Adoption of AI-Chatbots to Enhance Student Learning Experience in Higher Education in India

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***Abstract*—Today, every organisation depends on Information and Communication Technology (ICT) for the efficient service delivery and cost-effective application of technological resources. With growing preference towards faster services and acceptance of Artificial Intelligence (AI) based tools in business operations globally as well as in India, the global Chatbot market is going to accelerate in the next decade. In the era of AI, the Chatbot market is witnessing extraordinary growth with the increased demand for smartphones and increased use of messaging applications. In the past few years, the food delivery business, finance and the E-commerce industry have embraced Chatbot technology.**

One of the industries which can really benefit from using this technology is the educational sector. Education can benefit from Chatbot development. It can improve productivity, communication, learning, efficient teaching assistance, and minimize ambiguity from interaction. A new education platform can solve next-level problems in education using this technology as the engagement tool.

The aim of this research paper is to find out the factors which affect the adoption of Chatbot technology in order to enhance the student learning experience in the Indian higher education sector. In this research, a Quantitative method is used through data collection from surveys of some of the prominent higher education institutes using Chatbot technology in India. It is expected that the research outcome will help Chatbot developers and higher education providers to better understand the requirements of students while providing an interactive learning and communication platform for them.

Keywords— Chatbot, Artificial Intelligence, Student-centred learning, higher education, India

I. INTRODUCTION

"Education 4.0" involves the integration of AI in the learner-centred education system [1]. The learner-centred education system was an upgrade from the traditional education system that was tutor centred [2]. Advancement in the education sector is essential to accommodate evolving lifestyles, economy, technology and student's needs. Also, the increased scarcity of teachers in the education system have made the integration of advanced technology in our education system essential. Research indicates that Chatbots will assist in solving some of the current challenges facing the education sector [3]. This paper discusses the integration of AI centred Chatbots in the education system. The paper, through the literature review and data analysis, discusses the current state of Chatbot usage in India and addresses the differences between the traditional education system and the AI-Chatbot education system.

II. LITERATURE REVIEW

A. Artificial Intelligence

Current technological advancements have placed artificial intelligence (AI) at the focal point of research and innovation [1]. The integration of AI in our lives requires the distinction between weak AI and Artificial General Intelligence (AGI). Weak AI refers to computer programs developed to solve specific problems like playing chess or conducting facial recognition. The programs in weak AI employ AI techniques such as data mining and machine learning. AGI refers to flexible machines that can provide solutions to problems just like a human being [4]. The majority of current AI inventions mostly dwell on weak AI and a few on AGI. Georgescu [5] observes that the adoption of AGI is still in the initial stages but much advancement is expected within the next two decades. Integration of AI in the education system requires the use of AGI. However, the main questions that require more attention are how to address the diverse ethical and cultural backgrounds, and how to develop programs that are less directive but allow students to be in control instead of vice versa.

A Chatbot is an artificial intelligence (AI) based software program that is able to simulate a conversation with the user using natural language through messaging platforms, phone applications and websites [6] [7]. Users interact with Chatbots that have a conversational user interface (CUI), which allows users to interact with the bot. This means that the users do not have to download any applications onto their devices or launch any specific applications [8]. CUI are intuitive and easy to use.

B. Chatbots

Chatbots are classified using different parameters such as the knowledge domain, service provided, goals, and responses generated [9]. The knowledge domain is based on the knowledge the Chatbot accesses. There are two types of domains; the open and the closed domains. The open domain Chatbots address general topics and respond appropriately to general questions. The bots in the closed domain address specific knowledge domains and may fail to respond to questions from other domains [10]. The service-based Chatbots are categorized into those that offer interpersonal, intrapersonal and inter-agent services [7]. The goal-based Chatbots are further categorized under the informative, conversational and task-based Chatbots. The last category includes the Chatbots based on the input method and the

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responses generated [11] . There are Chatbots that accept input, and process and generate output in natural language, and others that are rule-based as they process input based on rules. Other Chatbots in this category are a hybrid as they use natural understanding and rules to process input and generate output [10].

