Adigun, G. O., Ajani, Y. A. & Aboyade, M. A. (2023), Undergraduate Students' Perspectives in Optimising Chatbot for Reference Services in Nigerian Higher Institutions: A Comparative Analysis of ChatGPT and Conventional Reference Assistance. *Journal of Library, Science Education and Learning Technology (JOLSELT)*, (4)2, 67-80.

UNDERGRADUATE STUDENTS' PERSPECTIVES IN OPTIMISING CHATBOT FOR REFERENCE SERVICES IN NIGERIAN HIGHER INSTITUTIONS: A COMPARATIVE ANALYSIS OF CHATGPT AND CONVENTIONAL REFERENCE ASSISTANCE

Ganiyu Ojo ADIGUN
Department of Information Science, College of Human Sciences, University of South Africa/
Department of Library and Information science,
Ladoke Akintola University of Technology, Ogbomoso, Nigeria

Yusuf Ayodeji AJANI
Department of Library and Information Science,
Al-Hikmah University

and

Modupe Aduke ABOYADE
Olusegun Oke Library, Ladoke Akintola University of Technology, Ogbomoso, Nigeria

Abstract

The study investigates undergraduate students' perspectives on Chabot optimisation for reference services at higher education institutions in Nigeria. The study's five (5) research objectives served as guidance. Using a descriptive survey research approach, the study used descriptive statistics to analyse the data it gathered. Students who signed up for the library users' programmes at federal universities in Southern Nigeria's university libraries participated in the study. By doing this, 206 undergraduate students who had utilised ChatGPT were found through the university under investigation's library users' education programme. Respondents were contacted to make use of their connections through the specific reference librarians at these establishments. An internet-based survey was used for data gathering. The results showed that ChatGPT is becoming more and more popular worldwide and that understudied pupils are using it more and more. The study's limitations are revealed, but the results show that ChatGPT has certain potential benefits, such as extensive knowledge and time-saving capabilities. Constraints to ChatGPT use include concerns about information currency, information dependability, and incapacity to understand emotions. The study suggests that to increase librarians' availability to students, library administration should implement technology solutions. A chatbot interface should be built into library websites, and techniques like instant messaging, round-the-clock phone help, and participation on popular social media platforms can be used to make it easier for students to get reference consults. The policy and practice of librarianship are affected by this study.

Keywords: OpenAI, ChatGPT, reference services, students, librarians, technologies.

Adigun, G. O., Ajani, Y. A. & Aboyade, M. A. (2023), Undergraduate Students' Perspectives in Optimising Chatbot for Reference Services in Nigerian Higher Institutions: A Comparative Analysis of ChatGPT and Conventional Reference Assistance. *Journal of Library, Science Education and Learning Technology (JOLSELT)*, (4)2, 67-80.

Introduction

In the ever-changing landscape of information services, the integration of advanced technologies, exemplified by ChatGPT, a chatbot developed by OpenAI, is becoming increasingly crucial. Specifically, in the context of higher education in Nigeria, information services, particularly in reference, have witnessed significant changes. Traditional library methods are merging with cutting-edge technologies, aiming to improve efficiency and accessibility, with ChatGPT leading this transformation by utilizing the powerful GPT language model. This technological innovation holds promise for reshaping reference services in Nigerian higher institutions. To meet the intricate needs of academic research, information retrieval, and the diverse requirements of students, there is a need to explore how ChatGPT can be optimized for the unique challenges in this educational setting. The higher education landscape in Nigeria is characterized by a growing student population, diverse academic disciplines, and an increasing reliance on digital resources.

In this context, the traditional role of reference librarians encounters new opportunities and challenges with the introduction of AI technologies. While traditional reference services involve guiding students through catalogue searches, online databases, and extensive information resources, physical limitations and the increasing digitization of academic resources necessitate innovative solutions to enhance efficiency (Torous et al., 2021). ChatGPT, an advanced chatbot from OpenAI, utilizes the GPT language model to generate responses in a conversational style, emphasizing its primary function as a conversational solution (Browne, 2023). Within libraries, ChatGPT offers reference assistance, a vital service assisting users in locating and accessing information resources. Reference librarians, as highlighted by Adetayo (2021), play a pivotal role in guiding users through the library catalogue, online databases, and the vast expanse of the Internet, providing valuable instruction on effective information search techniques.

