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Investigating the Role of AI Chatbots in Improving the Advanced Research Services for Undergraduate Level Students in the UAE

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Abstract

ChatGPT has facilitated the students in multiple ways. Talking particularly about its usefulness in library services provides several opportunities to students, enabling them to search and streamline their research endeavors. This research also examined the role of ChatGPT in faulting the library advance research services for undergraduate-level students in the United Arab Emirates (UAE) supported by Task Technology Fit (TTF) theory. Data gathered using 386 structured questionnaires was analyzed using Partial Least Square-Structural Equation Modelling (PLS-SEM). Results revealed that ChatGPT Use for Library Search significantly affects Library Research Inquiries, indicating that ChatGPT has improved research assistance, providing satisfactory advanced research resources, further leading to enhanced student research skills. Further, the effect of ChatGPT Use for Library Search on Research Skills among undergraduate students also remained significant. It was found that ChatGPT has improved skills regarding locating and evaluating the required research information, further improving the ability to select and apply suitable research approaches. Also, information retrieval and improved competence remained prominent. Finally, the effect of ChatGPT Use for Library Search on User Experience was significant. It was found that accessibility, user-friendly interface, organization, and structure of ChatGPT contribute to a positive user experience. Also, the online catalogs and databases are intuitive and encourage efficient information retrieval. It is concluded that AI technologies, particularly ChatGPT, go beyond theoretical concepts and show practical applications in academic settings. Incorporating AI into library research services is an advantageous strategy to meet the various needs of undergraduate students. Thus, there is a prospect to improve advanced research services and contribute to overall academic success in the evolving educational technology landscape.

Keywords- ChatGPT, Library Systems, Library Research Inquiries, Research Skills, Task Technology Fit (TTF)

Introduction

ChatGPT plays a crucial role in improving students' learning experiences by allowing them to tailor their educational journeys and obtain feedback that may serve their particular needs. They tailor their educational journeys and receive feedback catering to their needs (Zhai, 2022). The impact of ChatGPT technology expands across different facets of education. It is instrumental in information recovery, addressing precise queries, studying diverse subjects, encouraging

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open conversations, writing and revising reports and essays, coding software, providing code explanations for tutoring, providing model data for databases and analyses, and solving mathematical and statistical analyses. Besides, ChatGPT shows its versatility by translating texts into multiple languages. In this regard, UNESCO (2023) cited an example of ChatGPT's application in research within higher education, highlighting its significant role and relevance. According to Halaweh (2023), ChatGPT is a valuable resource for improving writing skills by generating texts, bringing information, and providing summaries. This ability saves time and improves the quality of work within higher education. Adiguzel et al. (2023) emphasize ChatGPT's proficiency in understanding natural language queries and rendering responses that mirror human-like interactions. This has positioned ChatGPT as a sought-after tool for addressing questions ranging from common to complex subjects.

Consequently, students find it a conducive tool supporting their educational journey, providing new learning experiences, and offering academic ideas. Williamson and Eynon (2020) draw a link between the use of ChatGPT and the concept of Artificial Intelligence in Education (AIED), especially highlighting the rapid advancements in deep learning technology, further accelerated by the COVID-19 pandemic. The field of Artificial Intelligence in Education (AIED) has evolved into a well-defined academic domain. Within AIED, two distinct approaches are identified: the development of AI-powered tools prepared for classrooms and the application of AI to acquire insights, evaluate, and improve the learning process.

Similarly, Srivastava (2023) argued that research-related activities benefit from ChatGPT's abilities, as their research showed ChatGPT's possibility to predict the likelihood of a paper being accepted during peer review. In higher education administration, ChatGPT contributes substantially by facilitating processes and improving overall efficiency. Another critical factor cornering ChatGPT in education is the role of ChatGPT-based Chatbots (Labadze et al., 2023) in upgrading the library services for the students. According to Dwivedi et al. (2023), users can use ChatGPT to explore the library catalog, searching for books, articles, and supplementary materials. ChatGPT uses natural language processing to understand user questions and provide appropriate search results. Javaid et al. (2023) stated that with the quick progress of artificial intelligence technology, precise libraries have adopted intelligent question-and-answer systems to address the challenge of slow and inefficient manual services. These systems mainly depend on a keyword recognition model, extracting keywords for searching within an existing knowledge base. The process involves checking search results and returning responses to the user. The integration of ChatGPT technology has paved the way for developing a dynamic and efficient intelligent consultation system. This system can respond to questions anytime and anywhere, significantly decreasing user wait times. Also, it can precisely apprehend user intentions, offering an efficient consultation service (Oyelude, 2023).