C. Usage of Chatbots in India

Innovation is required in a developing country like India, in order to develop quality education and create a workforce to compete globally [12]. India has widely embraced the use of Chatbots in various sectors and it is a key player in the Chatbot market. In the banking sector, Chatbots are used to handle customer queries (and FAQs) and give guidance on bank services and products [13]. Chatbots in the banking sector include SIA, iPal and EVA by the State Bank of India, ICICI Bank and HDFC Banks respectively[14]. In the insurance sector, Chatbots are assisting customers in filing claims, getting policies, checking the status of their policies, and locating providers and their branches, as well as other service providers [8]. Baja Allianz's Boing, Birla Sunlife's bot and PNB Metlife's banking applications are among the commonly used Chatbots in this sector [15].

In the transport sector, Chatbots are used to provide real-time cab details, flight bookings and verifications, and traffic analysis [16]. Meru Cab and Yatra.com Chatbots are among the bots used in the transport sector [17]. In the ecommerce sector, Chatbots have been used in handling queries, tracking orders, making payments and raising customer complaints [14].

D. AI-bot for the educational system

Chatbots have been in use for educational purposes for quite some time. These Chatbots can be categorized into those with education intentionality and those without. Chatbots without education intentionality are used in administrative tasks such as student guidance and assistance [14]. Chatbots with education intentionality are used in fostering teaching and learning. Within this category, there are Chatbots which provide the framework of the learning process, that is, select and arrange contents to fit the students' needs and speed, and help in reflection and learning motivation. These bots act as a learning companion which provides dialogue, collaboration and reflection [1]. Furthermore, there are exercise and practice Chatbots that present a stimulus in question form, to which the student provides an answer that is assessed by the Chatbot which then provides feedback [18].

Chatbots enhance dialogic learning as it is based on a communicative exchange between the bot and the student. According to Fleming, the interaction between the Chatbot and the student consists of the following elements: initiation, response, and feedback (IRF) [18]. The Chatbot initiates the conversation by asking questions and based on the response the student gives, the Chatbot provides feedback. These Chatbots also provide interaction among students and this interaction has an additional element of discussion (D) and thus we have IDRF [19]. The Chatbot initiates a conversation by asking a question, the students discuss the question and give a response, and the bot provides feedback.

The Chatbots in education perform different tasks such as handling FAQs (Frequently Asked Questions), administrative and management tasks, student mentoring, motivation, student learning assessments, simulations, training specific skills and abilities, and providing reflection and metacognitive strategies [6].

Cardenal Herrera University (CUE) has a Chatbot for mentoring students and providing answers to student queries [20]. The Chatbot acts as a personal assistant for handling administrative queries, although more enhancements are being conducted to enable the Chatbot to predict student behaviour and give advice to them during the learning process. Based on the Literature review, the differences between the traditional system and the AI bot system are shown in Table I.

TABLE I. DIFFERENCE BETWEEN THE TRADITIONAL SYSTEM AND THE AI BOT SYSTEM

Teacher Centred Learning/ Traditional System	**AI-Bot System**
Focus is on the instructor	The centre focus is on both the student and tutor
System is built on what the instructor knows about language forms and structures	The system focuses on how the student will use the language
Depends on passive learning	Incorporates both active and passive learning styles
Students rely on the teacher	There is interdependence between the teacher and the student
The tutor is responsible for the student's excellence	The student is solely responsible for his/her excellence
Online platforms are just repository areas	Online platforms accommodate interaction and experimentation
The learning environment is centred on the curriculum	The learning environment is centred on the student's profile, learning experiences and needs
The student's behaviour is not a factor in the formulation of the pedagogical model	The student's behaviour is modulated to tailor the pedagogical model to the learner's model
The learning environment is not adaptive	There is implementation of adaptive learning environments

III. PROBLEM STATEMENT

Technological advancement has enabled organizations to conduct their daily businesses in an effective and efficient manner. The information and communication technology have been adopted to facilitate effective and timely delivery of services in different public and private sections in India including higher education. It has been established that Chatbot development can improve learning, communication, and productivity, as well as provide efficient teaching assistance and minimize ambiguity. Consequently, this study aims at establishing the factors which affect the adoption of Chatbot technology to enhance the student experience in the Indian higher education sector.

3.1 Research Questions

This study is guided by the research question: How can the Indian education sector benefit from adopting Chatbot technologies?

