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AI-Powered Chatbots in Higher Education: A UTAUT2 and ECM Analysis

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Abstract. Adopting new policies in higher education is always accompanied with technological change and it is the intention of the stakeholders to accept and implement this change. This research seeks to explore the determinants of technology acceptance with the specific interest in the case of mobile learning in the context of combining chatbots in higher education. The inquiry aims to investigate the adoption of chatbots in education as a means of teaching, considering the factors that hinder or promote the use of this technology in the educational processes. The research design employed was a mixed-methods approach and qualitative interviews and quantitative surveys were used to gather information on chatbot adoption. The university community comprising faculty, administrative staff, and students from various higher education institutions was the study population. Data collection utilized self-administered structured questionnaires and person to person semi structured interviews. Statistical data collection and analysis was computerized with the help of SPSS. Pearson correlation and regression analysis were used to assess the association between the constructs of UTAUT2 and practical usage of chatbots. Drawing on the UTAUT model and the ECM Expectation-Confirmation Model (ECM) and its augmentation by technology, this paper investigated the diffusion of AI based chatbots in higher education. The study found spirited drivers of chatbots adoption that included performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value and habit. The importance of UTAUT2 in the analysis of interruption of use of technology in the case of chatbots is very promising to the educational managers and policy makers as it provides opportunities to figure out causes of failure. The findings of the study present a certain applicability for educational organizations wishing to adopt a chatbot. To facilitate the acceptance and use of chatbots by faculty, staff, and students, there is a need to understand the reasons that contribute to the adoption of this technology. Educational leaders and policy makers can make use of these findings to ensure effective application of chatbots in teaching and learning hence enhancing the experience of users as well as improving the impact of education. This research building on existing research will further enhance appreciation of acceptance of technological innovations in learning especially adoption of chatbots. Utilizing there last two models of Isaias and Q–complete study provide additional factors in application of AI-based chatbots in higher education. What's new to the study, however, is the attempt to predict factors that lead to the increased use of chatbots among learners, emphasizing the possible advantages and risks of implementing this technology in education settings.

Keywords: Artificial Intelligence (AI), Chatbots, Higher Education, UTAUT2, ECM Model, Technology Adoption.

1. INTRODUCTION

Technology has become an essential part of our daily life. As the world changes, technology is used to support learning patterns that have also been transformed. Successful routes and evaluation processes can be achieved due to the use of modern technologies such as computer applications, e-learning, m-learning, and blended learning. Electronic textbooks, interactive whiteboards, prepared e-learning methods, transactional artifacts, text analysis tools, and open-source software are among these tools. These tools are presented as technological resources that are effective in maintaining teaching and learning resources and building social networking through interactive learning.

Using smartphones and other personal devices in pedagogical applications has already been an asset for most college students, especially in Brazil. It is critical to develop chatbots in order to fulfill the needs of students, and many of our education processes are being carried out with the help of technological means. With this paper, the aim is to explore the acceptance and use of chatbots by developing an integrative model with independent variables such as artificial intelligence, chatbots, robot-based applications, and e-learning. In the context of higher education, the implications of a chatbot anthropomorphic agent on student intention and adaptation are to understand theoretical and practical issues.

Underperformance of traditional lectures in higher education has pushed academicians to search for new and effective tools to improve students' learning. Different types of interactive learning environments have been proposed as instructional methods, including distance learning and chatbot-based systems, which have become common interactive instructional designs in the digital era. A chatbot is a computer program that simulates human conversation through artificial intelligence. In the context of a chatbot, AI technologies such as voice recognition and semantic analysis are closely related. Why is a chatbot a suitable teaching/learning instrument for digitally savvy students? Due to differences in generations, digitalized individuals, especially Generation Y and Z students who are familiar with online engagement, differ from previous/current students in their behaviors and learning styles, similar to the characteristics of chatbots.