This research examines the role of ChatGPT, as a popular AI-enabled chatbot in improving advanced research services (Mhlanga, 2023; Ofosu-Ampong et al., 2023; Rahman & Watanobe, 2023) designed for undergraduate-level students in the United Arab Emirates (UAE). The preliminary objectives include investigating the effectiveness of AI chatbots in providing support for advanced research inquiries, considering the impact on students' research skills development, and comprehending the overall user experience with AI chatbots in the academic context. The significance of this research lies in addressing a crucial aspect of educational technology within the UAE's higher education landscape. As AI chatbots become increasingly integrated into academic environments, comprehending their role in promoting advanced research services for undergraduate students is important. The results of this research will

contribute practical insights to educators, administrators, and policymakers, helping in the informed integration of AI chatbot technology to improve research capabilities and overall academic experiences for undergraduate students in the UAE. Also, this study can provide a foundation for modifying AI chatbot implementations in educational settings globally, promoting improved learning results and research proficiency at the undergraduate level. Thus, the first section of this research is based on introducing the study topic and specifying the study problem, aims, gaps, and structure. The second section involves citing the literature providing theoretical and empirical support to current study. Further, the third section involves methodological approaches applied in the current study. The fourth section is based on data analysis and findings, while the fifth section involves discussion on results, implications, conclusion, and recommendations for the future studies.

Review of Literature

Theoretical Underpinnings

This research study is theoretically supported by the Task Technology Fit (TTF) theory as a framework for understanding technology use by evaluating the alignment of technology with users' distinct tasks and needs (Ofosu-Ampong et al., 2023; Tu et al., 2023). This model was conceived to expand the understanding of technology adoption, explicitly addressing the gap in explaining how the acceptance of technology contributes to individual performance in fulfilling the required tasks (Spies et al., 2020). According to Lytras (2023), measuring technology's value to a system is intrinsically challenging due to the complex interplay of elements like technology, users, systems, tasks, and processes (Foroughi et al., 2023). Directly evaluating this value becomes an intricate task. In response to this challenge, alternative measures have been proposed to measure the impact of technology on systems.

Consequently, the relevant theory is proposed to help evaluate how well ChatGPT aligns with library users' tasks and information-seeking goals. According to Retkowsky et al. (2023), the Task-Technology Fit (TTF) theory has widespread acceptance within Information System (IS) research. Regarded as "one of the most significant developments in information system theory," TTF in the current research provides strong support for quantifying the effectiveness of technology within organizational contexts.

Library Research Services

Library systems are critical to the research process, providing access to various resources, support, and services necessary for effective research (Aithal & S, 2023). These systems contribute to research differently, providing unprecedented access to information containing different resources, i.e., books, journals, online databases, and specialized collections. These resources provide researchers with the required knowledge and information for their investigative works. According to Lund & Wang (Lund & Wang, 2023), library systems advance research assistance services, helping researchers identify appropriate resources and facilitate sufficient access. This assistance may involve support in literature searches, citation management, and professional database navigation. These systems also facilitate the preservation of knowledge as they are responsible for preserving the scholarly record and assuring the longevity of books, journals, and other materials. These systems guarantee that this knowledge remains unrestricted to researchers both currently and in the future (Ray, 2023). According to Lappalainen and Narayanan (2023), library systems also play a crucial role in streamlining interlibrary loan services, allowing researchers to borrow materials from other

institutions when they are not locally available. This proves essential for accessing hard-to-find or technical resources. Also, library systems may actively support open-access initiatives, contributing to the free availability of academic articles, data, and other materials online. This commitment improves the visibility and effect of research, promoting knowledge sharing and dissemination (James & Filgo, 2023).

ChatGPT for Library Research Purpose

According to Mhlanga (2023), ChatGPT's integration into library services provides avenues for enhanced search, reference, information services, cataloging, metadata development, content creation, and ethical considerations. ChatGPT promotes a more accurate and comprehensive response mechanism, accessing many materials, i.e., rare books, manuscripts, and archives that may not be readily obtainable online. This proves specifically beneficial when ChatGPT is assigned to providing specialized information, improving its effectiveness in serving distinctive user queries. Panda and Kaur (2023) argued that the role of ChatGPT expands beyond classic library functions to address various factors. For instance, it can assist librarians in remaining abreast of emerging topics and preserving current, relevant collections by examining vast volumes of text to determine trends and patterns. Also, ChatGPT's ability to examine user reading habits, genres, and preferred authors allows it to offer personalized reading recommendations, improving the user experience.

Similarly, ChatGPT offers accessibility services by providing transcripts of videos or audio explanations of visual content for disabled students. It facilitates communication through immediate responses on social media platforms and is a valuable tool for libraries to engage with users, promote events, and advertise services (Zhang Zhixiong, 2023). According to Houston and Corrado (2023), ChatGPT finds application in reference services, where it can ease the workload of librarians by responding to common questions about library services, resources, and policies, thereby improving the efficiency of the reference process. Also, it serves as a promotional tool, interacting with students and teachers, advertising events, and improving community outreach through different channels like book clubs, workshops, and social media engagement. The adaptable applications of ChatGPT expand to information literacy, where it can be used to develop interactive tutorials to teach users how to assess sources and conduct research. Also, it helps evaluate users' reading interests, offers personalized book recommendations, and supports catalog searches through natural language processing (NLP) (Yamson, 2023). Besides, ChatGPT proves practical in providing interactive training, guiding users on accessing e-journal and e-book databases, and contributing to a more informed user base. Also, it functions as a language converter, helping users to engage with the library in their local languages and acquire responses in their preferred language through integration with translation software (Fernandez, 2023).