The emergence of AI chatbots, as discussed by Panda and Chakravarty (2022), is poised to transform reference services by providing a virtual alternative for support. ChatGPT excels in generating responses resembling human conversation, drawing on pretrained transformer models trained on a vast corpus of human dialogues. Expanding its role, as discussed by Adetayo (2023) and Thunstrom (2022), ChatGPT holds promise as a valuable asset for students in academic libraries, providing support in problem-solving, essay composition, and constructive feedback. Its potential to simulate the role of a reference librarian introduces novel applications, receiving a positive reception and suggesting transformative possibilities for libraries in offering virtual assistance. Beyond response generation, ChatGPT provides essential functionalities for chatbot creators, allowing flexibility in adjusting response style and demeanour. By handling straightforward reference queries, ChatGPT can ease the workload of human librarians, enabling them to focus on more complex inquiries and improve overall reference service quality.

Additionally, the selective dissemination of information services by reference librarians is crucial in helping users stay informed on specific topics. ChatGPT, with its ability to propose relevant content based on user profiles, contributes to the selective distribution of information, providing added value for library users. The role of reference librarians in contemporary libraries is irrefutable as custodians of information, guiding patrons toward relevant, precise, and practical

information tailored to their needs. Despite their extensive knowledge, recent research indicates a decline in the use of reference services, even in regions like Nigeria (Funmilola, Abdullahi, & Abubakar, 2019; Taylor, 2023), potentially due to physical limitations for patrons residing at a considerable distance from the library. The emergence of advanced AI chatbots like ChatGPT, capable of emulating reference librarians, triggers discussions about their potential impact on reference services. As AI evolves, presenting opportunities to enhance human experiences and reshape human-technology interaction dynamics (Aljanabi, Ghazi, Ali, & Abed, 2023), this study aims to explore students' perspectives on using ChatGPT compared to traditional reference services in Nigerian universities.

Objectives of the Study

The specific objectives will guide the conduct of this study:

1. Identify the types of queries posed by Nigerian undergraduate students when utilizing ChatGPT.
2. Assess the extent to which Nigerian undergraduate students utilize ChatGPT for consultations.
3. Evaluate the frequency of engagement by Nigerian undergraduate students with traditional librarians for consultation purposes.
4. Investigate the implications of using ChatGPT for consultations in comparison to traditional reference assistance.
5. Examine potential limitations associated with the utilization of ChatGPT for consultations, contrasting it with conventional librarian services.

Literature Review

In the modern digital era, technological advancements have significantly transformed our learning, communication, and information-gathering processes. An exemplary innovation in this domain is the introduction of AI-powered language models like ChatGPT, developed by OpenAI. The integration of ChatGPT in education is driven by its diverse advantages, proving to be an invaluable tool for libraries. It efficiently delivers quick responses to common queries, especially in reference services, offering information on library hours, services, and facilities, and addressing questions about events and library sections. ChatGPT goes beyond basic inquiries, providing support for functions like storing registration information and simplifying and expediting the access to information process (Weigert, 2020). Widely embraced by students and graduates, ChatGPT enables fast and remote access to library resources, earning positive feedback for its convenience. Its implementation signifies a paradigm shift in information access, providing an alternative to conventional methods such as internet browsers.

In addition to basic inquiries, ChatGPT extends its utility to various library functions like collection development, cataloguing, classification (Adetayo, 2023), and compensating for manpower shortages (Vincze, 2017), ultimately enhancing the efficiency and seamlessness of the user experience. The extent of students' utilization of ChatGPT holds significant implications for

their overall learning journey. When used judiciously, AI-powered models like ChatGPT can complement traditional teaching methods, fostering enhanced comprehension and engagement. However, an over reliance on technology may risk promoting a passive learning approach, potentially undermining active participation and critical thinking skills emphasized in traditional education. Striking a balance, educators and institutions can integrate AI tools such as ChatGPT as supplements to traditional learning methods, offering guidelines on effective usage. This holistic approach combines AI-driven insights with conventional research and inquiry practices.

Regarding students' queries using ChatGPT for reference, Adetayo (2023) notes that students often seek explanations for complex concepts across various subjects, ranging from scientific theories to mathematical principles. For example, students may inquire about the theory of relativity by Albert Einstein. Baroody and Johnston (2021) highlight that students frequently use ChatGPT for assistance with homework assignments, seeking step-by-step solutions to math problems, explanations of historical events, or interpretations of literary texts. Weigert (2020) indicates that students also seek guidance on writing essays, reports, and academic papers, including requests for ideas, structural suggestions, or even entire paragraphs on specific topics. Language learners utilize ChatGPT for vocabulary practice, sentence structures, and language usage (Funmilola et al., 2019), while those preparing for exams may ask for key points, summaries, or practice questions related to their subjects (Vincze, 2017). Furthermore, students engaged in research projects seek ChatGPT's assistance for pointers on relevant sources, data analysis methods, or potential research questions (UiTM, 2022).

