

# Chatbots in the service of university students: A review

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## ABSTRACT

This review examines the burgeoning role of chatbots within higher education institutions, specifically focusing on their service to university students. As digital technology increasingly infiltrates academic contexts, chatbots have become valuable tools for enhancing student support and administrative efficiency. This study investigates the potential of conversational agents to revolutionize traditional student-university interactions, streamline academic processes, and provide personalized student support. Through a comprehensive literature review, we identify and analyze existing implementations of chatbots in educational settings, emphasizing their impact on the student service sector. The results underscore the chatbots' effectiveness in handling inquiries, reducing administrative workload, and improving student satisfaction rates. This review highlights the necessity for educational institutions to adopt chatbot technology to facilitate improved student communication channels. Limitations and future research directions are also discussed, highlighting the need for broader database searches and varied methodological approaches in subsequent studies.

**Keywords:** chatbots; university students; higher education; user usage; academic process automation.

## 1. INTRODUCTION

**W**E LIVE in a world where we are increasingly dependent on technology; it is found in our daily lives, and we must get used to living with it (Kasthuri and Balaji, 2021). In recent years, conversational agents have become increasingly included in different development fields. One of the most requested is customer service in companies and the educational sector. These conversational agents were initially created as a complement to web pages (Baha, Hajji, Es-Saady, and Fadili, 2021). Still,

over time, they discovered the true potential of becoming conversational agents capable of helping in the processes of a certain company or institution (Akma *et al.* 2018).

In recent years, large companies such as Apple, Facebook, Google, Amazon, etc., have been investing in developing tools and platforms for the creation of chatbots, where companies and institutions can access their own conversational agent in a personalized way to communicate, becoming an efficient channel to improve the relationship with its clients (Cordero *et al.*, 2020).

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**Received:** 12-07-2024. **Accepted:** 15-11-2024. **Published:** 28-11-2024

**How to cite:** Tapia-Hoyos, J. J (2024). Chatbots in the service of university students: A review. *Social Sciences in Brief*, 1, 1-7. <https://doi.org/10.47909/ssb.08>.

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Concerning education, its excellent communication capacity can be one of the most applicable advantages for this sector (Múnera Torres *et al.*, 2021) since personalized monitoring can be provided through this IT tool for students who are personalized tutors. In universities, the communication that takes place with students, in many of them, occurs traditionally; that is, they have to go to the office where information is required to carry out some procedure (Nguyen, Le, Hoang, and Nguyen, 2021). The need to have a chatbot that can automatically answer questions within the university is essential for automating academic processes. These agents have been performing acceptably for some years in education. Thanks to innovation, the platforms that help create these conversational agents are implementing more and more functions that seek user satisfaction and flexibility if used (Bailey and Almusharraf, 2021). On the other hand, technology makes it easier for students to access online tools (Kowsher *et al.*, 2019). Some research indicates that chatbots play an important role in customer service, which is essential within academic processes and teaching (Cordero *et al.*, 2020).

In some universities, it is requested to have a conversational agent that serves as a support tool when answering students' questions or when providing them with information about a procedure (Nguyen *et al.*, 2021). University students are attached to technology. They use mobile messaging applications to communicate, making them potential users for conversational agents (Okonkwo and Ade-Ibijola, 2021).

Conversational agents or chatbots are computer programs that simulate human conversations (Ahmed *et al.*, 2021). They have no limits to their training since the more data a complex conversation can obtain. However, these agents can also use short and precise responses, becoming multifunctional in different sectors (Chandra and Suyanto, 2019). On many occasions, the repeated questions generated by students in a university office are usually reflected in the discomfort of those in charge of providing them with the information (Adamopoulou and Moussiades, 2020); they are also often uninformed about

the requirements they need to be able to do something of university process, which generates loss of time and delays (Skjuve *et al.*, 2021).

In the last decade, computer software driven by artificial intelligence (AI) can imitate human conversations, thus playing the role of virtual assistants for customer service (Bakkouri, Raki, and Belgnaoui, 2022). The more training these conversational agents are given with data, the closer they will become to human conversations, thus becoming more interactive with users. Therefore, this review aims to highlight the importance of conversational agents within universities, seeking to reduce counseling times in the different academic processes and support students in obtaining information (Nguyen *et al.*, 2021).

## 2. MATERIALS AND METHODS

### 2.1. Design

This research work was developed based on the literature review methodology (Bakkouri *et al.*, 2022), which collected publications on implementations of conversational agents in student service.