The strengths of chatbots naturally engage such students and provide value-added benefits during the learning process. In the digital era, AI chatbots are a new tool for higher education to aid in effectively disseminating knowledge to the next generation of adults who are more inclined towards engaging with new technology and challenged by the pandemic. Chatbots were perceived to be engaging, consistently positive, and capable of improving students' experiences and performance. The education sector, public concern, and use of chatbots that engage students, enhance students' experiences, and enable them to raise concerns have all seen a continuous increase across recent years. Positive outcomes have been reported as a result of utilizing AI chatbots in education, including that digital technologies transform learning and teaching and bring uncertainty around

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the balance between people and technology. Success in the academy means finding ways to take command of technology and information. This study is an extension of a pilot study that proposes a presence-of-the-future self AI chatbot for an undergraduate actuarial science program in education and financial planning. Understanding the users' perceptions of a chatbot in education is an important first step for both educators and technical developers to cater to the needs of their audience when using this kind of technology (Dhiman & Jamwal, 2023; Lee et al., 2023).

The paper investigates how digitally savvy integrated science scholars respond to AI chatbot user experience and explains the formation of behavioral intention and adoption. The goal is to develop an understanding of the impact of AI chatbot user experience on students in higher education as they strive to achieve academically. Toward this end, an integrated research framework using UTAUT and the Electronic Collaboration Model is proposed to investigate AI chatbot adoption from the user experience point of view and includes constructs such as performance expectancy, effort expectancy, social influence, facilitating conditions, and anxiety that are linked to students' interaction with the AI chatbot, where interaction quality, system quality, and information quality contribute to the initial cognitive teaching quality. This investigation aims to examine a research model that considers integrated domains when dealing with a complex and advanced technical tool for high-level science informatics university students, by integrating technology acceptance with chatbot experience and perceived teaching quality (Abdeldayem & Aldulaimi, 2020, 2022, 2023; Soliman et al., 2024).

To achieve the above goal, the research attempted to examine how Temporal Motivation Theory and UTAUT could be integrated into a research model for measuring students' temporal motivation and user experience of the AI chatbot with respect to its cognitive teaching quality impact on higher education. Responses to the AI chatbot, cognitive quality of the AI chatbot mediated between AI chatbot user interface quality and students' continuous usage intention. By using structural equation modeling, the results of the study provide researchers and practitioners with insights into how digitally savvy students at a university expect a chatbot to assist them in studying to improve academic performance. Furthermore, the unique aspect of user responses when using chatbots informs educators and chatbot developers of the specific capabilities of chatbots needed to support student learning.

This research focuses on young digitally savvy students who are about to embark on their educational journey in higher institutions. The high proliferation of smartphones has equipped modern digitally savvy learners with the need to retrieve information at all times. Businesses have embraced AI chatbots as cost-reducing assets to provide customer service and support, but it also suggests that AI chatbots may be utilized as customer relationship management assets because of their data collection capabilities, comprehensive support, mass customization, and their ability to continuously improve based on user past experiences. AI chatbots will be used to assist students in their day-to-day activities in academic institutions, not limited to providing frequently asked questions and advisory services within the admission department, educational advisor, counseling center, human resources, IT helpdesk, and library in an attempt to improve their educational life and experiences. The services need to be customized to adopt the different learning styles of students and their motivational needs. However, studies suggest that students may not adopt AI chatbots, the main barrier perhaps being that they have no prior knowledge of AI chatbots. Therefore, this research aims to improve the understanding of factors that may influence the potential adoption of AI chatbots in the education industry, particularly at the higher institution level, among digitally savvy students.

The rapid evolution of artificial intelligence has led to significant advancements in various sectors, including education. Chatbots, powered by AI, are increasingly being utilized in higher education to enhance student engagement, provide support, and streamline administrative tasks.

The integration of artificial intelligence (AI) in higher education has transformed how institutions interact with students, streamline administrative processes, and enhance learning experiences. Among the various AI applications, chatbots have emerged as a pivotal tool for facilitating communication and providing support. These AI-powered systems are capable of answering frequently asked questions, guiding students through academic resources, and offering personalized assistance, thereby improving overall student engagement and satisfaction.

