

Article

Impact of AI Chatbots on Academic Engagement and Administrative Efficiency: A Dual-Population Study at a Women-Only Higher Education Institution in Oman

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Abstract

Chatbots are becoming increasingly significant entry points to digital services and are used in areas including job support, education, healthcare, and customer services. On the other hand, less is known about how chatbots affect people individually, in groups, and in society. Moreover, several obstacles must be overcome before chatbots can realize their full potential. As a result, chatbots have become a significant research topic in recent years. We propose a research agenda outlining future directions and issues to advance knowledge in chatbot research and education. This research involves the quantitative analysis of the impact of these chatbot tools on academic staff, with a count of 40, and students, with a count of 300, at Al Zahra College for Women (ZCW). The links are uploaded electronically in bilingual form for both staff and students, and the responses are retrieved from them. This analysis is conducted in IBM SPSS Statistics version 29, and a comparative report is also prepared based on the questionnaire responses from students and staff members of ZCW. The study investigates the effects of artificial intelligence (AI) chatbots on the faculty and students at ZCW. The use of AI-powered tools in educational settings is examined, along with their effects on administrative, instructional, and learning procedures. This will enable us to identify the advantages of using AI tools within E-Learning systems. The results demonstrate how well AI chatbots can streamline administrative duties, enhance student involvement, and provide academic help. However, there are drawbacks as well, such as user adjustment, privacy issues, and technological constraints. The study offers helpful suggestions for enhancing chatbot integration at Al Zahra College to enhance learning results and operational effectiveness.

Keywords: artificial intelligence chatbots; higher education; cognitive computing; student and staff perceptions; educational technology adoption



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1. Introduction

One of the most apparent and decisive examples of modern cognitive computing is artificial intelligence (AI) chatbots. They are created to emulate human-like conversations using natural language processing, machine learning, and dialogue management techniques, and can thus decode the user's intentions and provide contextually relevant responses. Recent research defines AI chatbots as not simple automated responders but as conversational agents, intelligent, and able to learn through the process of interaction and facilitate complex decision-making procedures [1]. This development marks a transition from

systems based on rules to those grounded in reasoning, prediction, and personalization as fundamental computational units.

The invention of large language models and generative architecture has greatly contributed to the rapid development of conversational AI. Chatbots have experienced significant expansion in their range of functions because of tools such as ChatGPT 5.3, which enable open-ended dialogue and formulate ideas and arguments at contextual and interdisciplinary levels. By implication, conversational agents are no longer tied to predefined scripts but can interact actively and responsively with users in subtle and complex ways. Technological change has positioned generative AI chatbots as a unique research topic within the broader domains of higher education and cognitive computing research, thereby stimulating increased scholarly interest in their functionality, hazards, and consequences [2]. Meanwhile, issues of reliability, bias, and other ethical concerns have become increasingly acute as these systems become more autonomous and powerful in human–computer interaction.

Along with technological innovations, AI chatbots have been integrated into various sectors, such as education, healthcare, customer services, and organizational decision support. Their popularity is largely due to their scalable, real-time support, which minimizes operational costs and human workload. Chatbots in education and institutions have been examined as sources of information delivery, instruction, a trend reflected more broadly in the rise of data-providing and service-delivery robotic systems [3]. The systematic review also shows that the introduction of chatbots into industries has led to increased research demand to examine not only the performance outcomes but also user acceptance, perceptions, and long-term sustainability [4]. All these processes support the increased relevance of AI chatbots as the core units of a contemporary cognitive computing ecosystem.

This study is based on the Technology Acceptance Model (TAM) developed by Fred Davis, which explains users' acceptance and use of technology. According to TAM, perceived usefulness and perceived ease of use influence users' attitudes toward a system, which, in turn, affects their behavioral intention and actual usage [5,6]. The block diagram is given in Figure 1. The perceived usefulness defines the degree to which the person believes that the system improves job performance. Perceived ease of use is the degree to which the person believes that system usage is free of effort. In the context of AI Zahra College for Women, this model is applied to examine how staff and students perceive AI chatbots, how these perceptions influence their adoption, and the overall impact on teaching, learning, and administrative efficiency.

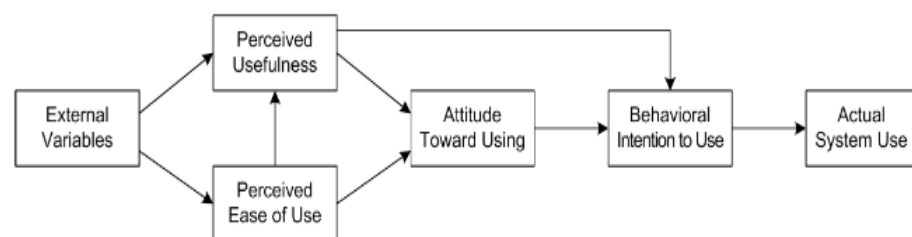


Figure 1. Architecture of TAM.

1.1. AI Chatbots in Higher Education and Administration

College education is also one of the main areas where AI chatbots are being implemented, driven by growing institutional complexity, rising student expectations, and the spread of online educational experience. Higher education institutions are under repeated pressure to provide timely academic services, personalized learning opportunities, and effective administrative services, sometimes with minimal human resources. In this scenario, AI chatbots have been proposed as scalable options that can facilitate tutoring, academic

advising, and on-demand learning support. Experience indicates that chatbots can increase the availability of academic materials and can offer 24/7 assistance outside the conventional teaching hours [7].

The three main parts of the AI chatbot's conceptual architecture studied in this work are the user interface layer, the AI processing layer, and the institutional support layer [4,8,9]. The conceptual architecture is given in Figure 2. At the user interface layer, students and administrative personnel can communicate with the chatbot for academic and administrative assistance via digital platforms. The chatbot can comprehend user inquiries and offer pertinent answers, which are the main tasks of the AI processing layer's natural language processing and automated response mechanisms. The institutional support layer facilitates communication, assistance, and service delivery by linking the chatbot with academic and administrative information resources.

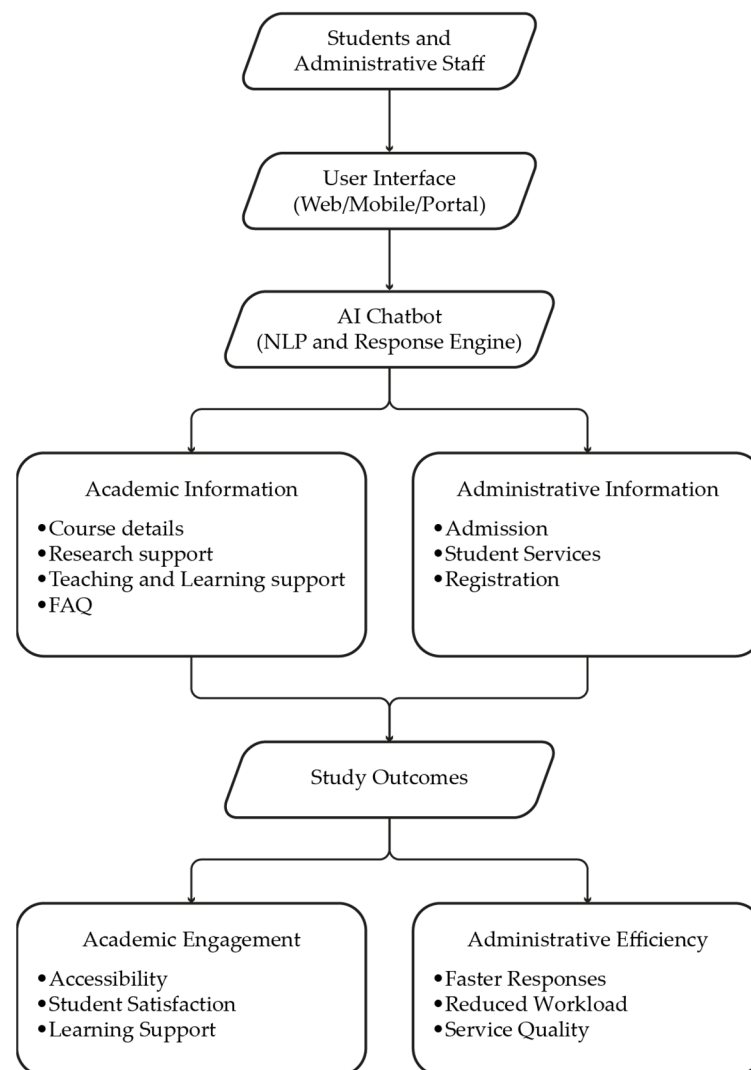


Figure 2. Conceptual architecture of an AI chatbot.

Besides teaching use cases, AI chatbots are increasingly used in administration and institutional processes. These are student services, admissions-related questions, course registration-related questions, and dissemination of policy-related information. Chatbots can help reduce administrative burdens by automating routine interactions, enhancing response consistency, and increasing service availability. Institutionally, these systems can be presented as strategic mechanisms of digital transformation and service optimization [10].