Students' Perceptions of ChatGPT Use for Library Purposes

Generally speaking, ChatGPT in education has played a substantial role in facilitating students. A study by Farhi et al. (2023) indicated that students widely perceive ChatGPT as a transformative technology that offers multifaceted assistance in different parts of their academic journey. Notably, the findings further confirmed the significant influence of ChatGPT usage on the students' workload management, which leads to positive perceptions about the relevant technology in education. Sart (2023) also examined university students' perceptions of using ChatGPT in their academic journey. Data gathered by employing a survey from 338 students across three different departments within the Faculty of Education,

Istanbul University, revealed that a significant majority of students (97.9%) acknowledged the critical role played by ChatGPT in their self-study sessions.

Further, a considerable proportion (86%) revealed that ChatGPT assisted them in learning complex concepts and problem-solving. Also, most (82%) reported that the tool enabled more effective and efficient engagement with intricate course materials, especially in areas like computer science. Notably, a significant % of students (76%) reported improved self-confidence when confronted with complex problems. Talking particularly about ChatGPT use for library and research purposes, Lai (2023) examined the potential of artificial intelligence to advance library services; ChatGPT was used to respond to reference queries. The evaluation of ChatGPT's effectiveness involved the application of an assessment rubric, which examined its proficiency in addressing different question types and levels of difficulty. Results indicated the overall performance of ChatGPT as satisfactory, although it showed a need to improve information accuracy. A study by Kirtania (2023) explored the potential benefits that ChatGPT holds for Library and Information Science (LIS) professionals and students. The results revealed that the capacity of ChatGPT provides different advantages for both library professionals and students, encompassing areas including reference services, research support, language support, access to library services, and information management. According to Inamdar (2023), the potential of Artificial Intelligence Technologies (AITGs) is to upgrade library operations, elevate services, and improve the accessibility of collections. It is essential to highlight that implementing Artificial Intelligence Technologies (AITGs) does not aim to discourage users from physically visiting libraries or support substituting physical spaces with virtual counterparts. Instead, these technologies are positioned as tools that can improve and complete the services and resources offered by virtual libraries. This perspective positions ChatGPT as a valuable asset in improving library functionalities, enabling a symbiotic relationship between technological advancements and library services, investigating the effectiveness of AI chatbots in providing support for advanced research inquiries, considering the impact on students' research skills development, and comprehending the overall user experience with AI chatbots in the academic context.

Research Methodology

This research is based on a case study design, striving to collect real-time data on the ChatGPT for advanced library research purposes (Cousin, 2005). The researchers used a five-point Likert scale to gather data and incorporated measurement items derived from existing studies. Before the formal distribution of the surveys, the researchers conducted a pilot test involving 33 individuals (Fraser et al., 2018). Details of questionnaire sources, items, and pilot testing results are shown in Table 1. Notably, the Cronbach Alpha values for all constructs ranged from 0.732 to 0.836, surpassing the threshold of 0.7 (Agbo, 2010), showing internal solid consistency. Before formal survey distribution, formal consent was acquired from the relevant institutions, and participants were directly accessed. The respondents were informed that their data would be kept confidential and that the researchers would refrain from using it commercially. The respondents were also notified of their right to terminate the survey at any point without incurring any further commitments. The collected data was meticulously reviewed for coding and analysis using descriptive and inferential statistical approaches, particularly Partial Least Square-Structural Equation modeling (PLS-SEM). This stringent methodology assures the reliability and validity of the findings (Novak et al., 2021), contributing to an extensive understanding of the role of ChatGPT usage in the specified context.