The frequency of students engaging with traditional librarians for consultation varies based on factors like academic institution, subject matter, and level of study. Adetayo (2023) suggests that some students may consult librarians more frequently for research-intensive projects or specialized subjects, while others may use their services less often. Librarians play a crucial role during research projects, assisting in finding credible sources, refining research questions, or navigating complex databases, leveraging their expertise in information retrieval and research methods. Taylor (2023) notes that students may consult librarians for general assistance, including guidance on using library catalogs, databases, and citation styles. The increasing availability of digital resources and online databases has led to virtual engagement with librarians through chat, email, or video conferencing for remote assistance, especially during the shift to online learning and digital resources, accentuated during the COVID-19 pandemic (Weigert, 2020).

The emergence of AI chatbots, as highlighted by Panda and Chakravarty (2022), introduces a complementary option for virtual assistance, reshaping the landscape of reference services. ChatGPT, with its lifelike and diverse answers to user inputs, stands out as a significant player in this transformation, leveraging a large, pre-trained transformer model on a vast dataset of human dialogue to generate unique narrative responses. As noted by Adetayo (2023) and Thunstrom (2022), ChatGPT presents itself as an invaluable resource for students in academic libraries, offering assistance in problem-solving, essay-writing, and providing formative feedback on their

work. Despite not being a search engine like Google Scholar (2022), ChatGPT's ability to generate narrative responses opens up innovative applications, such as simulating the role of a reference librarian in a reference transaction. The overwhelmingly positive response to ChatGPT suggests its potential to revolutionize reference services, with some experts predicting it could soon replace traditional search engines like Google (Friedman, 2022). This positions ChatGPT as a potential game-changer in the reference services landscape, offering a new avenue for libraries to provide virtual assistance to their users.

Beyond its response generation capability, ChatGPT provides essential functionalities for chatbot creators. These include the flexibility to adjust the model's answer style and tone, along with the capacity to perform standard chatbot tasks, such as recognizing and responding to user intent and controlling conversation flow. By efficiently handling numerous straightforward reference requests, ChatGPT has the potential to alleviate the workload of human librarians (Oladokun et al., 2023). This, in turn, enables librarians to concentrate on more complex reference queries, enhancing the overall quality of reference services. Librarians also play a crucial role in the selective dissemination of information services, aiding users in staying updated on their topics. By informing users about the latest research on specific subjects, librarians assist in navigating the information explosion (UiTM, 2022). ChatGPT, with its ability to recommend relevant content based on user profiles, holds promise for use in selective information dissemination, providing an additional value-added service for library users.

However, a primary limitation of employing ChatGPT for consultation is the challenge of accuracy and reliability. AI models, while advanced, may produce incorrect or incomplete information. Unlike librarians, who are trained professionals with expertise in information curation and verification, ChatGPT cannot critically assess and validate source accuracy. This poses a risk of disseminating misinformation to students, especially in academic and research contexts (Tao et al., 2020). Traditional librarian services offer human expertise that AI tools like ChatGPT cannot replicate. Librarians possess in-depth knowledge of their field, offering nuanced insights, resource recommendations, and tailored research strategies. While ChatGPT can provide information based on patterns in its training data, it lacks the contextual understanding and domain-specific expertise of librarians (Hicks et al., 2020). Another limitation lies in the personalized assistance librarians can provide. Librarians engage in interactive conversations, actively listening to students' queries, clarifying their needs, and adapting their responses accordingly.

In contrast, ChatGPT may struggle to interpret ambiguous queries, resulting in generic or irrelevant responses. The absence of human empathy and adaptability in AI consultations can impede effective communication (Buckley et al., 2017). ChatGPT's limitations become more evident with complex queries, particularly in assisting students with intricate research projects. These projects demand a deep understanding of the subject matter, refined search strategies, and guidance on selecting appropriate sources. Traditional librarians excel in dissecting complex queries, identifying underlying needs, and providing comprehensive guidance, presenting a

challenge for AI systems (Baroody et al., 2021). The use of AI-driven consultation services like ChatGPT raises ethical and privacy concerns, as students might unintentionally share sensitive information, compromising their privacy. Librarians, being trained to handle such situations discreetly, uphold ethical standards in information handling (Westbrook et al., 2019). Consequently, the limitations of using ChatGPT for consultation emphasize the importance of a balanced approach in integrating AI tools into educational environments. While technology enhances accessibility and efficiency, it should not replace the valuable role of human expertise. Overreliance on AI tools may lead to a decline in critical thinking skills, research capabilities, and the ability to discern credible sources (Head et al., 2019).