Nevertheless, the success of such systems will largely depend on supporting institutions, the policies governing them, and users' trust in AI-mediated mediation [11].

In addition to the efficiency factor, recent research has focused on the pedagogical and psychological effects of using chatbots in higher education. Studies show that AI chatbots affect student motivation, engagement, and persistence in learning when properly aligned with the instructional objectives. It is also linked to better motivation to learn and self-regulated learning behaviors through chatbots that offer feedback, encouragement, or adaptive guidance [12]. Additionally, the study [13] found that students who used ChatGPT exerted less mental effort when completing learning activities, suggesting that AI-assisted learning can enhance both the cognitive and motivational components of education. Nonetheless, the researchers emphasized the importance of using AI responsibly and pedagogically in educational settings.

1.2. Research Gap and Motivation

Although there is significant literature on AI chatbots in tertiary education, several significant shortcomings remain in current research. To begin with, empirical research is overrepresented in the Western and Global North, specifically in North America and Europe. Mass surveys and cross-national studies have yielded valuable insights into students' perceptions and the patterns of early adoption, but they feature very small samples of institutions in developing or non-Western countries [14]. Even though more recent global studies have broadened their geographical reach, geographical differentiation remains uneven, and the contexts of the Middle East have received relatively little dedicated attention [15].

Second, most previous studies have focused on the use of chatbots in co-ed or mixed-gender schools, and usually neglected the cultural, social, and pedagogical specificities of colleges where women are educated. Systematic reviews do not deny the existence of contextualized studies that consider institutional factors, cultural norms, and gender-specific learning environments, especially in regions such as the Middle East [4]. This disparity limits the generalizability of available results and the development of comprehensive AI adoption plans [10].

Third, the literature mostly concerns students or teachers, not both at the same time. Research that touches on perceptions, beliefs, and concerns tends to focus on students as the main users, with staff views treated as isolated tools or addressed only indirectly. Nevertheless, current studies note that the sustainable implementation of AI necessitates coordinating student expectations with staff preparedness, and the dual-population analysis proves crucial [16]. The support systems within institutions also influence the perception and adoption of AI technologies across the two groups, and there is a need to consider integrated empirical research methods [11]. The combination of these gaps is an incentive for current research.

1.3. Objectives

To address the identified gap, this research examines the effects of AI chatbots on students and employees at a higher education institution in Oman, a women's institution. Namely, the study aims to identify awareness rates, adoption trends, the perceived value, and anxieties associated with the adoption of AI chatbots in the academic and administrative environments. The study provides empirical, dual-population, quantitative evidence to fill gaps in the literature on chatbots and to address gaps revealed in previous studies due to their underrepresentation in regional and institutional contexts [1].

1.4. Hypotheses

1.4.1. Student-Focused Hypotheses

H1 (Students). *The use of AI chatbots has a significant positive effect on students' academic engagement at Al Zahra College for Women.*

H2 (Students). *Students who frequently use AI chatbots report higher satisfaction with academic support services compared to students with low or no chatbot usage.*

H3 (Students). *There is a significant relationship between AI chatbot use and students' perceived improvement in learning efficiency and the accessibility of course-related information.*

1.4.2. Staff-Focused Hypotheses

H4 (Staff). *The use of AI chatbots significantly reduces perceived administrative workload among academic staff.*

H5 (Staff). *Academic staff perceptions of instructional effectiveness are positively influenced by the integration of AI chatbots into teaching and learning processes.*

The paper will be organized as follows. In Section 2, a thorough literature review is conducted on AI chatbots, cognitive computing, and user perceptions in higher education. Section 3 outlines the research methodology, the research design, participants, instruments, and data analysis processes. Section 4 presents empirical findings, and Section 5 provides a discussion that places the findings in the context of the broader literature. Lastly, Section 6 summarizes the paper's main contributions, describes the practical implications, and provides future research directions.

2. Related Work

2.1. AI Chatbots in Higher Education

The ability to facilitate learning through AI chatbots increases accessibility, and to scale the problem of institutional accessibility, has attracted significant scholarly interest in higher education research. Initial applications used rule-based conversational agents designed to answer common questions or provide information on fixed academic topics. Nonetheless, recent progress in artificial intelligence, particularly in natural language processing and machine learning, has enabled a dramatic broadening of the pedagogical and practical possibilities of chatbots. According to systematic literature reviews, new educational chatbots are increasingly incorporating adaptive learning features, dialogue-based tutoring, and personalized feedback, enabling more meaningful interactions with learners [4].

According to recent systematic reviews, AI chatbots in higher education serve a variety of instructional functions, including virtual tutoring, formative assessment support, and content explanation. Reference [3] notes that most empirical studies indicate that usability and perceived usefulness are positively associated, especially in large-enrollment courses without individualized human support. Equally, ref. [7] shows that pedagogically aligned chatbot interventions can positively influence learning outcomes, particularly when used as part of the course goal and in full autonomy. These results indicate that chatbots' performance largely relies on instructional design and situational correspondence.

The advent of generative AI has also changed the world of educational chatbots. In contrast to previous conversational agents, generative chatbots can generate original explanations, examples, and feedback across any field of study. This has sparked recent academic interest in understanding how such systems affect teaching and learning practices. The

concept in [2] describes this stage as a developing field of research in which the innovation process is accelerating exponentially, but the theoretical understanding is not yet solid. Although generative chatbots offer greater flexibility than ever before, their open-ended nature also raises concerns about accuracy, overreliance, and a lack of critical thinking.

A more detailed picture of these impacts is available through meta-analytical evidence. According to [13], generative AI devices, such as chatbots, positively affected academic performance, affective motivation, and higher-order thinking, as indicated by this meta-analysis of experimental studies on the subject. The study also found that students who used ChatGPT exerted less mental effort when completing learning tasks, suggesting that AI-assisted learning can enhance cognitive and motivational aspects of education. However, the researchers stressed the importance of using AI technology in educational settings responsibly and pedagogically.

2.2. Cognitive Computing and Educational Support Systems

The arrival of AI chatbots in higher education is closely associated with broader changes in cognitive computing, which focuses on systems that can learn, reason, and naturally communicate with humans. Cognitive computing models position chatbots as smart agents beyond mere automation, facilitating sense-making, decision-making, and personal assistance. According to [1], conversational AI-based systems are a viable manifestation of the principles of cognitive computing, especially when interaction and contextual awareness processes are critical components.

In learning institutions, cognitive computing systems are increasingly adopted to enhance the digital learning experience through adaptive, responsive services. Generative AI chatbots in higher education have their own conceptual framework, as suggested by [17], which merges cognitive processing, institutional data, and learner analytics. The framework emphasizes the importance of chatbots as mediators in the relationship between learners and complex information systems, enabling real-time guidance and minimizing cognitive load. These views highlight the shift in paradigm from content delivery models to intelligent learning support systems.

Nonetheless, the advancement of cognitive computing in the educational field has also brought serious ethical and governance issues. Critically analyzes the ethical aspects of adopting chatbots and identifies such problems as data privacy, transparency, and academic integrity issues [18]. With the growing role of cognitive systems in learning and decision-making, concerns arise about accountability and the right balance between automation and human consideration. These issues are especially relevant in the educational setting, where the central concern of institutional credibility centers on trust and ethical responsibility.

Institutionally, the implementation of cognitive computing tools is typically discussed within broader digital transformation plans. According to [10], despite the opportunities AI chatbots offer in terms of efficiency and innovation, their effective implementation requires clear policies, employee training, and continuous assessment. In the absence of such structures, cognitive computing systems will be prone to perpetuating inequities or creating resistance among users. These reflections imply that the use of chatbots should not be viewed solely as a technological update but as a socio-technical change that requires the company to prepare and shape it within its culture.

2.3. Student and Staff Perceptions of AI Tools

Users' perceptions are an essential factor in the success and sustainability of AI chatbots in higher education. There is significant research on students' attitudes towards chatbots, which has examined perceived usefulness, ease of use, trust, and ethical issues. The findings of big-data research indicate that students tend to have a positive attitude

towards AI chatbots, especially regarding their use in academic support and for finding necessary information. According to [14], the adoption rate of chatbots among students varies by academic level and discipline, suggesting that disciplinary rules and learning requirements may affect adoption rates.

Cross-national studies also emphasize identical and circumstantial perceptions. Research [15] shows that students worldwide express interest and enthusiasm in generative chatbots, though issues of accuracy and overreliance are common. These results suggest that positive attitudes do not replace skepticism, underscoring the need to use them in a guided and transparent manner. Research in the field of language learning indicates that chatbots have the potential to assist with writing and the development of linguistic correctness, but students remain skeptical about using AI-generated materials without verification [19].