Constructs	Items	Sources	Cronbach Alpha	Number of Items
ChatGPT Use for Library Search	I am satisfied that ChatGPT utilizes machine learning to develop responses based on a massive corpus of text data. I believe that ChatGPT generates responses to a broad range of questions, even those it has not noticed before. I find ChatGPT is pre-trained on a vast corpus of text data and can be fine-tuned on detailed tasks or domains to enhance its performance in library research works. ChatGPT continuously learns from new data, making it easier to preserve over time. ChatGPT is developed to generate responses that more closely mimic human conversation, making it more engaging and user-friendly.	(Panda & Kaur, 2023a)	0.836	05
Library Research Inquiries	I agree with the effectiveness of AI chatbots in enhancing advanced research assistance for undergraduate students in the UAE. I feel engaged when interacting with AI chatbots while seeking advanced research services. The accessibility of advanced research resources provided by AI chatbots for students is satisfactory. I am satisfied with the support and assistance provided by AI chatbots in my advanced research queries as an undergraduate student. Interacting with AI chatbots has improved my research skills as an undergraduate student engaged in advanced research activities.	(Lund & Wang, 2023)	0.732	05
Research Skills	The interaction with AI chatbots has improved my research skills in locating and evaluating information for advanced research purposes. As a result of using AI chatbots for research questions, I am confident in my ability to conduct advanced research. AI chatbots have contributed to my knowledge of research methods relevant to advanced academic inquiries. Using AI chatbots has improved the efficiency of recovering relevant information for my advanced research projects. I believe the assistance provided by AI chatbots has positively affected my overall competence in conducting advanced research.	(Nazir & Wang, 2023)	0.801	05
Library User Experience	The library resources are readily accessible and user-friendly. The structure and organization of the library contribute to a positive user experience. The service provided by library staff is helpful and responsive when having any query about ChatGPT. The online catalog and databases are intuitive and encourage efficient information retrieval. The library support services, including technology assistance, improve the user experience.	(Foroughi et al., 2023; Zhang Zhixiong, 2023)	0.793	05

Study Population and Sampling

As this study focused on investigating the role of ChatGPT for advanced library research, the researchers selected two private sector universities in Al Ain City, including AL Ain University (9,061 students) and United Arab Emirates University (14,387 students). In this context, the

total population is 23,448. Thus, based on the total population, the same size is estimated using Yamane's sample size estimation formula, indicating a sample size of 393 individuals suitable for the current research (Adam, 2020). To ensure a representative selection, the research team conducted in-person visits to both institutions, personally distributing questionnaires. The distribution process occurred in four departments: the College of Media and Communications, the Faculty of Law, the College of Business, and the College of Pharmacy. Notably, the questionnaires were distributed randomly, without preconceptions based on gender, age, or academic level. The data collection period spanned from September 13th, 2023, to November 9th, 2023. Following the comprehensive data-gathering process, a meticulous evaluation revealed that 07 questionnaires needed to be included or wrongly filled by the respondents. Consequently, 386 questionnaires were finalized for subsequent analysis, reflecting a robust response rate of 98.2%. This response rate significantly exceeded the recommended threshold of 60% (Deutskens et al., 2004)

Respondents' Profile

The respondents' personal profile was calculated based on the data regarding their gender, age, and the relevant faculties. First, it was found that most of the respondents (69.4%) were males and 30.6% were females. Regarding age, 87.3% of respondents were 18 to 22, 10.4% were 23 to 26, and 2.3% were 27 or above. Finally, based on the information concerning faculties, 54.9% of students were from the Faculty of Law, 37.8% were from The College of Communication, 5.4% were from Business Management, and 1.8% were from the College of Pharmacy. Table 2 provides a summary of respondents' profiles.

Table 2: Summary of Respondents' Profile.

Variables	Constructs	N	%
Gender	Male	268	69.4
	Female	118	30.6
Age	18-22 years	337	87.3
	23-26 years	40	10.4
	27 or Above	9	2.3
Faculty	The College of Communication	146	37.8
	The Faculty of Law	212	54.9
	The College of Business	21	5.4
	College of Pharmacy	7	1.8

Statistical Analysis and Findings

The data analysis conducted in this research involved both descriptive and inferential statistics. Regarding inferential statistics, partial Least Square Structural Equation Modeling (PLS-SEM) was primarily employed. Confirmatory Factor Analysis was used to evaluate the convergent validity of the survey tool, serving as an approach for data reduction and evaluating the internal constancy between the study constructs (Hoyle, 2000, 2000). The findings of the Confirmatory Factor Analysis, accompanied by the construct reliability analysis, are presented in Table 3.

It is observed that most of these values exceeded the minimum threshold of 0.5 (Sun, 2005). Also, the Average Variance Extracted (AVE) values surpassed 0.5 (Farhi et al., 2022; Farhi, Jeljeli, Zahra, et al., 2023), with ChatGPT Use for Library Search at 0.558, Library Research Inquiries at 0.602, Research Skills at 0.563, and Library User Experience at 0.737. These findings indicate that convergent validity exists, showing robust internal consistency among the

constructs. Regarding construct reliability, the Cronbach Alpha values exceeded the minimum threshold of 0.7 (Chin & Yao, 2014), with ChatGPT Use for Library Search at 0.744, Library Research Inquiries at 0.818, Research Skills at 0.713, and Library User Experience at 0.741. Finally, the Composite Reliability remained above the minimum threshold of 0.7, with ChatGPT Use for Library Search at 0.834, Library Research Inquiries at 0.738, Research Skills at 0.781, and Library User Experience at 0.849 (Amirrudin & Nasution, 2021).

Table 3: Summary of Convergent Validity and Construct Reliability Analysis.