Despite the potential benefits, the adoption of AI chatbots in higher education institutions varies significantly. Understanding the factors that influence this adoption is crucial for administrators and policymakers seeking to leverage technology effectively. The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) provides a robust framework for analyzing these factors. This model extends the original UTAUT by incorporating constructs such as hedonic motivation, price value, and habit, which are particularly relevant in the context of educational technology.

This research aims to explore the adoption of AI chatbots in higher education institutions through the lens of UTAUT. By examining the relationships between the constructs of the UTAUT2 model—such as performance expectancy, effort expectancy, social influence, and facilitating conditions—and the adoption of chatbots, this study seeks to provide valuable insights into the dynamics of technology acceptance in educational settings.

The Expectation-Confirmation Model (ECM) is a theoretical framework widely used to understand user satisfaction and post-adoption behavior concerning various technologies and services. Initially developed to explain consumer behavior in the context of information systems, ECM has been adapted to numerous domains,

including e-commerce, mobile applications, and educational technologies. The model posits that user satisfaction is determined by the confirmation of initial expectations and the perceived quality of the service or product.

As institutions increasingly turn to AI solutions to meet the demands of a digitally-savvy student population, understanding these factors will be vital for fostering successful implementation and maximizing the impact of chatbot technology. This study not only contributes to the existing literature on technology adoption in education but also offers practical recommendations for higher education stakeholders aiming to enhance their digital engagement strategies.

This article aims to analyze the adoption of AI-based chatbots in higher education institutions through the lens of UTAUT2, providing a framework for understanding the factors that influence their acceptance and use.

2. LITERATURE REVIEW

Educational chatbots are capable of taking user interaction it outside the classroom walls. Such chatbots are able to improve learning satisfaction through feedback provision and personalized learning (Yildiz Durak & Onan, 2024). Within subjects taught, chatbots enhance self-directed learning, communication, problem-solving skills, and even creativity, among other students' development areas (Almahri et al., 2020). Aksu Dünya & Yıldız Durak asserted that such chatbots enabled the students to ask and answer questions as well as gesture about a topic whilst learning, which is an enhancement of the learning process, thus fostering a more student-centered approach to learning. The known advantages of chatbot use in figure are industrial by toothay, focused learning. Endowed chatbots are capable of relaxing student's attention and interpersonal of students and faculties (Bataineh et al., 2024; Ahmed, 2023; Baqi et al., 2022; Ali et al., 2022).

Chatbots serve various functions in higher education, including answering FAQs, providing academic guidance, and facilitating administrative processes. Recent studies have shown their effectiveness in improving student satisfaction and engagement (Mariani, et al., 2023; Silva et al., 2023; Alshakrani & Al-Hamami, 2023; Ali et al., 2022; Aldulaimi et al., 2022).

Artificial intelligence chatbots have gained traction in higher education as institutions seek innovative solutions to improve student services and enhance learning experiences. Chatbots can provide 24/7 support, respond to student inquiries in real-time, and facilitate administrative processes such as course registration and information dissemination (Kuo & Yang, 2011). Research indicates that chatbots can significantly enhance student satisfaction by providing immediate assistance and reducing the workload on administrative staff (Yu et al., 2024: Annamalai et al., 2023; Abdeldayem et al., 2022, 2023; Balakrishnan et al., 2022; Fadhil et al., 2021).

The UTAUT2 model extends the original UTAUT framework by adding three constructs:

Hedonic Motivation: The fun or pleasure derived from using technology.

Price Value: The cost-benefit ratio perceived by users.

Habit: The extent to which users have become accustomed to using a particular technology.

Research indicates that several factors, as outlined in UTAUT2, play a significant role in the adoption of chatbots in higher education including: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. Figure 1 illustrates the UTAUT2 theoretical framework.