In addition to cognitive and academic results, the social and emotional aspects of chatbot interaction have been the subject of recent studies. The research [20] concludes that AI chatbots have the potential to provide higher education students with a sense of emotional support and connection, especially in an online environment. Nonetheless, the research paper also underscores that chatbots cannot entirely replace human interaction, underscoring the significance of hybrid support models. The results will contribute to a more holistic understanding of chatbot impact, not only in terms of performance but also in terms of affective experiences.

Given the significant attention paid to students, the perception of AI chatbots among staff remains under researched. According to existing research, teachers and administrative staff tend to be cautious about adopting chatbots because they believe that using this tool will increase workloads, make their jobs obsolete, and undermine their ethical responsibilities. According to Fosner & Aver [16], the ideas and anxieties held by the staff influence the institutional adoption patterns because educators also largely act as gatekeepers in the process of technology incorporation. Jeilani and Abubakar [11] also show that the influence of perceived institutional support on both staff and student perceptions is strong and that it mediates the relationship between acceptance and trust, as well as between acceptance and self-efficacy. These results highlight the need to study both groups simultaneously to understand all the dynamics of chatbot adoption.

2.4. Latest Empirical Studies

The incorporation of conversational agents and Artificial intelligence into the education sector is changing how students experience the learning environment through customized, interaction-based learning experiences [21]. An educational chatbot was created using Natural Language Processing and deep learning to facilitate high school students' learning about the Logo programming language. The chatbot was introduced and assessed in thirteen Moroccan public schools, with 109 students separated into experimental and control groups. Data analysis suggests that the use of chatbots for learning helps motivate students, reduces stress, saves time, and allows students to move at their own pace. Overall, these findings suggest that adding AI chatbots to Smart Classrooms can stimulate student engagement and enhance student achievement.

A highly adaptive educational chatbot was proposed by Ait Baha et al. [22] to offer individualized support in learning contexts. In order to comprehend student questions and provide context-aware answers, the chatbot incorporates artificial intelligence capabilities. It improves accessibility and engagement by tailoring its interactions to the needs of learners. The system was created to provide prompt instructional help to both teachers and students. According to experimental findings, the chatbot improved user pleasure

and made learning easier. According to the study's findings, personalized and interactive learning experiences could be enhanced by adaptive educational chatbots.

Recent empirical studies have provided substantial evidence regarding the effectiveness of educational chatbots in improving learning outcomes and student engagement. De La Roca et al. [23] reported that chatbots functioning as course assistants significantly enhanced student participation, engagement, and academic support within engineering education courses. Students perceived chatbots as accessible learning companions that provided immediate assistance and increased interaction outside the classroom. Similarly, Iku-Silan et al. [24] developed a decision-guided chatbot for interdisciplinary learning and found significant improvements in students' learning achievement, collective efficacy, and reduced cognitive load. The study also demonstrated that chatbot-supported learning environments can accommodate different cognitive styles and enhance learning efficiency.

Recent investigations have also highlighted the role of chatbots in promoting student engagement and motivation. Yin et al. [25] examined the emotional aspects of educational chatbot interactions and found that positive emotions and learning motivation significantly influenced students' willingness to engage with chatbot-based learning environments. From the perspective of learning outcomes, Xu et al. [26] demonstrated that AI chatbots integrated with digital game-based learning improved academic performance, higher-order thinking skills, and learner participation in information technology education.

Together, the reviewed research shows that AI chatbots have improved learning support, engagement, accessibility, and academic achievement, making them useful tools in higher education. Staff personnel tend to be more wary because of worries about ethics, workload, and institutional ramifications, but students generally show positive opinions toward chatbot usage. Cognitive computing research further highlights the importance of governance, transparency, and organizational readiness for successful implementation. However, most of the literature comprises student-centered research done in Western settings, which leaves gaps in our knowledge of staff viewpoints and regional variations. Therefore, the present study contributes to the literature by investigating both student and staff perceptions within a women's higher education institution in Oman, providing a more comprehensive and contextually relevant understanding of AI chatbot adoption. The comparison of these studies is presented in Table 1. The reviewed studies consistently demonstrate that AI chatbots improve learning outcomes, engagement, accessibility, and academic performance in higher education. Student perceptions are generally positive, emphasizing usefulness, motivation, and learning support, while staff members show greater concern regarding ethics, workload, and institutional implications. Cognitive computing studies highlight the importance of intelligent support systems, governance, and organizational readiness. Ethical issues such as privacy, transparency, and academic integrity remain important concerns across the literature. Furthermore, most studies have been conducted in Western educational settings and focus primarily on students. Therefore, the present study addresses these gaps by simultaneously investigating student and staff perceptions within a women's higher education institution in Oman.

2.5. Limitations Identified from Existing Papers

Although research on the application of AI chatbots in college is expanding, several gaps remain. To begin with, there is a significant imbalance in the distribution of empirical studies across geographical and cultural contexts. Most of the available evidence has been drawn from Western institutions, thus limiting the generalizability of results to areas with diverse educational systems, cultural orientations, and technological systems. The systematic reviews are aware of this limitation; however, region-specific studies on the topic in the Middle East are few [4].

Table 1. Comparison of the research articles used.

Theme	Research Article	Study Focus	Method	Major Findings	Limitations
AI Chatbots in Higher Education	[3]	Educational chatbot applications	Empirical studies in higher education	Perceived usefulness and usability positively influence chatbot adoption and learning support.	Primarily focuses on students.
	[4]	Educational chatbot review	Systematic review	Chatbots provide adaptive learning, personalized feedback, and tutoring support.	Limited studies from developing regions.
	[7]	Pedagogical chatbot interventions	Course-based studies	Chatbots improve learning outcomes when aligned with course objectives.	Effectiveness depends on instructional design.
	[13]	Generative AI in education	Meta-analysis	AI improves academic achievement, motivation, and higher-order thinking skills.	Concerns regarding ethical and responsible use.
Cognitive Computing and Educational Support Systems	[1]	Cognitive computing and AI	Conceptual study	Chatbots act as intelligent agents supporting reasoning and contextual awareness.	Limited educational validation.
	[17]	Cognitive framework for education	Conceptual framework	Chatbots reduce cognitive load and support learning analytics.	Requires empirical verification.
	[18]	Ethical issues in AI	Critical analysis	Privacy, transparency, and academic integrity are major concerns.	Limited practical guidelines.
	[10]	Institutional AI implementation	Organizational study	Policies, staff training, and assessment are essential for adoption.	Limited user-based evidence.
Student and Staff Perceptions of AI Tools	[14]	Student perceptions	University students	Students generally have positive attitudes towards AI chatbots.	Adoption varies across disciplines.
	[15]	Global student perceptions	Cross-national study	Students show enthusiasm but express concerns about accuracy and overreliance.	Long-term effects remain unclear.
	[19]	AI in language learning	Language learners	Chatbots support writing and language development.	Students remain cautious about AI-generated content.
	[20]	Emotional support through chatbots	Higher education students	Chatbots provide emotional support and social connection.	Cannot replace human interaction.
	[16]	Staff perceptions	Academic staff	Staff express concerns regarding workload, ethics, and job security.	Limited staff-focused studies.
	[11]	Institutional support	Students and staff	Institutional support influences trust, acceptance, and self-efficacy.	Limited cultural and regional studies.
Recent Empirical Studies	[21]	Smart classroom chatbot	Experimental study (109 students)	Improved motivation, reduced stress, and supported self-paced learning.	Conducted at school level.
	[22]	Highly adaptive educational chatbot	Experimental study	Supported personalized and interactive learning experiences	Limited research involving both staff and students
	[23]	Course assistant chatbot	Higher education students	Increased engagement, participation, and academic support.	Limited disciplinary coverage.
	[24]	Decision-guided chatbot	Experimental study	Improved achievement and reduced cognitive load.	Limited institutional settings.
	[25]	Emotional engagement	Student participants	Positive emotions increase chatbot engagement and motivation.	Emotional factors need further study.
	[26]	Game-based learning chatbot	Information technology students	Improved academic performance and higher-order thinking skills.	Specific educational context.
Research Gaps	[4,10,16,21]	Regional and institutional gaps	Literature evidence	Most studies focus on students and Western institutions.	Limited research involving both students and staff, particularly in Middle Eastern and women-only institutions.

Second, chatbot research is mainly dominated by the absence of women in higher education institutions. Given that such institutions are unique in terms of pedagogical settings and cultural aspects, the lack of specific research is a serious omission. According to Davar et al. [10], contextual factors are the determining factors in AI adoption outcomes, suggesting that the results of mixed-gender institutions cannot necessarily be transferred to women-only institutions.

Third, the predominance of single-population studies limits knowledge of institutional readiness and alignment. Although student-led studies have provided valuable suggestions, staff viewpoints have not been considered, which limit the capacity to develop comprehensive and sustainable AI integration plans. Pitts et al. [27] emphasize that unresolved issues regarding ethics, academic integrity, and risk perception may erode the acceptance unless they are considered at both user levels. As a result, there is an evident need for an empirical study that would investigate not only students' perceptions but also those of staff members in underrepresented institutional settings.