Constructs	Items	Loadings	AVE	CA	CR
ChatGPT Use for Library Search	CTU1	0.766	0.558	0.744	0.834
	CTU2	0.718			
	CTU3	0.764			
	CTU4	0.776			
	CTU5	0.530			
Library Research Inquiries	LRI1	0.481	0.602	0.818	0.738
	LRI2	0.848			
	LRI3	0.663			
	LRI4	0.054			
	LRI5	0.397			
Research Skills	RSK1	0.884	0.563	0.703	0.781
	RSK2	0.433			
	RSK3	0.507			
	RSK4	0.028			
	RSK5	0.812			
Library User Experience	LIB1	0.614	0.737	0.741	0.849
	LIB2	0.744			
	LIB3	0.609			
	LIB4	0.584			
	LIB5	0.801			

As some of the loading values remained below the threshold of 0.5, the researchers removed those items to ensure that they would not affect the integrity of the structural model. For this purpose, the relevant items were carefully omitted, and further goodness of fit was assessed. According to Sun (2005), goodness of fit is essential to determine whether the obtained data fits well with the expected data. Table 4 represents the results of the goodness of fit assessment, indicating the Standardized Root Mean Square (SRMR) value is below the threshold value 0.85 (0.157) (Jeljeli et al., 2022; Jeljeli et al., 2022), the Tucker and Lewis (TLI) value exceed the threshold >0.90 (1.628), Chi-square value remained 2.708 that is below the threshold value <3.0, and Non-Fit Index (NFI) value remained 0.863 that is also considered ideal as it is between 0-1. Figure 1 illustrates the final measurement model of the current research study.

Table 4: Summary of Goodness of Fit.

	Saturated model	Criteria
SRMR	0.157	<0.85
TLI	1.628	>0.90
Chi-square	2.708	<3.0
NFI	0.863	b/w 0-1

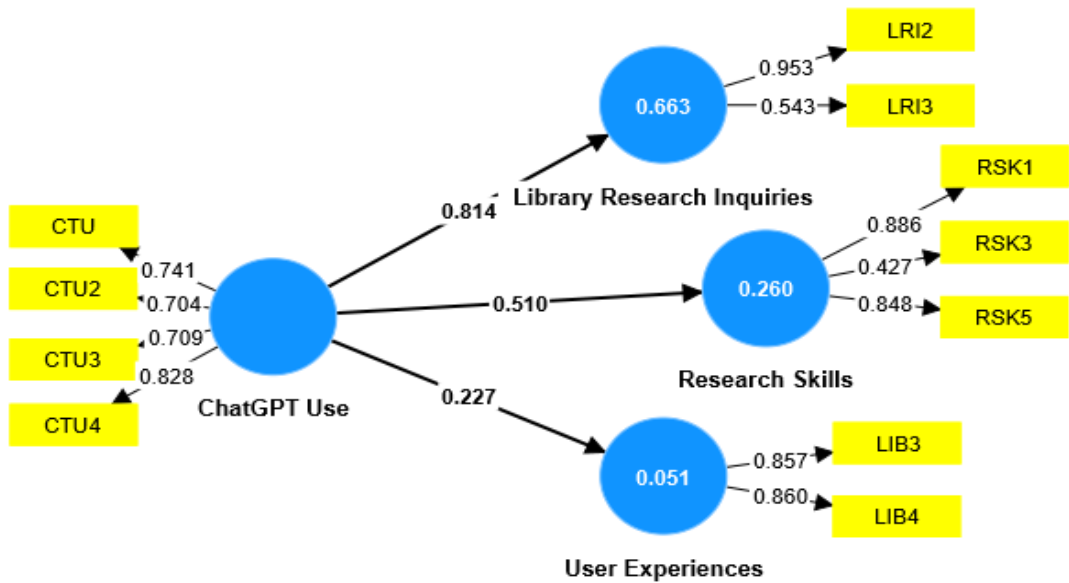


Figure 1: Final Measurement Model.

Further, the discriminant validity of the measurement model was tested by applying Fornell-Larcker Criterion recommended by Cheung and Wang (2017). The results from the Fornell-Larcker criterion indicated all the correlation values as distinct. Also, the outcomes showed a lower correlation that remained supported towards affirming discriminant validity. Overall, it is affirmed that the constructs' discriminant validity exists in the current model. Table 5 represents the results of the Fornell-Larcker Criterion.

Table 5: Fornell-Larcker Criterion.

	ChatGPT Use	Library Research Inquiries	Research Skills	User Experiences
ChatGPT Use for Library Search				
Library Research Inquiries	0.165			
Research Skills	0.242	0.046		
User Experiences	0.363	0.309	0.188	

This research involves five items representing the construct "ChatGPT Use for Library Search," one item was removed due to a lower loading value; the multicollinearity was further assessed to determine the potential correlation between the remaining items. Consequently, variance inflation factor (VIF) analysis was conducted as one of the most preferred quantitative research approaches (Liao & Valliant, 2012). Results revealed that the VIF value of each item remained below the threshold value of 3.0, indicating that multicollinearity does not exist between the constructs. Table 6 shows the results of multicollinearity analysis.