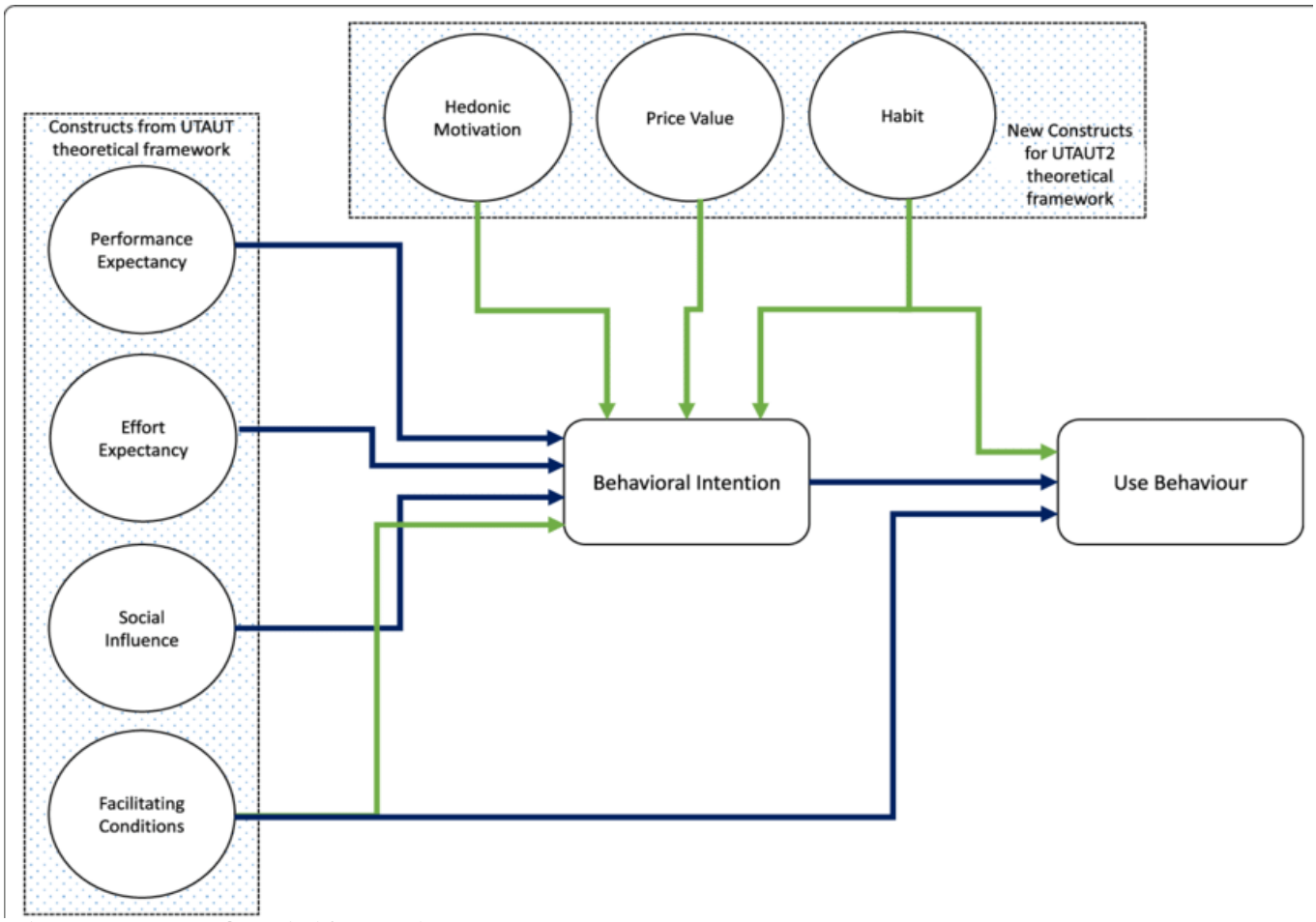

Figure 1: UTAUT2 theoretical framework.