The present study fills these gaps by offering a two-population study of AI chatbot usage at a women's higher education institution in Oman, providing contextually based evidence to guide policy, practice, and subsequent research.

3. Materials and Methods

3.1. Research Design

The flowchart of the proposed research is given in Figure 3. It consists of the identification of the research problem, literature review and research gap identification, setting the research objectives and hypotheses on staff and students, determining the technique for the research design, selection of participants covers 300 students (only female) and 40 staff members, development of the questionnaire by considering the participants separately, data collection through online, data screening and cleaning, performing the data analysis using SPSS, results and discussion on findings, and finally the recommendations and conclusions. The detailed description of the research design is explained below.



Figure 3. Flowchart of the proposed research.

The research design used in this study is a quantitative, cross-sectional survey, which was employed to investigate perceptions, usage patterns, and attitudes towards AI chatbots among students and staff of a women's higher education institution in Oman. The survey-based method was chosen because it is a viable way to collect large-scale perceptual data and to compare the participant groups statistically. The open-ended responses regarding additional comments or suggestions were analyzed using thematic analysis. In recent studies on chatbots, quantitative designs have been widely used to estimate user acceptance, perceived usefulness, and behavioral intentions in learning contexts [3].

The design structures were cross-sectional and enabled data collection at one time, providing a picture of institutional preparedness and user attitudes at a very early stage of AI chatbot awareness and implementation. This was a suitable methodology, given that the research was exploratory and that little previous empirical research was available on similar regional and institutional contexts. As previous research has shown, quantitative survey designs are useful for modeling user perceptions and identifying latent constructs associated with technology acceptance in education [28].

The research design was based on objectivity, generalizability, and statistical rigor. The use of standardized questionnaires and structured response formats reduced researcher bias and enhanced uniformity among respondents. The design further enabled the use of inferential statistical methods to address patterns and variations between student and staff groups and to arrive at evidence-based findings and conclusions in accordance with the transparency and reproducibility requirements of MDPI.

3.2. Participants and Sampling

The study's participants were divided into two groups: undergraduate students and members of the academic and administrative staff of an Omani women's higher education institution. The inclusion of both populations enabled a comparative analysis of perceptions among the most important institutional stakeholders, a gap previously unaddressed in the literature, which predominantly investigated only among students.

The non-probability convenience method was used due to limitations in institutional accessibility and voluntary participation. The sampling approach has been widely applied in the field of technology studies in higher education, where it is used to investigate user perceptions rather than to determine the prevalence of technology at a population level. According to past studies, convenience sampling remains acceptable as a methodology for exploratory research on the use of AI chatbots in academia [14].

Participants were encouraged to join the study via institutional communication channels, including official emails and announcements in the learning management system. The eligibility criteria had to be current enrolled students or employees with basic knowledge of digital learning technologies. Staff participants were included because it is a methodologically sound decision, as institutional support, policy awareness, and staff readiness have been shown to impact the success and sustainability of AI adoption efforts in higher education [11].

The last sample was heterogeneous in terms of academic levels, departments, and professional roles, which allowed meaningful comparisons between the two groups. This two-population sampling design enhanced the study's contribution quality by enabling it to capture institutional dynamics that are not well presented in single-population studies.

3.3. Instruments (Questionnaires)

Two structured questionnaires were used to collect the data: the student version and the staff version. The questionnaires had overlapping constructs to facilitate comparisons. The instruments were developed based on existing studies using questionnaires to investigate perceptions of AI chatbots in educational settings, thereby ensuring conceptual validity and alignment with the current literature [28].

Each of the two questionnaires had several sections that assessed key constructs, including awareness of AI chatbots, use frequency, perceived usefulness, perceived ease of use, perceived impact on academics or professionals, and perceived challenges or concerns. Measurement was conducted using a five-point Likert scale ranging from strongly disagree to strongly agree, which is commonly used in educational technology perception studies [19]. The open-ended responses received for the suggestion-based question

was analyzed using thematic analysis. The thematic analysis was selected to enable the identification, organization, and interpretation of recurring patterns within qualitative data. Qualitative findings were used to complement the quantitative survey results and provide additional insights into the perceived benefits, challenges, and future expectations associated with AI chatbot usage in higher education.

The questionnaire was designed to focus on clarity, relevance, and appropriateness. Questions were phrased simply and unambiguously to allow participants with varying degrees of technical expertise to answer. Brief explanations of AI chatbots were provided when needed to ensure consistent interpretation of survey items. The consideration of concern-related items included overreliance, accuracy, and ethical concerns, which are recent discoveries in the topic, reflecting users' apprehension and perceived benefits [16].

The subject experts in educational technology and research methodology reviewed the questionnaires to establish their content validity before full deployment. Minor changes were made to enhance the clarity of items and to remove redundancy. The development of this instrument made it more reliable and more accurate in how the questionnaires represented the constructs of interest.

3.4. Data Collection Procedure

The online survey was conducted over a specific period during the academic semester using an online survey platform, which is effective for distributing the survey and managing responses. Respondents were invited to the study and given details about the study's purpose, that participation was voluntary, and the approximate time the study would take. Electronically informed consent was obtained before directing the participant to the questionnaire. The links for the online survey for staff and students are given in Appendix A.

Ethics were considered during data collection. It was voluntary, and the respondents were informed that they could withdraw at any time without reprimand. No personally identifiable data was used, and responses were kept anonymous to preserve participants' confidentiality. These were the steps associated with the best ethical practices for conducting educational research with human subjects [18].

The online data collection mode was convenient and reduced administrative burden, enabling participants to take the survey when they could. Responses were automatically recorded and stored safely for later analysis. The final dataset contained only complete questionnaires to ensure data quality and consistency.

3.5. Data Analysis Using SPSS

The data obtained were processed using the Statistical Package for the Social Sciences (SPSS) software. SPSS was chosen because it is a very powerful tool, widely used in educational research, and appropriate for analyzing survey-based quantitative data. Preliminary data screening steps were taken to detect incomplete responses and assess data integrity.

Participants' demographics and general response patterns were summarized using descriptive statistics, such as frequencies, means, and standard deviations. To ensure the reliability of the instrument, Cronbach's Alpha was calculated. Content validity was established through internal expert review to ensure that the questionnaire items adequately represented the constructs under investigation. Reliability analysis was conducted using Cronbach's Alpha to assess internal consistency. Multiple regression analysis and Analysis of Variance (ANOVA) were employed to examine the relationships between AI chatbot usage and the proposed outcome variables, thereby testing the study hypotheses. These studies provided a general picture of people's awareness of AI chatbots, their usage patterns,

and their overall perceptions. It has been demonstrated that descriptive analysis can be useful for establishing a baseline for perception-based chatbot research [28].

The study used inferential statistics to test differences between staff and student populations. When necessary, comparative analyses were conducted to identify statistically significant differences in perceptions and attitudes. The choice of statistical tests was determined by the data distribution and the research purpose. The analytical strategy and results interpretation were based on quantitative synthesis methods, including those in recent data-analytical studies using meta-analysis [13].

Any statistical analysis has been conducted at a conventional level of significance, and the findings have been reported in line with MDPI guidelines, ensuring transparency and reproducibility. The analytical methodology enabled a systematic study of the research questions and produced evidence-based findings on the use of AI chatbots in the institutional setting considered.

4. Results

This chapter presents the empirical findings of the study investigating the impact of AI chatbots on students and staff at Al Zahra College for Women. The results are derived from two structured questionnaires administered separately to students and academic and administrative staff. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) to ensure systematic and rigorous quantitative analysis.

The chapter reports descriptive and inferential statistics, including frequency analysis, regression analysis, and analysis of variance (ANOVA), to address the research hypotheses. Frequency analysis is used to describe demographic characteristics and overall response patterns, while regression analysis examines the relationships between AI chatbot usage and key outcome variables. ANOVA is applied to identify significant differences in perceptions across participant subgroups.

Results are presented objectively without interpretation or reference to the existing literature. Student and staff findings are reported in separate sections to reflect the dual population research design and to ensure clarity. The chapter concludes with a summary of hypothesis testing outcomes, providing a clear foundation for the interpretative discussion in the subsequent chapter.

4.1. Reliability Test

The reliability analysis indicates strong internal consistency of the measurement instrument. All 300 cases were valid and included in the analysis, with no exclusions. The Cronbach's alpha value of 0.822 across 19 items exceeds the commonly accepted threshold of 0.70, demonstrating that the questionnaire items reliably measure the intended constructs. The statistical data are shown in Tables 2 and 3. This supports the robustness of the measurement instrument and confirms its suitability for subsequent inferential statistical analyses.

Table 2. Number of valid cases.