Table 6: Summary of Multicollinearity Analysis.

Items	VIF
CTU	1.832
CTU2	1.687
CTU3	1.415
CTU4	1.515

Further, the coefficient of determination (R^2) was tested. As per Samarth and Kodikal (2018), the relevant analysis is a valuable tool for evaluating the predictive capability of the predictor variable(s). In simpler terms, it allows for the quantification of the effect that predictor variables exert on the observed variation in the dependent variables. The coefficient of determination (R^2) results revealed a variance of 66.3% in Library Research Inquiries, 72.6% in Research Skills, and 55.1% in User Experiences. Thus, ChatGPT Use for Library Searches shows robust predictive power. Table 7 represents the results of the coefficient of determination (R^2).

Table 7: Coefficients of Determination R^2 .

Constructs	R-square	Strength
Library Research Inquiries	0.663	Strong
Research Skills	0.726	Strong
User Experiences	0.551	Strong

The effect size (f^2), also known as the f square of the independent variable "ChatGPT Use for Library Search," was also tested. According to Fauzi (2022), the effect size (f^2) is used to measure the power of independent variables in the regression-based study. It quantifies the extent to which the dependent variables are expected to vary when the independent variable undergoes a one-unit shift while keeping all other factors constant. Thus, the interpretation of effect size is established as suggested by Kraft (2020), where 0.025 or below is deemed minor, 0.20 is considered moderate, and 0.40 or higher is classified as significant (Lorah, 2018). The effect of ChatGPT Use for Library Search on Library Research Inquiries is high at 1.969 (large), and the effect size of ChatGPT Use for Library Search on Research Skills is measured at 0.351 (moderate), indicating a moderate level of impact. Finally, the effect size of ChatGPT Use for Library Search on User Experiences remained at 0.554 (large). These findings highlight the significant impact of the independent variables on the dependent variables. Table 8 represents the results of effect size (f^2).

Table 8: Effect Size (f^2) Analysis.

	f-square	R^2 Included	R^2 Excluded	Size
ChatGPT Use for Library Search -> Library Research Inquiries	1.969	0.148	0.145	Large
ChatGPT Use for Library Search -> Research Skills	0.351	0.667	0.666	Large
ChatGPT Use for Library Search -> User Experiences	0.554	0.537	0.536	Large

Finally, the path analysis was assessed to examine the effect of ChatGPT Use for Library Search on study variables, including Library Research Inquiries, Research Skills, and Library User Experience (Streiner, 2005). Table 9 represents the results of path analysis accompanied by Means, Standard Deviation, t -statistics, and significance values). First, the effect of ChatGPT Use for Library Search on Library Research Inquiries was assessed, indicating the beta coefficient value $\beta = 0.755$, t -value 17.209, and significance value $p < 0.000$. The effect of ChatGPT Use for Library Search on Research Skills remained significant with the beta coefficient value $\beta = 0.516$, t -value 11.650, and significance value $p < 0.000$. Finally, the effect of ChatGPT Use for Library Search on User Experiences also remained significant with the beta coefficient value $\beta = 0.465$, t -value 2.100, and significance value $p < 0.000$.

Table 9: Summary of Path Analysis.

Relationships	(M)	(STDEV)	β	t-statistics	P values
ChatGPT Use for Library Search -> Library Research Inquiries	1.106	0.064	0.755	17.209	0.000
ChatGPT Use for Library Search -> Research Skills	0.679	0.058	0.516	11.650	0.000
ChatGPT Use for Library Search -> User Experiences	0.392	0.661	0.465	2.100	0.000

Discussion on Results

This research has examined and highlighted the role and importance of ChatGPT in refining library services for undergraduate students in the United Arab Emirates-based studies. Theoretically supported by the Task Technology Fit (TTF) theory, this research employed a case study design and gathered data using structured surveys. Results remained supportive as ChatGPT use for library research indicated a significant impact on library research inquiries, further affecting the students' research skills and user experiences. Overall, the study findings showed the prominent role and effect of ChatGPT in upgrading library search services for Emirati students. Table 10 provides the descriptives of students' responses.

Talking specifically about the gathered data, the students' experience regarding ChatGPT Use for Library Search was first analyzed. Notably, this question is consistent with the propositions of Task Technology Fit (TTF) theory, indicating the technology adoption for the individual goals purposes. The respondents are satisfied that ChatGPT utilizes machine learning to develop responses based on a massive corpus of text data. The respondents also agreed that ChatGPT generates responses to a broad range of questions, even those it has not noticed before, as it is pre-trained on a vast corpus of text data and can be fine-tuned on detailed tasks or domains to enhance its performance in library research works. Most respondents agreed that ChatGPT continuously learns from new data, making it easier to preserve over time and generating responses that more closely mimic human conversation, making it more engaging and user-friendly. These results are consistent with the existing literature indicating ChatGPT as a task technology fit phenomenon in Natural Language Processing (NLP) (Adetayo, 2023; Kalla & Smith, 2023). These results concerning the effectiveness of AI chatbots in assisting undergraduate students with advanced research inquiries can be comprehended through the lens of the Task-Technology Fit (TTF) theory. According to TTF theory, the performance of individuals or groups with a precise technology relies on how well it aligns with the tasks they need to perform.