### 2.2. Search strategy

For the research, the search for intelligent conversational tools was carried out using two databases, ScienceDirect and IEEE Explore, which are search engines that have a high level of scientific quality and credibility. Within the keywords, the terms "chatbot", "chatbots in higher education", and "conversational agents" were used. (See table 1)

### 2.3. Inclusion criteria

The research included original works by authors who wrote about the importance of having a conversational agent within customer service that was integrated into web pages and mobile messaging applications such as WhatsApp, Messenger, and Telegram, which were aimed at providing information about admission processes and academic processes within universities.

2.4. Exclusion criteria

The exclusion was based on the following criteria:

- They were more than five years old.
- Journals that are not published in English.
- Chatbots related to marketing.
- Works carried out in academic conferences.

3. RESULTS AND DISCUSSION

The study results reveal that the use of a conversational agent within the Admissions Office received more than 50,000 questions from students and parents in the admission registration process. The chatbot, in detail, re-sponded satisfactorily to 90.29% of the total questions.

After conducting a survey, it was revealed that 98.61% of 1,000 customers were satisfied with the service (Nguyen *et al.*, 2021). In summary, it is rational to apply a chatbot in the National University of Economics’s admission office since it reduces the academic load in the admission counseling process.

In another research developed by (Chandra and Suyanto, 2019), he successfully developed a chatbot with a sequence model, obtaining a BLUE score of 43.61. A conversation in the WhatsApp application was used as training data, which showed the questions that university students asked the most, having as a basis for developing the chatbot that answered users’ questions—obtaining acceptance from students as it answered their questions efficiently and quickly.

ScienceDirect	Year
Indonesian Chatbot of University Admission Using a Question Answering System Based on Sequence-to-Sequence Model	2019
NEU-chatbot: Chatbot for admission of National Economics University	2021

IEEE Explore	Year
Adoption of AI-Chatbots to Enhance Student Learning Experience in Higher Education in India	2019
Use of chatbots for user service in higher education institutions	2020
Question Answering based University Chatbot using Sequence to Se-quence Model	2020
Chatbot for University Admission Services	2018

Table 1. Retrieved articles from the databases.

Within the research developed by (Sandu, 2019), they obtained 48.9% acceptance by students within 12 months of study as a communicative tool between them and their study center. They noted that the chatbot is more likely to be used in problem-solving due to its fast and efficient way of receiving responses for free. They feared the chatbot would provide incorrect information and their privacy would be vulnerable.

The research (Khin and Soe, 2020) used 4,700 pairs of questions and answers for the training phase and 300 questions for the test phase. The chatbot’s performance was using the BLUE scoring method, which revealed a similarity between the sentences generated by the chatbot and the real sentences a person could answer.

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IN THE EDUCATION SECTOR

4.1. What are chatbots?

For Shawar and Atwell (2015), it is a programmed software whose function is to simulate human conversa-tion to accomplish various specific tasks. In his research, Ramaditiya *et al.* (2021) point out that these intelligent programs are developed with natural language processing and AI (Artificial Intelligence). Chatbots fulfill various functions, and virtual assistants are becoming more important in companies and institutions. For (Santoso *et al.*, 2018), these conversational agents are very effective within the commercial sector, but study centers use them to support

teaching and tutoring. Likewise, higher education institutions have implemented them for student service.

#### 4.2. Functions of chatbots in the educational sector

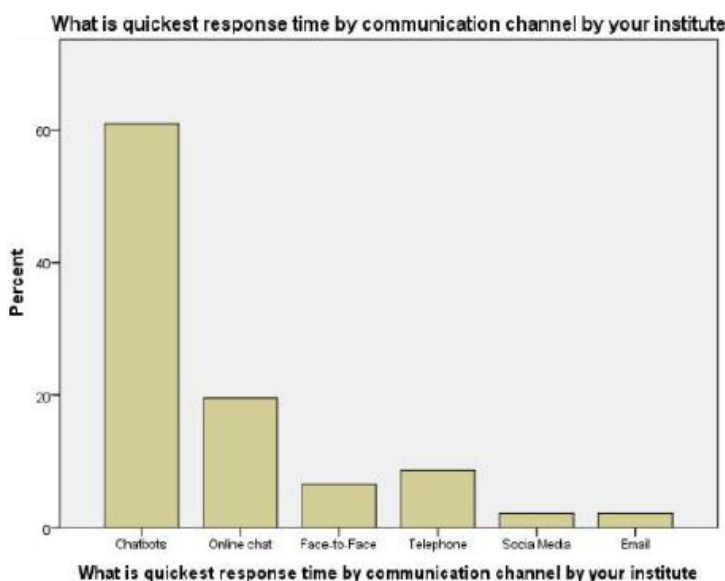
Among the functions that chatbots perform is customer service. Mittal *et al.* (2021) point out that they can serve as support in responses to customers as part of process automation. In most institutions where these conversational agents are implemented, the assigned tasks are to answer users' questions or to provide information. They want to be operational at all times of the day (Shawar, 2017). The educational sector is very broad and complex. For this, it is necessary to implement strategies that help cover this field. One of the strategies is adopting social networks as a tool for implementing conversational agents to serve students (Siglen *et al.*, 2021). The potential of conversational