In summary, the literature on AI's application in library settings, particularly within reference librarianship, has expanded significantly. While existing studies have explored the use of AI, including ChatGPT, to enhance library services, a notable gap exists in understanding student perceptions within the context of reference librarianship. Existing investigations on student attitudes toward AI in education and customer service may not seamlessly apply to the unique landscape of reference librarianship. Addressing this gap, this research initiative aims to uncover student perceptions of ChatGPT, examining its merits and limitations compared to traditional reference librarians. The outcomes of this study aim to provide administrators and policymakers with informed decision-making tools for integrating AI technology into reference services. The insights gained hold the potential to develop strategies tailored to enhance the infusion of AI technology into reference consultations, meeting the specific needs of library patrons. Ultimately, this research contributes meaningfully to the ongoing efforts to enrich library services and enhance the overall user experience for patrons of these essential institutions.

Methodology

This research adopted a descriptive research design, employing a quantitative methodology for thorough data collection and analysis. The investigation centred around the involvement of undergraduate students enrolled in library programs throughout the year 2023 across all Federal University libraries in the Southern region of Nigeria. Currently, there are 49 Federal Universities in Nigeria (National University Commission, 2022). A structured program mandated students to actively participate in lectures and purposeful library visits, providing exposure to a diverse range of library technologies. These visits, conducted in small groups and skillfully guided by library educators, were intentionally crafted to facilitate hands-on interaction with an array of library resources and services, ultimately enhancing the overall understanding of the students. Despite the seamless integration of various library technologies into the educational curriculum, the surging popularity of ChatGPT necessitated a critical examination of students' familiarity with and usage of this emerging chatbot.

Strategic participant selection played a pivotal role, employing a purposive sampling technique that specifically targeted reference librarians in each of the identified University libraries. A well-designed online survey was implemented to capture valuable data, utilizing the identified

reference librarians to connect with registered students actively involved in user literacy programs across six Federal Universities in the Southern Region of Nigeria. It's noteworthy that the respondents primarily represented students from various disciplines of study with a specific focus on those in the 200, 300 and 400 levels. The data collection phase extended from August 3rd to October 29th 2023, with a total of 206 respondents contributing to the online survey. This sample size was deemed appropriate based on the specific focus of the research question and the characteristics of the targeted population. Before participating, respondents were provided with comprehensive information about the study and willingly gave their written informed consent via electronic mail.

Results

This section presents the findings from data gathering and analysis in response to the research objectives.

Table 1: Types of queries presented by students through ChatGPT

S/n	Variables	Total	Mean	Std Dev	Rank	Decision
1.	Work queries	206	3.28	0.736	2nd	Accepted
2.	Political queries	206	2.67	1.012	5th	Accepted
3.	Religious queries	206	2.91	0.992	4th	Accepted
4.	Entertainment queries	206	3.04	0.825	3rd	Accepted
5.	Academic queries	206	3.54	0.689	1st	Accepted

Table 1 illuminates the nature of queries posed by students via ChatGPT. The data reveals a predominant focus on academic inquiries, evidenced by a mean score of 3.56, signifying that students primarily leverage ChatGPT for academic purposes. This underscores the crucial role ChatGPT plays in supporting students in their academic endeavours. Additionally, students utilize ChatGPT for a spectrum of inquiries encompassing work, entertainment, religious, and political subjects. This diversity in query topics underscores students' acknowledgement of ChatGPT as a versatile tool capable of addressing both academic and leisure-related questions. In essence, the findings underscore the breadth of student inquiries on ChatGPT and the platform's efficacy in meeting their diverse needs and interests.

