	16	0.853

Table 3.KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.864
Bartlett's Test of Sphericity	Approx. Chi-Square	2036.871
	Df	120
	Sig.	.000

Table 4.Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.365	39.779	39.779	6.365	39.779	39.779	3.682	23.011	23.011
2	2.111	13.191	52.970	2.111	13.191	52.970	2.902	18.137	41.147
3	1.322	8.261	61.232	1.322	8.261	61.232	2.367	14.795	55.943
4	1.046	6.535	67.766	1.046	6.535	67.766	1.892	11.824	67.766

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5	.825	5.154	72.921						
6	.752	4.702	77.622						
7	.518	3.239	80.861						
8	.491	3.068	83.930						
9	.470	2.938	86.867						
10	.426	2.662	89.529						
11	.368	2.301	91.830						
12	.343	2.141	93.972						
13	.320	2.002	95.974						
14	.242	1.514	97.488						
15	.228	1.428	98.916						
16	.174	1.084	100.000						

Extraction Method: Principal Component Analysis.

Table 5.Rotated Component Matrixa

Statements	Component			
	1	2	3	4
The AI chatbot provides high-quality assistance for digital library services.	.833			
The chatbot delivers consistent and reliable responses to my queries.	.787			
The chatbot helps improve the overall quality of digital library services.	.754			
The chatbot effectively supports academic and research-related information needs.	.754			
The AI chatbot is easy to access through the digital library platform.	.664			
I can use the AI chatbot without requiring special technical skills.		.862		
The chatbot interface is clear and easy to understand.		.790		
Interaction with the chatbot is simple and user-friendly.		.782		
The AI chatbot responds quickly to my queries.	.503	.644		
The chatbot maintains smooth interaction without interruptions.			.860	
The information provided by the AI chatbot is accurate and reliable.			.814	
The chatbot effectively handles multiple queries without delays.			.593	
The chatbot provides prompt assistance during library service hours and beyond.				
The chatbot clearly understands my queries and provides relevant answers.				.856
The chatbot directs me to appropriate digital library resources when needed.				.755
The chatbot provides up-to-date information related to digital library resources.			.523	.601
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalisation.				
a. Rotation converged in 6 iterations.				

Table 6.Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.721[a]	.519	.511	.639	2.239
a. Predictors: (Constant), AI Chatbot Information Accuracy, AI Chatbot Service Quality, AI Chatbot Ease of Use, AI Chatbot Responsiveness					
b. Dependent Variable: Digital library operational performance in Indian (HEIs).					

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Table 7.Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	107.967	4	26.992	66.158	.000[b]
	Residual	99.957	245	.408		
	Total	207.924	249			
a. Dependent Variable: Digital library operational performance in Indian (HEIs).						
b. Predictors: (Constant), AI Chatbot Information Accuracy, AI Chatbot Service Quality, AI Chatbot Ease of Use, AI Chatbot Responsiveness						

Table 8.Coefficientsa

Model B		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		Std. Error	Beta			
1	(Constant)	.982	.174		5.626	.000
	AI Chatbot Service Quality	.113	.047	.144	2.391	.018
	AI Chatbot Ease of Use	.164	.053	.189	3.097	.002
	AI Chatbot Responsiveness	.301	.051	.365	5.898	.000
	AI Chatbot Information Accuracy	.170	.045	.192	3.738	.000
a. Dependent Variable: Digital library operational performance in Indian (HEIs).						

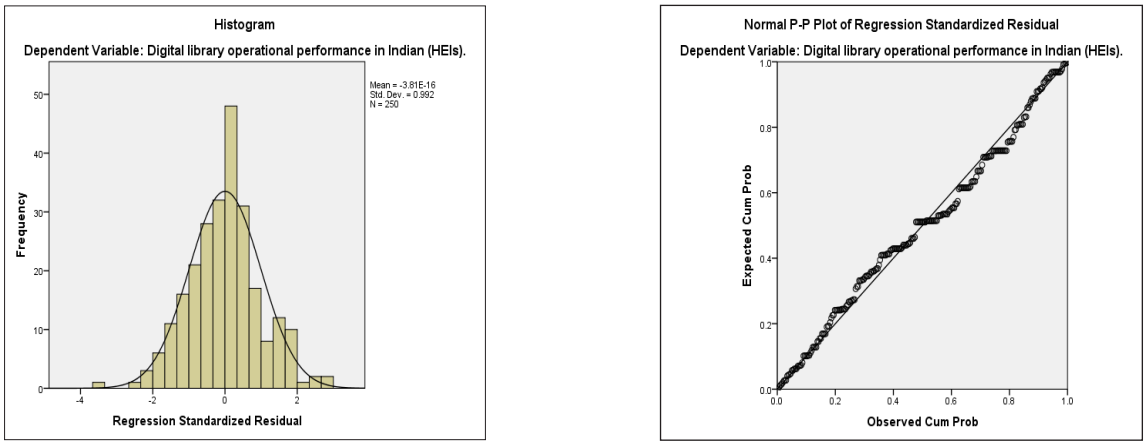

Figure 1. Histogram And Normal P-P Plot

Suggestions

- HEIs should concentrate on raising the general level of AI chatbot service quality in order to improve digital library operations. This entails maintaining standards for professional interactions, precise direction, and consistent performance. Maintaining good service quality has a significant impact on customer happiness and library efficiency. This can be achieved through regular monitoring of chatbot responses and frequent modifications based on user feedback.
- For AI chatbots to be widely adopted by teachers and students, they must be simple to use. Institutions should create chatbots with easy-to-use interfaces, straightforward navigation, and unambiguous instructions. Providing new users with brief lessons, help manuals, or on boarding sessions can assist lower usage barriers and promote smooth interaction with digital library services.
- The most important aspect influencing operational performance is responsiveness. In order to reduce waiting times and enhance user experience, AI chatbots should respond to customer enquiries promptly and in real time. To guarantee that the chatbots is responsive under various load levels, libraries can optimise

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response algorithms, use natural language processing, and keep a database of commonly requested queries.

- Reliable digital library services depend on accurate information. Academic databases and repositories should provide chatbots with verified and current materials. Maintaining high information accuracy, building user confidence, and facilitating successful research and learning can be achieved by regular audits, cross-checking responses, and implementing feedback loops.

Conclusion

The study on the impact of AI chatbots on digital library operations in Indian HEIs demonstrates that all four dimensions; AI Chatbot Information Accuracy, Service Quality, Ease of Use, and Responsiveness have a significant and positive influence on the digital library operational performance. The most significant factor among these was responsiveness, underscoring the significance of prompt and effective interactions in improving library services. The accuracy and usability of the information were also crucial, highlighting the necessity of dependable, current content and user-friendly interfaces for the successful adoption of AI chatbots. High service quality also promotes smooth library operations and increases user satisfaction. Overall, the results indicate that the strategic deployment of AI chatbots in digital libraries can significantly enhance user engagement, operational effectiveness, and the general calibre of library services in Indian higher education institutions. These observations offer library administrators useful advice on how to improve service delivery, maximise AI chatbots features, and promote scholarly research and education.

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