agents is precious because they can establish communication with users, making it more enjoyable thanks to artificial intelligence and natural language (Múnera Torres *et al.*, 2021).

#### 4.3. Chatbots for virtual attention in the educational sector

In the world, many chatbots provide virtual customer service within higher education institutions (Nguyen *et al.*, 2021), which are used to automate the customer service process for students and external people at the university. Some examples of these chatbots are the following:

- Erasmus: a chatbot that supports university information, using the question/answer model to chat with users.
- Eaglebot is another chatbot created with artificial intelligence using the university website as an information base.



**Figure 1.** Fastest response time per communication channel per student institute. Source: Sandu (2019).

#### 4.4. Chatbot implementation success stories

In the research carried out at the National University of Economics (Nguyen *et al.*, 2021), it was defined that the main objective of having a conversational agent was to be able to

help both students and parents with admission queries. Basically, what was sought was to reduce the workload of the Admissions office. With the implementation, 97.1% accuracy was achieved, where it was specified that the key was the chatbot training with a lot of data provided in the Admissions Office.

The research carried out by Sandu (2019) aimed to integrate communicative factors with higher education students in India. For 12 months, students used the chatbot to communicate with their study center, and 48.9% of them used it as a communication tool to make academic queries. Thus, within the educational sector, students adopt chatbots to communicate effectively, conduct research, and correct online exams. The research identified factors that are most relevant to improving the experience of users who use these virtual services through chatbots. Regarding the systematic structure of the literature review, interesting discoveries were made where it was evident that the conversational agent's personalization and the topic specification that the chatbots will address are crucial to generating a positive experience for the end user.

The research carried out by Khin and Soe (2020) develops a chatbot with the sequence-to-sequence model, where the effectiveness of generating information to answer questions from users and external people who want information about the university is shown. We worked with the GPU model, and the Python programming language served as a base since it has libraries that help train and precise the chatbot's responses.

## 5. CONCLUSIONS

A meta-review of the importance of chatbots in communication in higher educational institutions was evident in the research presented. To this end, a search for information was carried out to support this research, consulting various sources of authors who supported chatbots' great communication potential within the education sector, which was related to the study's objective. Furthermore, the applied methodology allowed all the results obtained to be validated and thus have a literature review based on a solid base.

Based on the literary review, there were some problems with the service process in the universities, many of which were due to the large crowd of people in some academic process offices. Another problem was the few personnel covering the attention service to students, thus generating displeasure and discomfort. For this reason, we seek to

automate the attention process through a virtual conversational agent.

Finally, it is indispensable to have conversational agents within higher educational institutions to communicate with students where valuable data will be exchanged so that they can carry out any university process or acquire information about the university, making the university student feel satisfied with receiving quality care.

## 6. LIMITATIONS OF THE RESEARCH AND FUTURE RESEARCH PERSPECTIVES

The present research has some limitations. The primary limitations depend on the criteria for choosing the articles by the authors since each one will have its unique characteristics. First, the search was limited to two well-known databases (ScienceDirect and IEEE Explore). In this case, other databases can be considered for future research, and a broader category of journals can be covered. For the next stage, keywords such as "chatbots", "chatbot", "conversational agent", "higher education" were used; no synonyms for chatbots were used. Therefore, subsequent research may vary the keywords depending on the search criteria. Finally, to enrich similar research, other Artificial Intelligence tools can be considered to cover more sectors that were not considered.

## Conflict of interest

The authors declare that there is no conflict of interest.

## Statement of data consent

The data generated during the research process has been included in this article. ■

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