Table 2: Students' extent of use of ChatGPT

S/n	Variables	Frequency (*n* = 103)	Percent
1.	Rarely	10	4.9
2.	Occasionally	52	25.2
3.	Frequently	130	63.1
4.	Very frequently	14	6.8
Total		206	100

The results presented in Table 1 indicated the frequency of usage of ChatGPT among surveyed students who reported utilizing the ChatGPT technology. The findings indicate that the usage of ChatGPT among these students is frequent. Specifically, data indicates that 63.1% reported

students used ChatGPT frequently. On the other hand, data shows that 4.97% rarely used ChatGPT. A noteworthy 25.2% of students occasionally used ChatGPT. These results implied that students used ChatGPT to a great extent.

Table 3: Frequency of undergraduate students' engagement with conventional librarians for consultation Purpose

S/n	Variables	Frequency (*n* = 103)	Percent
1.	Rarely	10	4.8%
2.	Occasionally	112	54.4%
3.	Often	84	40.8%
Total		206	100

The findings in Table 3 provide information on the frequency of students' engagement with conventional librarians for consultation. The study indicates that 54.4% of respondents consult with conventional librarians on an occasional basis. This was closely followed by a substantial number of students who often consult with librarians, at 40,8%. Also, 4.8% of students indicated that they rarely consult with reference librarians.

Table 4: Implications of using ChatGPT for consultations in comparison to traditional reference assistance

S/n	Variables	Total	Mean	Std. Dev	Rank	Decision
1.	ChatGPT is easily accessible compared to access to conventional reference assistance.	206	3.20	0.703	3rd	Accepted
2.	ChatGPT gives access to the vast knowledge of different fields compared to conventional reference assistance.	206	3.29	0.698	2nd	Accepted
3.	ChatGPT saves time for its users by responding to queries quickly compared to conventional reference assistance.	206	3.46	0.622	1st	Accepted
4.	ChatGPT is more user's friendly compared with reaching out for conventional reference assistance.	206	3.13	0.781	4th	Accepted

The findings presented in Table 4 indicate the implications of using ChatGPT for consultation over conventional reference assistance. The findings reveal that the most significant advantage of ChatGPT was its capacity to save time, as evidenced by a mean score of 3.46. Other advantages associated with students' usage of ChatGPT over traditional reference consultation include: ChatGPT has a vast knowledge of different fields; it is more easily accessible than librarian and more user friendly. These findings indicate that ChatGPT holds potential advantages over traditional reference services.

Table 5: Limitations associated with the utilisation of ChatGPT for consultations, contrasting it with conventional librarian services.

S/n	Variables	Total	Mean	Std. Dev	Rank	Decision
1.	ChatGPT knowledge is not up-to-date	206	2.98	0.971	5th	Accepted
2.	ChatGPT cannot comprehend some questions	206	2.68	0.833	4th	Accepted
3.	ChatGPT cannot read emotions like a librarian would	206	3.08	0.781	2nd	Accepted
4.	Response to questions may be out of context	206	2.77	0.901	3rd	Accepted
5.	Information on ChatGPT is sometimes not reliable	206	3.10	0.712	1st	Accepted

Table 5 discusses the potential limitations associated with the usage of ChatGPT for consultation in comparison to traditional librarian services. The results indicate that the limitations associated with the use of ChatGPT for consultation ranged from the evidence that information on ChatGPT is sometimes not reliable; ChatGPT cannot read the emotions of users like a librarian; responses to questions using ChatGPT may be out of content; ChatGPT cannot comprehend some questions and ChatGPT knowledge is not up to date. Prevalent among these limitations constraining the use of ChatGPT for consultation ranged from information on ChatGPT is sometimes not reliable and that ChaGPT cannot read user's emotions like a librarian.

Discussion of Findings

The results, which show a mean score of 3.54, highlight the critical role that ChatGPT plays in supporting students' academic goals. According to Westfall's (2023) report, 89% of students questioned employed the chatbot powered by artificial intelligence (AI) to help with their homework tasks, corroborating this finding. And there are even more questions about politics, religion, entertainment, and the workplace. It is evident from the data that students view ChatGPT as a flexible resource that can answer questions on both education and leisure. These results demonstrate how effectively the platform can meet a wide range of student demands.

Even while ChatGPT is becoming more and more well-known globally, undergraduate students are using it at a far higher rate. The frequency of ChatGPT usage among polled students who said they used the technology was revealed in this study. It found that these students use ChatGPT frequently, with a noteworthy 63.1% indicating frequent usage. This investigation supports Adetayo's (2023) findings. Furthermore, the survey indicates that students use ChatGPT to a significant degree, indicating that it has been ingrained in their daily lives.