	<i>N</i>	%
Cases Valid	300	100.0
Excluded ^a	0	0.0
Total	300	100.0

^a Listwise deletion based on all variables in the procedure.

Table 3. Reliability statistics.

Cronbach's Alpha	N of Items
0.822	19

4.2. Response Rate and Sample Characteristics

4.2.1. Student Sample Demographics

The student sample was evenly distributed across age groups, ensuring balanced representation of younger and more mature learners as given in Table 4. Female participants were drawn from foundation, diploma, undergraduate, and postgraduate programmes, reflecting the institution's academic diversity. Representation across years of study was also well balanced. Most students reported prior experience with AI chatbots, with the largest proportion indicating more than one year of usage, suggesting sufficient exposure to support informed and reflective responses.

Table 4. Student sample demographics.

Variable	Category	Frequency
Age Group	18 to 20	100
	21 to 23	98
	24 and above	102
Program of Study	Foundation	104
	Diploma	70
	Undergraduate	63
	Postgraduate Degree	63
Year of Study	First Year	54
	Second Year	82
	Third Year	82
	Fourth Year	82
Experience with AI Chatbots	No Prior Experience	71
	Less than 6 months	66
	6 months to 1 year	74
	More than 1 year	89

4.2.2. Staff Sample Demographics

Staff respondents were distributed evenly across age groups, with slightly higher representation among those aged 40–49 and 50 and above, as shown in Table 5. Academic roles were evenly distributed across the lecturer, assistant professor, associate professor, and professor ranks, indicating broad participation across faculty levels. Teaching experience was also well distributed, with most respondents reporting more than five years of teaching experience, and comparable representation across the 5–10 years and 11–15 years categories. Regarding technology engagement, most respondents reported at least occasional use of AI chatbots, while a smaller proportion reported no experience or extensive use, suggesting moderate overall familiarity with AI-based tools in academic contexts.

Table 5. Staff sample demographics.

Variable	Category	Frequency
Age Group	Below 30	10
	30 to 38	8
	40 to 49	11
	50 and above	11
	Total	40

Table 5. *Cont.*

Variable	Category	Frequency
Academic Role	Lecturer	8
	Assistant Professor	11
	Associate Professor	11
	Professor	10
	Total	40
Years of Teaching Experience	Less than 5 years	11
	5 to 10 years	10
	11 to 15 years	11
	More than 15 years	8
	Total	40
Experience Using AI Chatbots	No Experience	9
	Occasional Use	10
	Regular Use	12
	Extensive Use	9
	Total	40

4.3. Hypothesis 1: The Use of AI Chatbots Has a Significant Positive Effect on Students' Academic Engagement at Al Zahra College for Women

4.3.1. Frequency Analysis

The responses in Table 6 reflect mixed perceptions regarding the role of AI chatbots in enhancing academic engagement. While a considerable proportion of students agreed that chatbots improve interactivity, motivation, and focus, many respondents selected neutral or negative responses. This variation suggests that the perceived engagement benefits of AI chatbot use differ across students, potentially influenced by individual learning preferences and prior experience with the technology.

Table 6. Frequency analysis of statements.

Statement	Response Category	Frequency
1.1 AI chatbots encourage active engagement	Strongly Agree	18
	Agree	72
	Neutral	84
	Disagree	42
	Strongly Disagree	84
1.2 AI chatbots increase motivation	Strongly Agree	30
	Agree	78
	Neutral	78
	Disagree	48
	Strongly Disagree	66
1.3 AI chatbots help maintain focus	Strongly Agree	30
	Agree	78
	Neutral	78
	Disagree	66
	Strongly Disagree	48
1.4 AI chatbots increase involvement	Strongly Agree	42
	Agree	60
	Neutral	84
	Disagree	42
	Strongly Disagree	72

Table 6. Cont.

Statement	Response Category	Frequency
1.5 AI chatbots make learning interactive	Strongly Agree	60
	Agree	78
	Neutral	78
	Disagree	36
	Strongly Disagree	48

The academic engagement perception is shown in Figure 4.

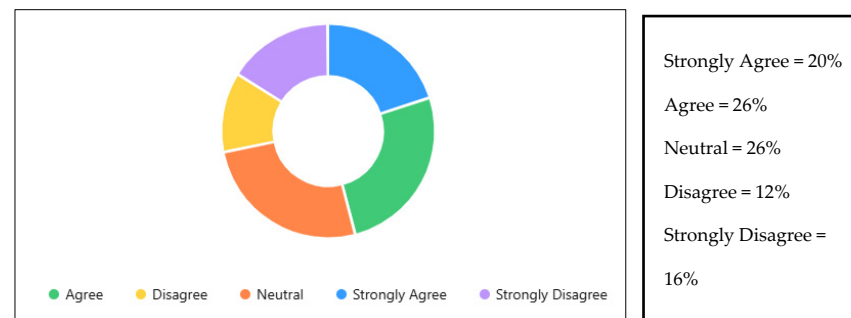


Figure 4. Academic engagement perception.

4.3.2. Regression and ANOVA

The regression model was statistically significant and explained 14.8 percent of the variance in student academic engagement, as given in Table 7. The ANOVA results in Table 8 confirm that the set of predictors jointly provides a significant explanation of engagement outcomes among the 300 respondents. This indicates that motivation, focus, involvement, and perceived interactivity collectively have a meaningful relationship with students' active academic engagement. Accordingly, Hypothesis 1 is supported.

Table 7. Model summary.

Model	R	R-Square	Adjusted R-Square	Std. Error of the Estimate
1	0.384 ^a	0.148	0.130	1.192

^a Predictors: (Constant), 1.5 AI chatbots make my learning experience more interactive; 1.3 AI chatbots help me stay focused on my academic tasks; 1.2 Using AI chatbots increases my motivation to participate in academic activities; 1.4 I feel more involved in my learning when I use AI chatbots.

Table 8. ANOVA.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	47.922	4	11.980	8.435	0.000 ^b
Residual	276.958	295	0.939		
Total	324.880	299			

^a Dependent Variable: 1.1 AI chatbots encourage me to engage more actively with my course materials.

^b Predictors: (Constant), 1.5 AI chatbots make my learning experience more interactive; 1.3 AI chatbots help me stay focused on my academic tasks; 1.2 Using AI chatbots increases my motivation to participate in academic activities; 1.4 I feel more involved in my learning when I use AI chatbots.

4.4. Hypothesis 2: Students Who Frequently Use AI Chatbots Report Higher Satisfaction with Academic Support Services Compared to Students with Low or No Chatbot Usage

4.4.1. Frequency Analysis

Students generally expressed favorable perceptions regarding the responsiveness and reliability of AI chatbots, as well as their contribution to overall satisfaction with academic support services, as given in Table 9. However, the continued presence of a

substantial number of neutral responses indicates that satisfaction levels were moderate rather than uniform across the sample, suggesting variation in individual experiences with chatbot-supported services.

Table 9. Frequency analysis on statements.

Statement	Response Category	Frequency
2.1 AI chatbots provide timely responses	Strongly Agree	36
	Agree	90
	Neutral	66
	Disagree	60
	Strongly Disagree	48
2.2 Satisfaction with AI chatbot support	Strongly Agree	18
	Agree	72
	Neutral	84
	Disagree	42
	Strongly Disagree	84
2.3 AI chatbots resolve concerns efficiently	Strongly Agree	42
	Agree	60
	Neutral	84
	Disagree	42
	Strongly Disagree	72
2.4 AI chatbots are reliable	Strongly Agree	60
	Agree	78
	Neutral	78
	Disagree	36
	Strongly Disagree	48
2.5 AI chatbots improve overall satisfaction	Strongly Agree	36
	Agree	90
	Neutral	66
	Disagree	60
	Strongly Disagree	48

Satisfaction with academic support is shown in Figure 5.

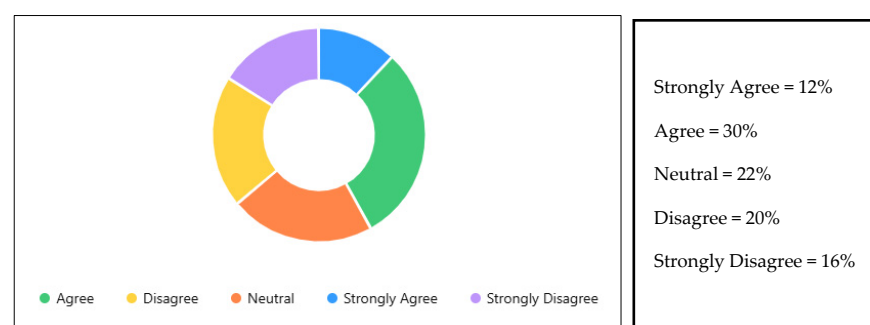


Figure 5. Satisfaction with academic support.