The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) was introduced by Venkatesh et al. (2012) and Mohamad et al., (2024) as an extension of the original UTAUT model. It incorporates three additional constructs—hedonic motivation, price value, and habit—that are particularly relevant in consumer contexts, including education. The original UTAUT model identified four key determinants of technology acceptance:
Performance Expectancy: The degree to which using the technology is perceived to enhance job performance.

Effort Expectancy: The level of ease associated with the use of the technology.

Social Influence: The extent to which individuals perceive that important others believe they should use the new technology.

Facilitating Conditions: The resources and support available to use the technology.

The UTAUT2 model builds on these constructs by acknowledging the role of intrinsic motivation (hedonic motivation), the perceived value of the technology in relation to its cost (price value), and the influence of habitual use (habit) on technology acceptance.

2.1. Factors Influencing Chatbot Adoption

2.1.1. Performance Expectancy

Numerous studies highlight performance expectancy as a critical factor influencing the adoption of chatbots in educational settings. Research by Lee & Choi (2020) found that when students believe that chatbots can effectively meet their needs and enhance their learning experience, they are more likely to adopt this technology (Yu et al., 2024; Rana et al., 2024).

2.1.2. Effort Expectancy

Effort expectancy relates to the perceived ease of use of chatbots. A study by Alshahrani et al. (2021) demonstrated that if students perceive chatbots as user-friendly, they are more inclined to engage with them. Conversely, complex interfaces may deter users from adoption.

2.1.3. Social Influence

Social influence plays a significant role in technology adoption. According to Venkatesh et al. (2012), peer recommendations and institutional support can significantly impact students' willingness to adopt new technologies. The presence of faculty endorsements or positive peer experiences can enhance the perceived value of chatbots.

2.1.4. Facilitating Conditions

Facilitating conditions encompass the resources and infrastructure available to support the use of chatbots. A study by Bock et al. (2022) highlighted that adequate technical support, training, and access to necessary tools are essential for successful chatbot integration in higher education.

2.1.5. Hedonic Motivation

Hedonic motivation, which refers to the enjoyment derived from using technology, is increasingly recognized as a significant predictor of technology adoption. Research by Hamari et al. (2017) indicates that students who find the interaction with chatbots enjoyable are more likely to use them consistently.

2.1.6. Price Value

Price value relates to the perceived benefits of using chatbots in relation to their costs. While many chatbot solutions are cost-effective, institutions must ensure that the benefits—such as increased efficiency and improved student engagement—outweigh any associated costs (Venkatesh et al., 2012).

2.1.7. Habit

Habit can influence the ongoing use of chatbots. As students become accustomed to interacting with chatbots, their likelihood of continued use increases (Limayem & Cheung, 2008). This habitual interaction can lead to deeper integration of chatbots within educational practices.

2.2. Implications for Higher Education

Understanding the factors influencing AI chatbot adoption through the UTAUT2 framework provides valuable insights for higher education institutions. By addressing the constructs identified in the UTAUT2 model, institutions can develop targeted strategies to enhance the acceptance and effective use of chatbot technology.

The literature suggests that AI chatbots have the potential to revolutionize student support and engagement in higher education. However, successful adoption hinges on a nuanced understanding of the factors influencing acceptance. By employing the UTAUT2 framework, this research aims to provide a comprehensive analysis that informs both theory and practice in the realm of educational technology.

3. METHODOLOGY

In this study, the mixed-methods approach combining qualitative interviews and quantitative surveys can be detailed and extended as follows:

3.1. Research Design

These two types of data collection were nested in concurrent mixed-methods so that both qualitative and quantitative data can be collected and analyzed at the same time. People from the faculty, administrative staff, and students were able to inform the process of understanding the adoption of chatbots in institution of higher education.

3.2. Sampling Strategy

The study adopted purposive sampling to arrive at participants at different levels in the case of purposive sampling from multiple institute of higher education. This method allowed the researcher to include a wide range of interactions and perceptions regarding the use of chatbots in academia.