3.2 Study Hypotheses

- There is no significant statistical difference in the adoption of Chatbot technology by gender of the respondent.
- The level of education of the respondent does not affect the adoption of Chatbot technology in the Indian higher education sector.
- There is no significant difference in the adoption of Chatbot technology by age of the respondents.

IV. METHODOLOGY

An empirical research design was used in the study. Quantitative method was used through data collection from surveys of some of the prominent higher education institutes using Chatbot technology to explore the factors that influence the adoption of Chatbot technology in Indian higher education. Stratified random sampling was used to select a sample of 47 students for the study, and questionnaires were administered.

A series of 10 questions were included in the questionnaire. The data collected was on demographic information as well as data on Chatbot use. Information on the students' age, gender, and their highest level of education was collected. Additionally, the respondents gave information on whether they had communicated with their educational institute in the past 12 months, the quickest response time by communication channel by their institute, the most likely predicted use cases for Chatbots in their educational institute, the barrier to using Chatbots compared to other methods of communication, whether they would talk to Chatbots to get help with their educational issues, and whether they would be less likely to use other forms of communication if they were chatting with Chatbot.

V. DATA ANALYSIS RESULTS

Data was recorded in excel and exported to SPSS for analysis. Descriptive statistics and inferential statistics were computed to achieve the objectives of the study.

5.1 Descriptive Statistics

The study sample comprised of 24 male and 23 female respondents as shown in Table II. It shows the age distribution of the respondents. The majority of the respondents were aged between 25 and 34 years (53.2%), with 34% of respondents aged between 18 to 24 years, 6.4% under 18 years, and 6.4% aged between 35 to 44 years.

TABLE II. GENDER OF THE RESPONDENTS

Gender	Frequency	Valid Percent	Cumulative Percent
Male	24	51.1	51.1
Female	23	48.9	100.0
Total	47	100.0	

Figure 1 shows the highest level of education for the respondents, with 38.3% having completed a master's degree (M.A., M.B.A.), 36.2% having a bachelor's degree (B.A, BSc), 17% having completed high school, and 2.1% having a doctorate. Results show that most of the people using Chatbots are educated with a Bachelor or Master level of studies, with few having a high school level education. The lowest level of usage was by people with a doctorate degree.

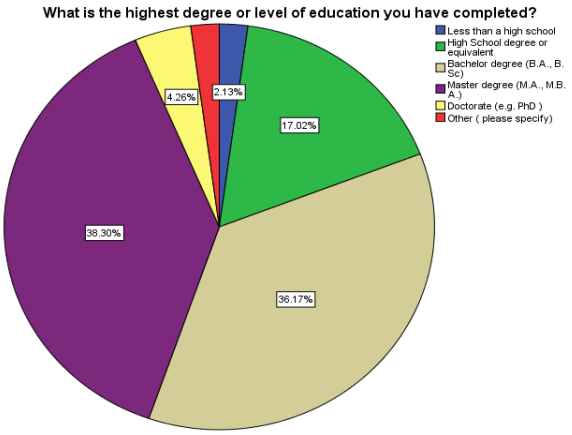

Figure 1: Highest level of education

Additionally, most of the students assert that they would use Chatbot to get help with their educational issues. The research survey collected the data from participants based on 1 to 10 rating system in which 0% response received for ratings 1,2,3,4, and 6 respectively. A majority (93.6%) of the students would be less likely to use other forms of communication if they were chatting with Chatbot as shown in Table III.

TABLE III. WOULD YOU BE LESS LIKELY TO USE OTHER FORMS OF COMMUNICATION IF YOU WERE CHATTING WITH CHATBOT

Rating system (1-10)	Frequency	Percent	Valid Percent	Cumulative Percent
5	**1**	**2.1**	**2.1**	**2.1**
7	**2**	**4.3**	**4.3**	**6.4**
8	**7**	**14.9**	**14.9**	**21.3**
9	**29**	**61.7**	**61.7**	**83.0**
10	**8**	**17.0**	**17.0**	**100.0**
Total	**47**	**100.0**	**100.0**	

5.1.1 Students Communication with Their Education Institute in the Past 12 Months

On the question of how the students have communicated with their educational institute in the past 12 months, 48.9% indicated that they used Chatbot while 51.1% used other communication channels with their institution, as shown in Table IV.