4.4.2. Regression and ANOVA

The regression model was statistically significant and explained 13.5 percent of the variance in perceived efficiency of academic support among the 300 respondents, which is shown in Table 10. The ANOVA results in Table 11 indicate that satisfaction with chatbot support and perceived reliability significantly predict the effectiveness of academic concern resolution. These findings provide empirical support for Hypothesis 2.

Table 10. Model summary.

Model	R	R-Square	Adjusted R-Square	Std. Error of the Estimate
1	0.368 ^a	0.135	0.122	1.274

^a Predictors: (Constant), 2.5 Overall, AI chatbots improve my satisfaction with academic support services; 2.4 AI chatbots are a reliable source of academic assistance; 2.2 I am satisfied with the academic support provided by AI chatbots.

Table 11. ANOVA.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	49.733	3	16.578	10.207	0.000 ^b
Residual	318.347	296	1.075		
Total	368.080	299			

^a Dependent Variable: 2.3 AI chatbots help resolve my academic concerns efficiently. ^b Predictors: (Constant), 2.5 Overall, AI chatbots improve my satisfaction with academic support services; 2.4 AI chatbots are a reliable source of academic assistance; 2.2 I am satisfied with the academic support provided by AI chatbots.

4.5. Hypothesis 3: There Is a Significant Relationship Between AI Chatbot Usage and Students' Perceived Improvement in Learning Efficiency and Accessibility of Course-Related Information

4.5.1. Frequency Analysis

Overall, students demonstrated moderate agreement that AI chatbots assist with accessing course information, saving time, and improving learning efficiency, as shown in Table 12. However, the high proportion of neutral responses suggests cautious or conditional perceptions regarding the extent to which chatbots enhance independent learning and academic efficiency.

Table 12. Frequency analysis on statements.

Statement	Response Category	Frequency
3.1 AI chatbots help access course information	Strongly Agree	18
	Agree	72
	Neutral	84
	Disagree	42
	Strongly Disagree	84
3.2 AI chatbots save time	Strongly Agree	30
	Agree	78
	Neutral	78
	Disagree	48
	Strongly Disagree	66
3.3 AI chatbots improve task efficiency	Strongly Agree	18
	Agree	72
	Neutral	84
	Disagree	42
	Strongly Disagree	84
3.4 AI chatbots increase resource accessibility	Strongly Agree	30
	Agree	78
	Neutral	78
	Disagree	48
	Strongly Disagree	66

Table 12. Cont.

Statement	Response Category	Frequency
3.5 AI chatbots support independent learning	Strongly Agree	30
	Agree	78
	Neutral	78
	Disagree	66
	Strongly Disagree	48

Learning efficiency and accessibility are shown in Figure 6.

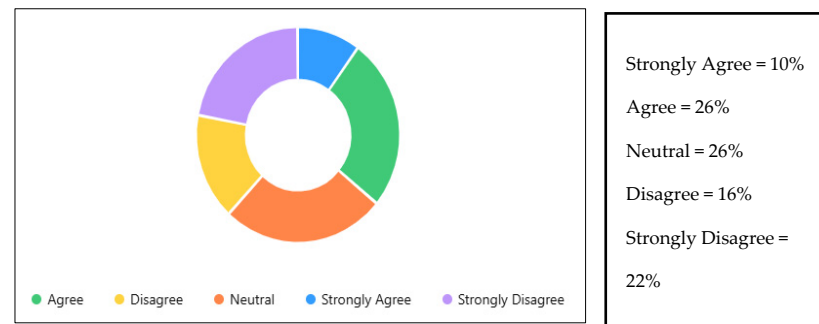


Figure 6. Learning efficiency and accessibility.

4.5.2. Regression and ANOVA

The regression model was statistically significant and accounted for 8.3 percent of the variance in perceived support for independent learning among the 300 respondents, as given in Table 13. The ANOVA results, presented in Table 14, confirm a significant relationship among learning efficiency, resource accessibility, and independent learning outcomes. Although the explained variance is modest, these findings provide empirical support for Hypothesis 3.

Table 13. Model summary.

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	0.289 ^a	0.083	0.074	1.188

^a Predictors: (Constant), 3.4 AI chatbots make learning resources more accessible to me; 3.3 AI chatbots improve my efficiency in completing academic tasks.

Table 14. ANOVA.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	25.268	2	12.634	8.971	0.000 ^b
Residual	277.452	297	0.934		
Total	302.720	299			

^a Dependent Variable: 3.5 AI chatbots support my independent learning effectively. ^b Predictors: (Constant), 3.4 AI chatbots make learning resources more accessible to me; 3.3 AI chatbots improve my efficiency in completing academic tasks.

As shown in Figures 4–6, it is identified that the largest proportion of respondents either agreed or strongly agreed that AI chatbots contribute to interactive learning (46%), improve satisfaction with academic support services (42%), and enhance accessibility to learning resources (36%). However, a considerable proportion of respondents remained neutral, indicating varying levels of experience and acceptance of AI chatbot technologies. Overall, the findings support the positive role of AI chatbots in fostering academic engagement, improving satisfaction with support services, and facilitating access to educational resources.

The overall findings of the three hypotheses (H1 to H3) are shown in Table 15. All three hypotheses were supported. The strongest effect was observed for student satisfaction with academic support services (H2), followed by academic engagement (H1). Although the effect size for learning efficiency and accessibility (H3) was smaller, the relationship remained statistically significant.

Table 15. Overall findings of hypotheses from H1 to H3.

Hypotheses	R ²	F-Value	p-Value	Decision
H1	0.148	8.435	<0.001	Supported
H2	0.135	10.207	<0.001	Supported
H3	0.083	8.971	<0.001	Supported

4.6. Hypothesis 4: The Use of AI Chatbots Significantly Reduces Perceived Administrative Workload Among Academic Staff

4.6.1. Frequency Analysis

Staff responses in Table 16 indicate cautious perceptions regarding the workload reduction potential of AI chatbots. While some respondents agreed that chatbots save time, assist with query management, and reduce repetitive communication, a substantial proportion selected neutral or negative responses. This reflects varied experiences and differing levels of effectiveness in the use of chatbots for administrative purposes.

Table 16. Frequency analysis on statements.

Statement	Response Category	Frequency
4.1 AI chatbots reduce time on routine tasks	Strongly Agree	2
	Agree	10
	Neutral	11
	Disagree	6
	Strongly Disagree	11
	Total	40
4.2 AI chatbots help manage student queries	Strongly Agree	4
	Agree	10
	Neutral	10
	Disagree	6
	Strongly Disagree	10
	Total	40
4.3 AI chatbots reduce repetitive communication	Strongly Agree	4
	Agree	10
	Neutral	10
	Disagree	9
	Strongly Disagree	7
	Total	40
4.4 AI chatbots support administrative processes	Strongly Agree	6
	Agree	8
	Neutral	10
	Disagree	6
	Strongly Disagree	10
	Total	40

Table 16. Cont.

Statement	Response Category	Frequency
4.5 AI chatbots reduce overall workload	Strongly Agree	8
	Agree	10
	Neutral	10
	Disagree	5
	Strongly Disagree	7
	Total	40

4.6.2. Regression and ANOVA

The regression model was statistically significant and explained 17.1 percent of the variance in perceived administrative workload reduction among the 40 staff respondents, which is shown in Table 17. The ANOVA results given in Table 18 confirm that chatbot-supported administrative functions significantly predict overall workload reduction. Accordingly, Hypothesis 4 is supported.

Table 17. Model summary.

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	0.413 ^a	0.171	0.136	1.243

^a Predictors: (Constant), 4.1 AI chatbots reduce the time spent on routine administrative tasks; 4.4 AI chatbots support administrative processes effectively; 4.3 AI chatbots reduce repetitive administrative communication; 4.2 AI chatbots help manage student queries more efficiently.

Table 18. ANOVA.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	30.282	4	7.570	4.896	0.001 ^b
Residual	146.878	295	0.498		
Total	177.160	299			

^a Dependent Variable: 4.5 Overall, AI chatbots reduce my administrative workload. ^b Predictors: (Constant), 4.1 AI chatbots reduce the time spent on routine administrative tasks; 4.4 AI chatbots support administrative processes effectively; 4.3 AI chatbots reduce repetitive administrative communication; 4.2 AI chatbots help manage student queries more efficiently.

4.7. Hypothesis 5: Academic Staff Perceptions of Instructional Effectiveness Are Positively Influenced by the Integration of AI Chatbots into Teaching and Learning Processes

4.7.1. Frequency Analysis

The frequency analysis given in Table 19 indicates mixed but generally positive views among staff regarding the role of AI chatbots in enhancing administrative efficiency and instructional effectiveness. In the administrative aspects, employee reactions have shown no consensus, and there are many more disputes than the agreed-upon operational advantages. For example, respondents disagreed with the idea that AI chatbots reduce the time spent on routine administrative processes by 45.0 percent and agreed with the statement by only 27.5 percent.