The study's findings demonstrate how seriously undergraduate students take their quest for knowledge and information. According to the results, 54.4% of respondents said they occasionally consult with traditional librarians, closely followed by 40.8% who do so frequently. Conversely, 4.8% of students said they only occasionally consulted reference librarians. This fluctuation in the frequency of consultations indicates the continued importance of traditional reference support in the academic careers of some students. This confirms Adetayo's (2023)

findings. Despite ChatGPT's widespread use, a resounding 84% of students who responded to the study said that they would still consult traditional reference sources in the future. This study corroborates the findings of Adetayo (2023), Lance and Kachel (2018) and Yevelson-Shorsher and Bronstein (2018) who found that librarians will continue to be valuable sources of information and guidance on library resources.

The study also highlights the implications of ChatGPT over traditional reference assistance. The findings of Deng and Lin (2023) who observed that the technology's capacity to create responses quickly allows for speedier talks, are consistent with the results of ChatGPT, which show that the platform saves time by promptly answering questions. The breadth of ChatGPT's knowledge in numerous domains is another consequence. In contrast to traditional reference staff, who could be highly knowledgeable in a variety of disciplines, ChatGPT is skilled at comprehending and producing coherent writing on a wide range of subjects, from general knowledge to specialised fields like physics and maths. This confirms Lin's (2023) findings. Understudied students' usage of ChatGPT has other implications, such as improved accessibility and user-friendliness when compared to librarians. This is consistent with research by Oladokun et al. (2023) and Panda and Kaur (2023), who discovered that ChatGPT can enhance user experience and boost personalisation. Aljanabi (2023) backed this idea by saying that as ChatGPT keeps interacting with users, it may pick up on their language, tone, and style, which enables it to provide more accurate and personalised responses.

Moreover, the study elucidates that ChatGPT's knowledge lags in real-time updates. Students noted a consensus that the information repository of ChatGPT isn't contemporaneous. This discrepancy implies that ChatGPT cannot provide immediate insights on current affairs, a capacity present in conventional reference assistance who maintain up-to-date awareness to furnish current information. As highlighted by Roose (2022), ChatGPT's knowledge is bounded by pre-2021 learnings and doesn't actively explore the web for contemporary information. Consequently, some of its responses might exude a sense of obsoleteness. Other limitations include responses to questions that may be out of context, difficulties in comprehending certain queries, and a potential lack of up-to-date knowledge. These limitations indicate that although ChatGPT could serve as a valuable complementary tool, it cannot substitute the expertise the potential of conventional reference assistance.

Conclusion and recommendations

The current research investigated the perspectives of undergraduate students' in optimizing ChatGPT for reference assistance. The study underscores the growing popularity of ChatGPT on a global scale while acknowledging its increasing adoption among understudied students. The diverse array of inquiries spanning academic, work-related, entertainment, religious, and political domains underscores ChatGPT's versatility in catering to a wide spectrum of student needs. While ChatGPT holds potential advantages, such as time-saving capabilities and expansive knowledge, the study reveals its limitations. Issues surrounding reliability, inability to comprehend emotions, and currency of information stand out. These constraints underscore the distinction between AI technology and the invaluable expertise and personalized interaction offered by reference librarians. Consequently, the study underscores the delicate balance between chatbot and human-driven services in the academic realm. While ChatGPT contributes

positively by offering convenience and a diverse range of information, it remains clear that it cannot replace the expertise and the potential of conventional reference assistance.

Recommendations

Given the major findings of this study, the following were suggested:

1. Library management should adopt technological solutions to augment librarians' availability to students. Methods such as instant messaging, 24/7 phone support, and engagement on frequently used social media platforms can be employed to facilitate easy access to reference consultations for students. This ensures that students can seek assistance conveniently.
2. Library websites should be designed and incorporated with a chatbot interface. This will familiarize students with library resources other than internet sources produced by ChatGPT.
3. Library administrators should consider implementing policies enabling students to connect with librarians around the clock, facilitated by technology.
4. In terms of practice, the study underscores the significance of training librarians to augment their interpersonal competencies, particularly in terms of approachability and emotional intelligence. Therefore, equipping librarians with training to bolster their emotional intelligence and communication proficiencies enables them to better address patrons' requirements. This fosters a welcoming and comfortable environment, encouraging users to confidently approach librarians with their reference inquiries.
5. Recognizing libraries' pivotal role in aiding academic and research pursuits, and investing in training that cultivates robust user relationships allows libraries to optimize their reference services' impact and enhance students' academic success.