TABLE IV. USE OF CHATBOT TO COMMUNICATE WITH EDUCATIONAL INSTITUTE IN THE PAST 12 MONTHS.

	Frequency	Percent	Valid Percent	Cumulative Percent
no	**24**	**51.1**	**51.1**	**51.1**
yes	**23**	**48.9**	**48.9**	**100.0**
Total	**47**	**100.0**	**100.0**	

5.1.2 Quickest Response Time by Communication Channel

In terms of the *quickest response time by communication channel in the institute for the last 12 months*, the responses are as follows: the majority of the students (60.9%) indicated that Chatbot was the quickest communication channel. This is followed by online chat with 19%, telephone chat with 8.9%, face-to-face with 6.5%, and social media and email were 2.2% respectively as shown in Figure 2. This indicates that Chatbot technology is appreciated as having the quickest response time.

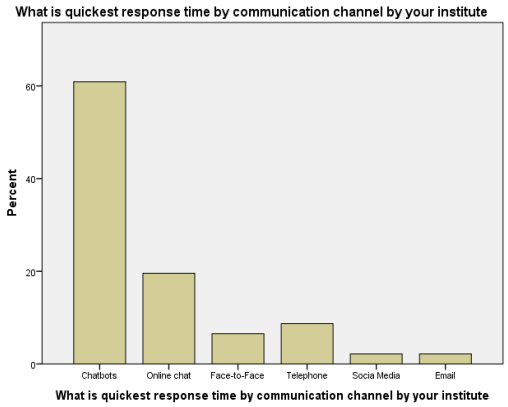

Figure 2*:* The quickest response time by communication channel by students' institute

5.1.3 The Likely Predicted Use Cases for Chatbots

On the likely predicted use cases for Chatbots in the educational institute, 10.6% of the respondents indicated that Chatbots are used for tutoring, 48.9% for learning feedback, 68.1% for paying fees, 68.1% for being more convenient than other methods of communication, 76.6% for resolving a problem, and 51.1% of the students indicated that the likely predicted use cases for Chatbots in the educational institute is for getting a quick answer. The results indicate that a Chatbot is most likely used by students in resolving a problem as well as due to its convenience in comparison to other communication methods, and for paying their fees as shown in Figure 3.

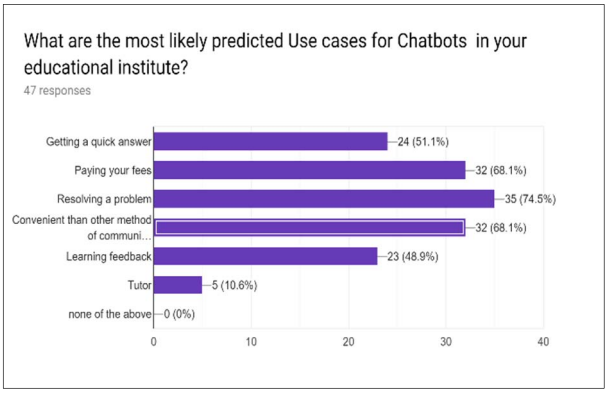

Figure 3. Likely predicted use cases for Chatbots

5.1.4 Barriers to Using Chatbots as Compared to Other Methods

On the barriers to using Chatbots compared to other methods of communication, 21.3% of the students indicated that Chatbots had limited intelligence and hence were not suitable for solving issues, 63.8% preferred to use a normal website as it is easier to use than Chatbots, 55.3% preferred to deal with real assistants (personal Touch), 66% risked losing personal information (privacy issues), and 77.8% were worried about receiving incorrect advice. The foregoing results indicate that the highest number of students (77.8%) were worried about getting incorrect advice by using Chatbots. The other barrier to using Chatbots, the risk of losing personal information (privacy issues), also had a higher percentage of 66%. Additionally, the preference of using a normal website for its easy usage also had a high number of students, as shown in Figure 4.