The same was true for the reduction in repetitive administrative communication and administrative process support, where the disagreement ranged from 40.0 to 42.5 percent. This cautious attitude notwithstanding, the perception improved when the workload was viewed holistically. Almost half of the respondents (45.0%) said that AI chatbots helped reduce the total volume of administrative work; in this case, individual administrative tasks might not be optimized, but employees still felt the benefits of increased efficiency. This trend is consistent with [29], who argue that the initial use of chatbots

usually yields diffuse returns rather than direct, task-specific productivity, especially in partially integrated institutions.

Table 19. Frequency analysis.

Item	Agree <i>n</i> (%)	Neutral <i>n</i> (%)	Disagree <i>n</i> (%)	Total
4.1 AI chatbots reduce time on routine administrative tasks	11 (27.5%)	11 (27.5%)	18 (45.0%)	40
4.2 AI chatbots help manage student queries efficiently	14 (35.0%)	10 (25.0%)	16 (40.0%)	40
4.3 AI chatbots reduce repetitive administrative communication	12 (30.0%)	12 (30.0%)	16 (40.0%)	40
4.4 AI chatbots support administrative processes effectively	13 (32.5%)	10 (25.0%)	17 (42.5%)	40
4.5 AI chatbots reduce my overall administrative workload	18 (45.0%)	11 (27.5%)	11 (27.5%)	40
5.1 AI chatbots support my teaching activities effectively	17 (42.5%)	8 (20.0%)	15 (37.5%)	40
5.2 AI chatbots enhance staff–student communication	11 (27.5%)	11 (27.5%)	18 (45.0%)	40
5.3 AI chatbots help students understand course requirements	13 (32.5%)	10 (25.0%)	17 (42.5%)	40
5.4 AI chatbots complement traditional teaching methods	18 (45.0%)	11 (27.5%)	11 (27.5%)	40
5.5 AI chatbots improve overall instructional effectiveness at Al Zahra College for Women	17 (42.5%)	8 (20.0%)	15 (37.5%)	40

Staff perceptions were mediocre but split on instruction support. About 42.5% of the participants admitted that AI chatbots facilitate teaching processes and enhance overall teaching efficacy, and about one-third denied it. Correspondingly, 45.0% accepted that AI chatbots complement conventional instructional approaches, indicating that employees are more open to using AI tools as supplementary instructional tools rather than as substitutes. These results align with the evidence underpinning the systematic review, which indicates that educators tend to view chatbots as auxiliary aids that promote clarity and access rather than as full-scale pedagogical agents [30,31].

It is worth noting that perceptions of communication and student understanding were less favorable. Regarding whether chatbots can increase communication between staff and students, only 27.5% said yes, and 45.0% said no. Similarly, fewer than a third of employees were convinced that chatbots help students better understand course requirements. This reservation reflects larger anxieties reported in previous studies on pedagogical dependability, situational sensibilities, and the ethical responsibility of AI-generated reactions [18,32]. In general, the frequency findings indicate that although staff members are not dismissive of the possible pedagogical potential of AI chatbots, they still show a level of conditional and skeptical agreement with their acceptance, especially in spheres where subtle academic judgment is essential.

4.7.2. Regression and ANOVA

The regression analysis presented in Table 20 provides strong statistical evidence for the relationships between AI chatbot integration and perceived instruction effectiveness and administrative effectiveness. A correlation coefficient ($R = 0.753$) was high, and the model

explained 56.7% of the variance in staff perceptions of efficient student query management, indicating strong explanatory power. The adjusted R^2 value (0.504) is another measure that substantiates the model's strength, given the sample sizes.

Table 20. Regression analysis.

Model Summary				
Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	0.753 ^a	0.567	0.504	0.929

^a Predictors: (Constant), 5.5 The use of AI chatbots improves the overall effectiveness of instruction at Al Zahra College for Women; 5.4 AI chatbots complement traditional teaching methods; 4.1 AI chatbots reduce the time spent on routine administrative tasks; 4.3 AI chatbots reduce repetitive administrative communication; 5.3 AI chatbots help students better understand course requirements.

The results of the ANOVA in Table 21 indicate that the regression model is statistically significant ($F = 8.912$, $p < 0.001$), indicating that the chosen predictors are significant joint contributors to perceptions of chatbot effectiveness. Instructional efficacy, complementary role with traditional teaching, efficiency in reducing monotonous administrative tasks, efficiency in eliminating monotonous communication, and assistance to student understanding were identified as strong predictors.

Table 21. ANOVA.

ANOVA ^a					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	38.443	5	7.689	8.912	0.000 ^b
Residual	29.332	34	0.863		
Total	67.775	39			

^a Dependent Variable: 4.2 AI chatbots help manage student queries more efficiently. ^b Predictors: (Constant), 5.5 The use of AI chatbots improves the overall effectiveness of instruction at Al Zahra College for Women; 5.4 AI chatbots complement traditional teaching methods; 4.1 AI chatbots reduce the time spent on routine administrative tasks; 4.3 AI chatbots reduce repetitive administrative communication; 5.3 AI chatbots help students better understand course requirements.

These results indicate that perceptions of instruction and administrative efficiency are closely related in influencing staff ratings of AI chatbots. If chatbots are seen to enhance instruction clarity and supplement current teaching methods, employees will be more likely to appraise them favorably in administrative scenarios such as student query management. Such a combination of perceptions is consistent with the results of studies conducted at the global level [15], which indicate that the early adoption of generative AI tools in education is not based on functionality-specific factors but on the perceived consistency of those tools with current academic processes.

Meanwhile, the model's strength is inversely related to the ambivalence of the frequency analysis. This deviation implies that, even though employees might have complaints at the item level, their aggregate evaluative judgments do not ignore the practical utility of AI chatbots when these gains are realized simultaneously. The same tendencies are observed in massive reviews, where teachers already acknowledge the systemic benefits of chatbots despite ongoing ethical and pedagogical issues [18,33].

The overall findings of staff members (H4 and H5) are given in Table 22.

The results demonstrate that academic staff perceive AI chatbots as valuable tools for both administrative and instructional purposes. While the impact on administrative workload was moderate ($R^2 = 17.1\%$), the influence on instructional effectiveness was substantially stronger ($R^2 = 56.7\%$). These findings suggest that AI chatbots are particularly

effective in supporting teaching and learning activities while also contributing to improved administrative efficiency within the institution.

Altogether, the findings indicate that AI chatbots are statistically significant and substantively influential on staff perceptions of instructional and administrative effectiveness. Nevertheless, the heterogeneity of agreement at the descriptive level highlights that these advantages have yet to be distributed equally, which supports the view that the successful adoption of chatbots requires internationalization, ethical regulation, and pedagogically consistent roadmaps [10].

Table 22. Overall findings of H4 and H5.

Hypotheses	R ²	F-Value	p-Value	Decision
H4	0.171	4.896	0.001	Supported
H5	0.567	8.912	<0.001	Supported

4.7.3. Thematic Analysis

The thematic analysis of the open-ended responses revealed five major themes: (1) perceived usefulness, (2) accessibility and convenience, (3) learning support and engagement, (4) ethical concerns, and (5) future implementation recommendations as given in Table 23.

Table 23. Thematic analysis findings.

Theme	Description	Findings
Perceived Usefulness	Participants viewed chatbots as helpful learning tools.	Quick responses and easy access to information.
Accessibility and Convenience	Chatbots were available anytime and anywhere.	Students appreciated 24/7 support.
Learning Support	AI assisted understanding and independent learning.	Improved assignment completion and concept clarification.
Ethical Concerns	Concerns about accuracy and overreliance.	Staff emphasized academic integrity issues.
Future Implementation	Participants recommended institutional guidelines.	Training and responsible AI usage were suggested.

5. Discussion

This chapter discusses the study's findings in relation to existing research on AI chatbots in higher education. The discussion is structured around the five hypotheses and reflects the dual population design involving students and academic staff at a women-only higher education institution in Oman. The findings are interpreted within the broader literature on conversational AI, cognitive computing, and educational technology adoption, while also considering the specific cultural and institutional context of the study.

The results show that respondents' opinions on AI chatbots were mainly favorable. Acceptance of chatbots was strongly influenced by perceived utility and perceived usability. Additionally, acceptance of chatbots was linked to increased staff administrative effectiveness and student academic engagement. These findings confirm that the Technology Acceptance Model can be used to explain the uptake of AI chatbots in higher education.

5.1. Student Academic Engagement and Motivation

The results for Hypothesis 1 indicate that AI chatbot use has a statistically significant positive relationship with student academic engagement. Although the explained variance

was moderate, the findings suggest that chatbot-supported features such as interactivity, focus, and motivation contribute meaningfully to engagement outcomes. This aligns with the scoping review by [12], which identifies motivation and engagement as key areas where chatbots can influence learning when used as supportive tools rather than replacements for instruction. The presence of substantial neutral responses in the frequency analysis suggests that engagement benefits are not uniform, reinforcing the view that chatbot impact is highly dependent on implementation quality and alignment with learning tasks.