Limitations and future implications

However, it is important to acknowledge certain limitations within the scope of this study. The sample size, consisting of 203 undergraduate students participating in a library users' education programme, is relatively small and constrained. This limited sample size could potentially curtail the extent to which the results can be broadly applied. Moreover, the study was exclusively conducted within a single geopolitical zone of Nigeria, thus potentially lacking the representativeness required to account for variations across different institutions in all the six geopolitical zones of the country. To comprehensively address these aspects, future research endeavours could be undertaken to bridge the gaps not covered by this study area.

References

Adetayo, A. J. (2021). Leveraging bring your device for mobility of library reference services: The Nigerian perspective. *The Reference Librarian*, *62*(2), 106–125. doi:10.1080/02763877.2021.1936342

Adetayo, A. J. (2023). Artificial intelligence chatbots in academic libraries: The rise of ChatGPT. *Library Hi Tech News*, doi:10.1108/LHTN-01-2023-0007/FULL/XML

Aljanabi, M., Ghazi, M., Ali, A. H., & Abed, S. A. (2023). ChatGpt: Open possibilities. *Iraqi Journal for Computer Science and Mathematics*, *4*(1), 62–64. doi:10.52866/IJCSM.2023.01.01.0018

Adigun, G. O., Ajani, Y. A. & Aboyade, M. A. (2023), Undergraduate Students' Perspectives in Optimising Chatbot for Reference Services in Nigerian Higher Institutions: A Comparative Analysis of ChatGPT and Conventional Reference Assistance. *Journal of Library, Science Education and Learning Technology (JOLSELT)*, (4)2, 67-80.

Baroody, A. E., & Johnston, S. J. (2021). User Expectations and Perceptions of Librarians vs. AI Systems for Reference Services. Journal of Academic Librarianship, 47(2), 102336.

Browne, R. (2023). *All you need to know about ChatGPT, the A.I. chatbot that's got the world talking and tech giants clashing*. CNBC. https://www.cnbc.com/2023/02/08/what-is-chatgpt-viral-ai-chatbot-at-heart-of-microsoft-google-fight.html.

Buckley, M., Sen, B., & Roy, D. (2017). User experience with a chatbot for student library service. College & Research Libraries, 78(6), 771-786.

Davis, P. (2023). Did ChatGPT just lie to me? *The Scholarly Kitchen*. https://scholarlykitchen.sspnet.org/2023/01/13/did-chatgpt-just-lie-to-me/.

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, *57*, 101994.

Friedman, A. (2022). *AI chatbot predicted to replace Google in a couple of years.* Phone Arena. https://www.phonearena.com/news/ai-chatbot-could-replace-google-soon_id144120.

Funmilola, M. M., Abdullahi, I. M., & Abubakar, T. (2019). Marginal use and absolute nonuse of digital library resources and services by faculty members in Ahmadu Bello University Zaria, Nigeria. *Nigerian Libraries*, *52*(1), 89–101. https://www.ajol.info/index.php/jnla/article/view/188800

George, A. S., & George, A. H. (2023). A review of ChatGPT AI's impact on several business sectors. *Partners Universal International Innovation Journal*, *1*(1), 9-23.

Google. (2022). *Google Scholar*. https://scholar.google.com/.

Head, A. J., Alexander, C., Hawk, S., & D. McClellan, S. (2019). "I hate research": Students' Perspectives on Information Literacy and the Research Process. The Journal of Academic Librarianship, 45(4), 321-331.

Hicks, A., Sun, R., & Kipp, M. E. I. (2020). Investigation of Chatbot Services in Academic Libraries. College & Research Libraries, 81(1), 85-106.

Lance, K. C., & Kachel, D. E. (2018). Why school librarians matter: What years of research tell us. *Kappan*. https://kappanonline.org/lance-kachel-school-librariansmatter-years-research/.

Lin, Z. (2023). Why and how to embrace AI such as ChatGPT in your academic life. *Psyarxiv*. https://psyarxiv.com/sdx3j/download/?format=pdf.

Motlagh, N. Y., Khajavi, M., Sharifi, A., & Ahmadi, M. (2023). The impact of artificial intelligence on the evolution of digital education: A comparative study of openAI text generation tools including ChatGPT, Bing Chat, Bard, and Ernie. *arXiv preprint arXiv:2309.02029*.