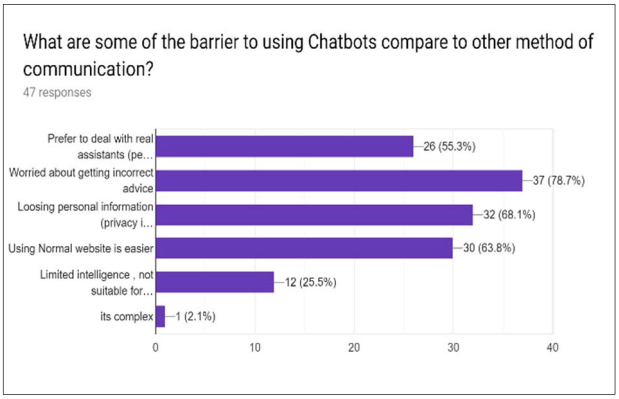

Figure 4. Barriers to using Chatbots compared to other methods of Communication

5.2 Inferential Statistics

To establish whether there is a relationship between the adoption of Chatbot technology and gender of the respondent, the following hypotheses were formulated;

Ho: *There is no significant statistical difference in the adoption of Chatbot technology by gender of the respondent.*
Ha: *There is a significant statistical difference in the adoption of Chatbot technology by gender of the respondent.*

Chi-Square tests were conducted at 0.05 level of significance. Tests are used for testing relationships between categorical variables. In a statistical hypothesis test, the p-value is the amount of marginal significance. It is used as an alternative to rejection points by providing the lowest level of significance to dismiss the null hypothesis. The p-value for Pearson Chi-Square was 0.188, which is greater than 0.05. The null hypothesis was not rejected. It is concluded that gender does not affect the adoption of Chatbot technology, as shown in Table V.

Table V: Chi-Square Test results for gender

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	**1.733a**	**1**	**.188**		
Continuity Correction	**1.050**	**1**	**.306**		
Likelihood Ratio	**1.744**	**1**	**.187**		
Fisher's Exact Test				**.248**	**.153**
N of Valid Cases	**47**				

The relationship between age and adoption of Chatbot technology was tested using the Chi-Square test, and the results showed a Pearson Chi-Square p-value of 0.226, which is greater than 0.05. The null hypothesis was not rejected, and it is therefore concluded that the age of the respondents has no significant effect on the adoption of Chatbot technology in the Indian higher education sector. Furthermore, the level of education of the respondent does not affect the adoption of Chatbot technology in the Indian higher education sector as indicated by a Pearson p-value of 0.388 (greater than 0.05 level of significance).

VI. DISCUSSION AND CONCLUSION

The aim of this research paper was to establish the factors which affect the adoption of Chatbot technology to enhance the student experience in the Indian higher education sector. A Quantitative method was used through data collection from surveys of some of the prominent higher education institutes using Chatbot technology. The study sample comprised of 24 male and 23 female respondents. Descriptive statistics established that the majority of the students would talk to Chatbot to get help with their educational issues and they were less likely use other forms of communication if they would be chatting with Chatbot.

On the question on how the students have communicated with their educational institute in the past 12 months, 48.9% indicated that they used Chatbot. Furthermore, the majority of the students indicated Chatbot as the quickest communication channel. The results further indicate that Chatbots are most likely used by students in resolving problems, due to its convenience in comparison to other communication methods, and for paying their fees. However, results indicate that the biggest concerns for students involved getting incorrect advice by using Chatbot, and risking losing personal information (privacy issues).

The Pearson Chi-Square tests established that there was no relationship between gender, age and level of education of the students, and the adoption of Chatbot technology in the Indian higher education sector.

The integration of AI-Chatbot in the education sector will facilitate the achievement of student-centered learning. The above research indicates that students are embracing use of Chatbots and immense benefits have been achieved. Chatbots can assist students to communicate well, conduct research and mark online exams.

VII. FUTURE STUDIES

Student-centered education focuses on the student. The introduction of AI-Chatbots to replace teachers means that students will interact with the Chatbots more often than with teachers. Therefore, more research needs to be conducted regarding the negative effect of using technology, such as addiction. Strategies needs to be set aside to ensure that AI does not end up controlling students. While this study is based on the Quantitative method, future research can also use Qualitative or a mixed method approach for more insight on students' experiences using Chatbots in the educational institute. The present study was conducted only in Indian educational institutes, so similar studies may also need to be conducted in other countries to understand the factors affecting the adoption of AI-Chatbot in individual countries. Comparative studies between developing and developed countries may also be conducted as future studies to understand if there are any significant differences between them in terms of the factors affecting the adoption of Chatbot.

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