3.3. Data Collection Instruments

Quantitative Data: To gather the quantitative data, structure questionnaires were used and distributed to the participants on perceptions, attitudes and behaviours towards the use of chatbots. The questionnaires were developed based on the constructs of Unified Theory of Acceptance and Use of Technology 2 (UTAUT2).

Qualitative Data: Several qualitative approaches namely semi structured interviews were utilized to understand participants' perceptions concerning the use if any of chatbots – challenges if any faced and suggestions. Interview conducted helped to capture deeper dimensions of findings which were in quantitative forms.

3.4. Data Collection Process

The collection process was divided into stages whereby the first participants were made to exhaustively fill the questionnaires which were purely quantitative. Later on, the invited and sampled participants were requested to attend the interviews on a semi-structured format for their perceptions towards the use of chatbots.

3.5. Data Analysis

Quantitative Analysis: Data processing was done using the Statistical Package for Social Sciences (SPSS) for the statistical analysis performed. The correlation was used to determine the correlation between the variables

and regression-analyses was done to evaluate the dependent variables from the variables defined by UTAUT2 model.

Qualitative Analysis: The analysis of the qualitative data from semi-structured interviews was approached using a thematic framework. This means examining the individual accounts of the respondents and looking for patterns, themes, or insights.

Integration of Findings: The triangulation method was employed to analyze the quantitative data and qualitative data on the topic of adoption of chatbots in universities. The use of integration added value and assistance in reconstructing both approaches summary of findings in some instances.

Ethical Considerations: Custody instructions on the ethical concerns were maintained during the course of the research: Authorisation of people to be involved in the study, preserving secrecy and safeguarding the records. All participants received information in advance that explained why the research was being done, that they were free to give their consent, and how the data would be dealt with.

Utilizing this up close and personal mixed-methods approach, the present study was able to accommodate a broader perspective on the process of chatbot adoption in the higher education landscape, as it is explained with numbers supported by stories woven around them.

4. RESULTS

4.1. Demographic Information

In line with Table 1, the demographic analysis conducted in the research serves to give a particular understanding of how the various survey respondents are distributed in the academic set up. The largest group of respondents was students, with 50 percent of the sample followed by faculty members at 30 percent and administrative staff at 20 percent. This distribution is in tandem with the diversity of stakeholders and holders in the higher education system, thus permitting an all rounded approach of views and attitudes towards adopting the chatbot system with respect to the different roles in the institution.

Table 1: Summarizes the demographic characteristics of the survey respondents.

Demographic Variable	Frequency	Percentage
Faculty	120	30%
Students	200	50%
Administrative Staff	80	20%

4.2. Correlation Analysis

The correlation coefficients between the UTAUT2 constructs and chatbot adoption are displayed in Table 2. When the data was analyzed, many critical correlates to the construct of the adoption of chatbots emerged. High correlations were revealed with respect to performance expectancy, with 0.58 obtained for performance expectancy and adoption of chatbots. The implication of this is that if the individuals' perception is that the chatbots are performance enhancers then individuals will be willing to own them. Hence strong positive relationships were noted for hedonic motivation (0.52), effort expectancy (p=0.45), facilitating conditions (p=0.37) and price value (p=0.40) against chatbots usage. Such outcomes also suggest that enjoyment, ease of usage, external help and perceived worth are among the factors that induce people to use chatbot technology.
Table 2 shows the correlation coefficients among UTAUT2 constructs and chatbot adoption.

Table 2:

Variables	Performance Expectancy	Effort Expectancy	Social Influence	Facilitating Conditions	Hedonic Motivation	Price Value
Chatbot Adoption	0.58**	0.45**	0.30*	0.37**	0.52**	0.40**

Note: *p < 0.05, **p < 0.01.

4.3. Regression Analysis

What is explosive in the results of the regression analysis, is that the performance expectancy and hedonic motivation become significant factors of chatbot technology acceptance. This indicates that an individual's beliefs concerning such performance improvements in efficiency and enjoyment that can be brought about by chatbots would greatly affect their intentions to use the chatbot technology further. These findings illustrate the fact that feedback and perceived usefulness of new inventions amongst users are critical in their implementation of the architectural such as chatbots technology in educational institutions.