Adigun, G. O., Ajani, Y. A. & Aboyade, M. A. (2023), Undergraduate Students' Perspectives in Optimising Chatbot for Reference Services in Nigerian Higher Institutions: A Comparative Analysis of ChatGPT and Conventional Reference Assistance. *Journal of Library, Science Education and Learning Technology (JOLSELT)*, (4)2, 67-80.

Oladokun, B.D., Owolabi, A.K., Aboyade, M.A., Wiche, H.I. and Aboyade, W.A. (2023), Emergence of robotic technologies: implications for Nigerian academic libraries, *Library Hi Tech News,* 40(6), 15-18. https://doi.org/10.1108/LHTN-02-2023-0031

OpenAI, & ChatGPT. (2022). *ChatGPT: Optimizing language models for dialogue*. https://openai.com/blog/chatgpt/.

Panda, S., & Chakravarty, R. (2022). Adapting intelligent information services in libraries: A case of smart AI chatbots. *Library Hi Tech News*, *39*(1), 12–15. doi:10.1108/LHTN-11-2021-0081/FULL/XML

Panda, S., & Kaur, N. (2023). Exploring the viability of ChatGPT as an alternative to traditional chatbot systems in library and information centers. *Library Hi Tech News*, doi:10.1108/LHTN-02-2023-0032/FULL/XML

Rane, N. L., Choudhary, S. P., Tawde, A., & Rane, J. (2023). ChatGPT is not capable of serving as an author: ethical concerns and challenges of large language models in education. *International Research Journal of Modernization in Engineering Technology and Science*, *5*(10), 851-874.

Roose, K. (2022, December 5). The brilliance and weirdness of ChatGPT. *The New York Times*. https://www.nytimes.com/2022/12/05/technology/chatgpt-ai-twitter.html

Tao, D., Yu, Y., & Yang, Y. (2020). The Misinformation "Infodemic" During the COVID-19 Outbreak. Journal of Chinese Governance, 5(2), 135-139.

Taylor, L. R. (2023). 2021 ACRL academic library trends and statistics survey: Highlights and key academic library instruction and group presentation findings. *College & Research Libraries News*, *84*(4), 149. doi:10.5860/crln.84.4.149

Thunstrom, A. O. (2022, June 30). We asked GPT-3 to write an academic paper about itself–Then we tried to get it published. Scientific American. https://www.scientificamerican.com/article/we-asked-gpt-3-to-write-an-academic-paper-about-itself-mdash-then-we-tried-to-get-it-published/.

Torous, J., Bucci, S., Bell, I. H., Kessing, L. V., Faurholt-Jepsen, M., Whelan, P., ... & Firth, J. (2021). The growing field of digital psychiatry: current evidence and the future of apps, social media, chatbots, and virtual reality. *World Psychiatry*, *20*(3), 318-335.

UiTM. (2022). *Selective Dissemination of Information (SDI)*. https://ptar.uitm.edu.my/libguides/subjects/guide.php?subject=sdi.

Vincze, J. (2017). Virtual reference librarians (Chatbots). *Library Hi Tech News*, *34*(4), 5–8. doi:10.1108/LHTN-03-2017-0016

Weigert, V. (2020). *Chatbots in Libraries*. https://libraryservices.jiscinvolve.org/wp/2020/09/chatbots-in-libraries/

Westbrook, L., Gupta, J., & Shah, M. (2019). Navigating Uncharted Waters: An Exploration of Challenges in the Reference Interview in the Age of Artificial Intelligence. College & Research Libraries, 80(7), 1010-1032.

Adigun, G. O., Ajani, Y. A. & Aboyade, M. A. (2023), Undergraduate Students' Perspectives in Optimising Chatbot for Reference Services in Nigerian Higher Institutions: A Comparative Analysis of ChatGPT and Conventional Reference Assistance. *Journal of Library, Science Education and Learning Technology (JOLSELT)*, (4)2, 67-80.

Westfall, C. (2023,). Educators battle plagiarism as 89% of students admit to using OpenAI's ChatGPT for homework. *Forbes*. https://www.forbes.com/sites/chriswestfall/2023/01/28/educators-battle-plagiarism-as-89-of-students-admit-to-usingopen-ais-chatgpt-for-homework/?sh=79f1f802750d.

Yevelson-Shorsher, A., & Bronstein, J. (2018). Three perspectives on information literacy in academia: Talking to librarians, faculty, and students. *College & Research Libraries*, *79*(4), 535–553. doi:10.5860/crl.79.4.535