As noted by Zhang Zhixiong (2023), ChatGPT is a valuable tool within library services, especially in domains related to natural language processing, text analysis, and encouraging user engagement. Its ability to generate coherent and contextually relevant responses to user queries holds the possibility to increase the efficacy of library Chatbots and virtual assistants. These technological aids are increasingly crucial in delivering online services to students. Also, ChatGPT is harnessed to examine considerable volumes of text data from user interactions with library services (Abdaljaleel et al., 2023). This utilization promotes identifying patterns in user behavior, preferences, and needs, thereby informing the refinement of more personalized and efficient library services. The transformative prospect of ChatGPT advances reshaping the delivery and evaluation of library services, eventually contributing to increased user satisfaction and engagement (Kirtania, 2023).

Further, the study respondents shared their opinions regarding Library Research Inquiries, indicating the effectiveness of AI chatbots in enhancing advanced research assistance for undergraduate students in the UAE. The respondents also revealed that they feel engaged when interacting with AI chatbots while seeking advanced research services, as the support and assistance provided by AI chatbots in advanced research queries are satisfactory. Also, according to the respondents, interacting with AI chatbots has improved their research skills as undergraduate students engaged in advanced research activities. Thus, the results from the study on the effectiveness of AI chatbots in improving advanced research assistance for

undergraduate students in the UAE can be examined through the framework of the Task-Technology Fit (TTF) theory. According to the TTF theory, the performance of individuals or groups with a specific technology depends on how well the technology fits the tasks they need to perform. These results are in line with the existing literature (Haleem et al., 2022; Lund & Wang, 2023). For instance, (Aithal & S, 2023) conducted an exploratory study to evaluate the impact of technology on information gathering and evaluate AI-based GPTs in their capacity to deliver accurate information promptly in library services. Results revealed quick and accurate search results through ChatGPT compared to conventional and digital library systems.

Table 10: Descriptives of Students' Responses.

Constructs	Min	Max	Mean	Std. Deviation	Variance
ChatGPT Use for Library Search	2.00	5.00	3.9088	.61579	.379
Library Research Inquiries	2.00	5.00	3.8808	.51964	.270
Research Skills	2.00	5.00	4.0420	.59260	.351
User Experiences	1.80	5.00	3.9285	.66110	.437

Similarly, regarding Research Skills, respondents indicated that interaction with AI chatbots has improved their research skills in locating and evaluating information for advanced research purposes. This further led them to feel confident in their ability to conduct advanced research. According to most study respondents, AI chatbots such as ChatGPT have contributed to their knowledge of research methods relevant to advanced academic inquiries and improved their efficiency in recovering relevant information for my advanced research projects. Also, respondents revealed that they believe the assistance provided by AI chatbots has positively affected their overall competence in conducting advanced research. As the Task-Technology Fit theory proposed, these results emphasise the importance of aligning research skills development tasks and AI chatbots' abilities. The positive effect of AI chatbots on enhancing research skills and competence among undergraduate students in the UAE mirrors the successful integration of technology into the research process. These findings are consistent with the existing research on the impact of ChatGPT on the students' research skills (Kirtania & Patra, 2023; Lo, 2023). In their study, Khan et al. (2023) investigated the possible influence of artificial intelligence (AI) on specific services offered by academic libraries. The research used three distinct Generative AI systems: ChatGPT, Perplexity, and iAsk.Ai. The results provided vital support to adapt libraries to these transformations for improved service. The chosen AI systems represent diverse approaches applicable in academic libraries. Specifically, ChatGPT is a conversational AI capable of swiftly addressing students' queries. Perplexity serves as a language model assisting in tasks like cataloging and content classification. iAsk.Ai, functioning as a natural language processing (NLP) system aids in research and reference questions. Finally, the study respondents agreed that the library resources are readily accessible and user-friendly, and the structure and organization of the library contribute to a positive user experience. According to the respondents, the services provided by library staff are helpful and responsive.

Also, the online catalog and databases are intuitive and encourage efficient information retrieval. Finally, the respondents agreed that the library environment, including seating and study spaces, improves the user experience (Chaudhry et al., 2023; Khurma et al., 2023). These results also show compatibility with the existing literature (Ganadi et al., 2023; Menon & Shilpa, 2023; Panda & Kaur, 2023b). In their study, AlZaabi et al. (2023) examined the existing literature on the application of ChatGPT in academic library research. The empirical literature

gathered from PubMed/MEDLINE, SCOPUS, and Google Scholar highlighted ChatGPT's ability to expedite the search and writing, allowing researchers to draft their work more efficiently. Also, providing them with the most relevant academic literature they require is advantageous. Further benefits identified include support in data analysis, assistance in formulating trial protocols, and helping design scientific studies.