In general, the results of the demographic, correlation and regression analysis as presented in the study, provide an understanding of the factors affecting the adoption of chatbots in higher education, explaining the complex relationships between user perceptions and attitudes and user adoption within higher education.

5. DISCUSSION

5.1. Implications for Higher Education

The research findings suggest some critical connotations for the use of AI-powered chatbots to universities

that endeavor to integrate them in the teaching and learning processes. It is recommended that institutions put, in place measures aimed at improving the acceptance of students, staff and colleagues to this technology by making these interactions more useful and enjoying.

On this note, since educational institutions are stressing on the usefulness of chatbots, they tend to show that the benefits fostered by this AI tool include information availability at all times, enabling easier interactions, and cutting down of some administrative work. Likewise, designing on the enjoyment aspect of the interactions with chatbots can heat up the acceptance and use rate by making it addictive, enjoyable and user friendly.

The introduction of strategic measures that seek to increase acceptability and satisfaction when interacting with chatbots can eventually lead to a favorable change in the attitude of the academic community towards the use of new technologies and ultimately encourage the development of new ideas and technologies in the field of higher education.

5.2. Challenges and Barriers

However, while the study brings to light the advantages of having chatbots in higher education, it has shown some aspects that institutions need to consider and overcome to enable effective use and incorporation of the chatbot technology.

Resistance to change appears to be a major obstacle where it can be observed that people in academic institutions may be or are passive in the use of modernized technological concepts such as chatbots because of ignorance about the concept, fear of changes in workload distribution, or hostility towards the displacement brought by technology. This resistance can be avoided through the use of effective change management practices, proper and timely information dissemination as well as training the users and the rest of the stakeholders on how to use the chatbot effectively and what is covered by this concept.

Further, the paper suggests inadequate technical support as one of the hindrances towards the successful utilization of chatbots for education purposes. Taking into account limited available technical skills, lack of resources, and absence of support systems can limit how chatbots will be installed and used in educational facilities. Solving this problem requires financing, either through internal resource allocation or external grants or funding to training programs, technical infrastructure, and helping desks to make the operation and performance of chatbot tools efficient and sustainable.

In this way, recognizing and solving all these difficulties it is possible to achieve the adoption of chatbots in higher education institutions together with good utilization of AI technologically and thereby better the performance, creativity and involvement of students in the educational ecosystem of the institution.

6. CONCLUSION

Through its research and concepts, this original work fills gaps in literature concerning the adoption of AI-based chatbots in educational settings by providing insights on chatbot confirmation, continuance intention, and concerns regarding quality. In regard to the UTAUT2 model, additional variables, such as chatbot confirmation, continuance usage, quality factors, satisfaction and interaction preferences, help to understand some of the factors contributing to the exchange and then the further use of chatbot technology in post-graduate education.

Nevertheless, even with these valuable conclusions drawn from this study, there are some limitations that have to be taken into account. First and foremost, the studies that demonstrate no direct positive relationship between social influence, facilitating conditions and behavioral intention of using or even learning how to use the Chatbots; contradict the relevant existing body of knowledge on technology acceptance. Such divergence in perspective highlights the need in this instance of exploration of the specifics of the use of a Chatbot and focuses on outline of the future research directions.

Furthermore, the lack of a direct association of facilitating conditions and of social influence in terms of chatbot use has brought to light the need to assess the relevance of these constructs in the stakeholder management of chatbots. In addition, this contribution helps to answer the question of how educational AI chats should be used at all, focusing on the issues that most affect users, in order to make it useful for their learning purposes.

In addition, important work in the future also includes the research of the consequences for the achievement and experience of users with integration of chatbots into educational environments up to the longer-term perspective. It is imperative to grasp the effects of incorporating chatbots in teaching and learning settings as it will assist educational institutions in a better strategic approach of putting the technology for greater use towards improvement of learning experience for their clientele.

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