These findings are consistent with those of Labadze et al. [4], who conclude that chatbots are most effective when embedded in structured pedagogical frameworks. Similarly, Debets et al. [3] emphasize that engagement gains are often modest but statistically significant, particularly in large or digitally mediated learning environments. In the present study, students appear to perceive chatbots as facilitators of interaction rather than transformative agents of engagement, reflecting an emerging yet cautious acceptance of AI-mediated learning support.

5.2. Satisfaction with Academic Support Services

Hypothesis 2 examined whether frequent chatbot use is associated with higher satisfaction with academic support services. The regression results confirm a significant relationship between perceived reliability, satisfaction, and efficient resolution of academic concerns. These findings align with Alkishri et al. [1], who describe chatbots as scalable support tools that deliver timely responses and reduce friction in accessing information. The ability to provide immediate assistance appears to be a key factor influencing student satisfaction, particularly in contexts where institutional resources may be limited.

However, the frequency data also reveal a sizeable proportion of neutral and negative responses, indicating that satisfaction is conditional rather than absolute. This echoes the findings of Fošner and Aver [16], who report that students often appreciate the availability of chatbots but remain cautious about the accuracy and depth of support. The present results support the argument that chatbots are most valued as supplementary academic support mechanisms rather than primary sources of guidance.

5.3. Learning Efficiency and Accessibility

Hypothesis 3 explored the relationship between chatbot usage and perceived learning efficiency and accessibility of course-related information. Although the regression model explained only a small proportion of the variance, the relationship was statistically significant. This suggests that chatbots contribute incrementally to students' perceptions of efficiency, particularly in accessing resources and supporting independent learning. These findings are consistent with those of Ruiqi Deng et al. [13], who found that generative AI tools can enhance learning efficiency.

The modest effect size observed in this study reflects broader concerns in the literature regarding overreliance and surface-level learning. McGrath et al. [2] argue that while generative chatbots offer flexibility and accessibility, their educational value depends on students' ability to critically engage with outputs. The prevalence of neutral responses in this study suggests that students may recognize efficiency gains without fully integrating chatbots into deeper learning practices. This cautious engagement aligns with global findings reported by Ravšelj et al. [15], which show that students express interest alongside skepticism.

5.4. Administrative Workload Reduction Among Staff

The findings for Hypothesis 4 indicate that AI chatbots significantly reduce academic staff's perceived administrative workload. The regression model explained a greater proportion of variance than the student models, suggesting that staff perceive more tangible benefits in administrative contexts. This supports the argument advanced by Davar

et al. [10] that chatbot adoption is often most successful in routine, transactional tasks such as managing student queries and repetitive communication.

Despite statistical significance, the frequency analysis reveals mixed perceptions, with many staff members selecting neutral responses. This suggests that while chatbots offer efficiency potential, their impact may be constrained by institutional integration and staff familiarity. Hasan et al. [28] note that perceived usefulness strongly predicts acceptance, but only when supported by adequate training and system reliability. In the present study, the variability in staff responses may reflect differences in role, experience, and exposure to chatbot systems.

5.5. Instructional Effectiveness and Teaching Support

Hypothesis 5 examined whether chatbot integration positively influences staff perceptions of instructional effectiveness. The results indicate a significant relationship between chatbot use and perceived improvements in teaching support, communication, and clarity of course requirements. These findings align with [7], which reports that chatbots can enhance instructional processes when used to complement rather than replace traditional teaching.

However, the model's moderate explanatory power suggests that instructional effectiveness remains primarily grounded in human pedagogical practices. This resonates with Al Zahrani [20], who emphasizes that while chatbots can offer emotional and informational support, they cannot replicate the relational dimensions of teaching. The present findings suggest that staff view chatbots as auxiliary tools that enhance communication efficiency rather than as core instructional agents.

5.6. Thematic Findings

The thematic analysis supported the quantitative findings by demonstrating generally positive perceptions of AI chatbots among both students and staff. Students emphasized the benefits of accessibility, learning support, and convenience, whereas staff highlighted ethical considerations and the need for institutional policies. These findings indicate that successful AI chatbot implementation requires both technological support and clear institutional guidelines.

5.7. Comparative Insights Between Students and Staff

A key contribution of this study lies in its dual-population design, which allows for comparative insights into student and staff perceptions. Overall, staff appear to perceive more concrete benefits in administrative efficiency, while students report more nuanced and conditional benefits related to engagement and learning. This divergence supports the argument by Jeilani and Abubakar [11] that institutional support and role-specific expectations shape AI adoption outcomes.

The findings also reflect broader concerns regarding trust, accuracy, and ethical use. Kooli [18] highlights that ethical considerations remain central to chatbot adoption, particularly in educational contexts where credibility and accountability are critical. The cautious acceptance observed across both groups suggests that institutional governance and clear usage guidelines are essential for sustainable integration.

5.8. Theoretical and Contextual Implications

According to TAM, users' attitudes and behavioral intentions about the adoption of an AI chatbot are greatly influenced by their assessments of its utility and usability. A favorable opinion of AI chatbots in higher education is anticipated to promote their use for administrative and academic tasks, increasing student involvement, facilitating better information access, lowering administrative burden, and boosting service effectiveness.

As a result, TAM offers a strong foundation for comprehending how user acceptability influences the efficacy of AI chatbot deployment in an Omani Higher educational institution, only for women.

From a theoretical perspective, the findings support cognitive computing frameworks that position chatbots as mediating tools rather than autonomous agents. Chukwuere [17] argues that generative AI chatbots function most effectively as interfaces that reduce cognitive load and facilitate access to information. The present study reinforces this view, demonstrating incremental rather than transformative impacts across both populations.

In this context, the study addresses a significant gap in the literature by focusing on a women-only institution in the Middle East. As noted by Stöhr et al. [14], perceptions of AI tools vary across demographic and cultural contexts. The results suggest that while adoption patterns in Oman mirror global trends, cultural and institutional factors shape the pace and nature of acceptance.

5.9. Summary

In summary, the discussion highlights that AI chatbots offer measurable but moderate benefits in higher education contexts. Students perceive value in engagement, support, and efficiency, while staff report clearer gains in reduced administrative workload and improved instructional support. The findings align with the existing literature while providing region- and institution-specific insights. Together, they underscore the importance of thoughtful, context-aware implementation strategies that balance technological innovation with pedagogical and ethical considerations.

6. Conclusions

This study examined the impact of AI chatbots on students and academic staff at Al Zahra College for Women, intending to understand their roles in academic engagement, learning support, administrative efficiency, and instructional effectiveness. Using a quantitative, dual population research design, the study addressed an important gap in the literature by focusing on a women-only higher education institution in a Middle Eastern context. Based on the analysis report, the three hypotheses regarding students are strongly supported, and the two hypotheses regarding staff are also supported. The reliability analysis was conducted using Cronbach's Alpha in IBM SPSS Statistics to assess the internal consistency of questionnaire items on AI chatbot usage, academic engagement, and administrative efficiency. The obtained Cronbach's Alpha values for all constructs were above the acceptable threshold of 0.70, indicating good reliability and consistency among the survey items.

The findings demonstrate that AI chatbots have a statistically significant, though moderate, positive influence on students' academic engagement, satisfaction with academic support services, and perceived learning efficiency. For academic staff, chatbots were found to meaningfully reduce administrative workload and support instructional processes, particularly in communication and the clarification of course requirements. Across both groups, perceptions were cautious, indicating that chatbots are viewed primarily as complementary tools rather than replacements for human interaction or teaching.

The study contributes empirically by providing region-specific evidence on chatbot adoption and by integrating student and staff perspectives within a single analytical framework. Practically, the findings highlight the importance of institutional support, clear governance structures, and targeted training to maximize the benefits of AI chatbot integration. As future work, the survey can be expanded to include other Higher Educational Institutions in Oman by considering not only a single-gender-specific population. Qualitative research techniques, such as interviews and group discussions, can be incorporated as

a future development to provide deeper insights into cultural backgrounds and contextual factors. Also, applying advanced technological analytical tools such as Power BI, SmartPLS, and Tableau will be used in the future. Overall, the research underscores that the effective use of AI chatbots in higher education depends not only on technological capability but also on pedagogical alignment, ethical oversight, and contextual sensitivity.

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Appendix A

The questionnaire links for staff and students are given as follows.

For Staff

<https://forms.gle/vGGFydmRynh73k7v8> (accessed on 26 April 2025).

For Students

<https://docs.google.com/forms/d/e/1FAIpQLSeWRSNzcj8oZvrPXmRqVt66YC-aAhPRTPguSjz5419sT6ZoMg/viewform?usp=sharing&ouid=100584176932596242612> (accessed on 26 April 2025).

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