Finally, regarding the User Experiences, the respondents agreed that the library resources are readily accessible and user-friendly. Also, the structure and organization of the library contribute to a positive user experience. According to the respondents, the services provided by library staff are helpful and responsive when having any query about ChatGPT, the online catalog and databases are intuitive and encourage efficient information retrieval, and the library support services, including technology assistance, improve the user experience (Ge & Lai, 2023; Ruixue et al., 2023). Overall, the respondents' positive experiences with library resources, online catalogues, databases, and support services contribute to a favourable user experience. These experiences mirror a successful alignment between the tasks users must perform and the capabilities of the technology and human support systems, as proposed by the Task-Technology Fit theory. By meeting users' requirements and facilitating their tasks efficiently, the library improves user experiences and promotes effective use of its resources and services. In their study, Lappalainen and Narayanan (2023) examined the development and effect of a custom chatbot for Zayed University Library (United Arab Emirates) using Python and the ChatGPT API. Designing and using Aisha chatbot indicated the benefits of chatbots in academic libraries, supported by the early literature on ChatGPT's applicability in this field. Notably, the development and implementation process was stimulated by factors such as perceived capabilities and limitations of the bot and plans for further development.

Theoretical Implications

As this research is theoretically supported by Task Technology Fit (TTF) theory, it implies a focus on the alignment between technology (AI chatbots) and advanced research services for undergraduate students in the United Arab Emirates. The theory suggests that the effectiveness of technology is influenced by how well it fits the tasks it is intended to support; it helped evaluate the usefulness of ChatGPT for streamlining advanced research services. As indicated in the research, the successful integration of AI technologies indicates their potential to address students' technological preferences. It is needed in the UAE's higher education landscape, having implications for the ongoing development and implementation of AI-enabled educational tools, particularly ChatGPT. The positive impact of AI chatbots on students' library research skills development suggests potential educational benefits. The integration of AI technologies in educational settings can serve not only as a tool for information recovery but also as a means to promote skill development, aligning with broader discussions on the evolving role of technology in education. The research contributes practical insights into the evolving nature of library services in the UAE. Understanding the factors influencing the acceptance and adoption of AI chatbots in the library research context is essential for shaping future developments in this field. Evaluating the overall user experience with ChatGPT emphasizes the successful human-technology interaction in the academic context. Insights acquired can inform the design and implementation of future educational technologies, underlining the significance of user experience in promoting technology adoption and effectiveness. Thus, the theoretical implications of this research, rooted in TTF, extend to task-technology fit, improve library research systems, the higher education landscape in the UAE,

pedagogical considerations, and the overall user experience in the context of AI technology promoting advanced research services for undergraduate students. The study provides valuable insights into successfully integrating AI technologies in education.

Conclusion

This research shows the crucial role of advanced library research systems in serving the evolving needs of undergraduate students in the UAE's educational landscape. As academic needs become increasingly refined, the demand for robust research support systems becomes more apparent. The study highlights the rudimentary importance of these advanced systems in providing students with the means and resources required for successful research. The integration of artificial intelligence within modern education, exemplified by the use of ChatGPT, emerges as a transformative force in improving library research services. The AI-powered abilities of ChatGPT bring a new dimension to information retrieval, providing students with a more efficient and instinctive approach to accessing and using academic resources. The study positions AI as a critical enabler, augmenting conventional research methodologies and contributing to a more streamlined and adequate research process. The explicit focus on ChatGPT in the context of library research services is notably noteworthy. The findings showed tangible advantages regarding improved task performance, skill development, and user experience. Students engaging with ChatGPT for advanced research queries report a positive impact on their capability to steer complex information landscapes, promoting skill enhancement and confidence in their research capabilities. The significant relationships observed in the research suggest that AI technologies are not only theoretical constructs but have discernible and practical applications in the academic setting. Therefore, integrating AI, especially ChatGPT, into library research services stands out as an advantageous and practical strategy to meet the myriad needs of undergraduate students. As educational technology continues to evolve, the positive results observed in this study highlight the prospect of AI contributing to improving advanced research services and prevailing academic success.

Limitations and Recommendations

While this study provides a foundational empirical investigation of students' use of ChatGPT for library research purposes, it also has some primary limitations. First, the research was confined to students in the United Arab Emirates; the generalizability of its results is questionable in other geographical regions. Second, the sample respondents were based only on undergraduate-level students, narrowing its scope. Finally, the last limitation involves addressing only the library research services, while it is apparent that ChatGPT has contributed much to the overall educational development in the present era. Thus, future research can overcome the limitations by conducting more research on ChatGPT regarding library research services in other regions and different educational levels to gain further insights.

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