

"The Advantages and Obstacles of Adopting AI Chatbots in Higher Education: A Critical Evaluation"

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ABSTRACT

Conversational chatbots, powered by artificial intelligence (AI), are becoming increasingly popular and prevalent in various fields such as e-commerce, online banking, and digital healthcare. Although there has been limited use of chatbots in educational contexts, their potential for individualized service delivery has garnered attention. This paper outlines the development of three chatbot prototypes by the Warwick Manufacturing Group, along with newly introduced prototypes, and explores the potential benefits and technical challenges of integrating chatbots into daily operations in the educational sector. The three AI virtual agents being created include one to aid in the delivery of a simulated Master's course, one to support training and usage of an educational application, and one to handle helpdesk requests within a university division. This study contributes to the understanding of the unique pedagogical and operational requirements of educational institutions, which may differ from other sectors, among chatbot developers, especially chatbot engine vendors. Overall, this research could be beneficial for those interested in employing chatbots in educational settings as it highlights the advantages, practicalities, and potential issues related to introducing chatbots in these contexts.

Keywords: Intelligent systems; chatbots; tailored educational services; educational simulations using AI; application training using AI; and help desk support using AI.

I. INTRODUCTION

An artificial intelligence (AI) automated software program known as a chatbot mimics a dialogue between a human and a computer using natural language [1]. Instead of speaking to a live human, the end user may "speak" to a pre-built AI talking robot when chatbot technology is enabled

[2].

Conversational chatbots that use artificial intelligence have become more prevalent and are widely used in various industries such as e-commerce, online banking, and healthcare to provide personalized services [3,4,5]. However, there has been limited research on the use of these chatbots in educational settings. This paper focuses on three recent case studies of chatbots in educational contexts. By describing these case studies, the paper aims to illustrate the potential advantages and challenges of utilizing chatbot technology in the education sector. The three case stories showcased in the paper discuss the development of chatbots to offer support in delivering a simulated Master's course, to assist in training and using an educational application, and to manage helpdesk requests for a university division.

Three AI virtual agents are being created at the moment, each with a particular function:

1. A simulation game for a taught Master's course will be delivered with the assistance of one agent.
2. An additional agent will help with the training and use of a recently released instructional application.
3. A university department's third agent attempts to enhance the administration of helpdesk queries.

II. RELATED WORK

Chatbots are becoming used in both professional and medical contexts. In order to assist clients with finding fashion goods based on their personal style preferences, Liao and her colleagues built a fashion chatbot [3]. To manage business cards, Ko and Lin created a chatbot [4]. Based on the user's reported symptoms, Madhu and his colleagues [5] have created a medical agent that may identify various illnesses and provide a list of potential therapies. A chatbot was created by

Fadhil and Gabrielli to educate people about nutrition and encourage healthy lives [6].

In educational settings, the utilization of chatbots remains limited, but some instances showcase their potential. For instance, researchers have developed intelligent tutor chatbots to teach foreign languages like English, making online and mobile learning more accessible [7]. Another example includes a chatbot designed by Verleger and Pembridge, focused on teaching computer programming languages [8]. Additionally, Lee and Fu have explored the application of chatbots to facilitate peer evaluation [9]. Despite these promising initiatives, the widespread implementation of chatbots in education is still relatively uncommon.

Some chatbots have arisen that include components of cutting-edge technology. By combining virtual reality (VR) and artificial intelligence (AI), Dascalu and Bodea [10] created a chatbot that helps people prepare for job interviews. An indoor discussion chatbot designed for use in a mixed reality environment was also created by Park and Jeong [11]. The potential of chatbots to integrate diverse technologies for improved user experiences is demonstrated by these creative ways.

III. METHODOLOGY

Through the following research topics, our pilot project evaluated the possibility of integrating chatbots in higher educational contexts:

- How may chatbots be employed at a typical British university?
- What are the possible advantages and technical obstacles of implementing chatbots in a university setting?

In order to analyze the potential benefits and limitations of utilizing chatbots in educational settings, we explored three case studies. Each case study involved the use of a virtual chatbot with artificial intelligence in different scenarios, such as educational simulation, training for educational software, and helpdesk support in a university division. Through examining these case studies, one can gain insights into the potential of chatbot technology in education, including improved operational efficiency, personalized assistance, and enhanced learning experiences. Therefore, these case studies provide a foundation for further exploration of how chatbots with artificial intelligence can be implemented in educational institutions to promote student engagement and productivity.

IV. PROTOTYPES OF CHATBOTS

In this domain, we will showcase the prototypes we are currently developing, along with the techniques employed to create these chatbots.

4.1 An educational simulation game chatbot

As part of a Master's degree program, we developed a simulation chatbot to enhance the delivery of a simulation game. The chatbot serves as a virtual consumer seeking to do business with a company other than their current one. In this simulation game, students take on the role of salespersons representing their current company and engage with the chatbot, playing the role of the virtual customer. Their objective is to persuade the virtual customer to continue being a client of their company. Students need to effectively provide four key selling points offered by their organization to retain the customer's loyalty. Figure 1 displays a range of chat messages used in the simulation. The use of this simulation chatbot provides students with a unique opportunity to practice their sales skills and improve their ability to communicate effectively with clients in a low-risk setting. Moreover, the simulation allows students to receive personalized feedback, enabling them to reflect on their performance, identify areas for improvement, and refine their approach.

Ultimately, this simulation chatbot serves as an innovative and engaging way to enhance the learning experience, improve students' preparedness for their future careers, and promote the development of critical skills relevant to sales and client relationship management.

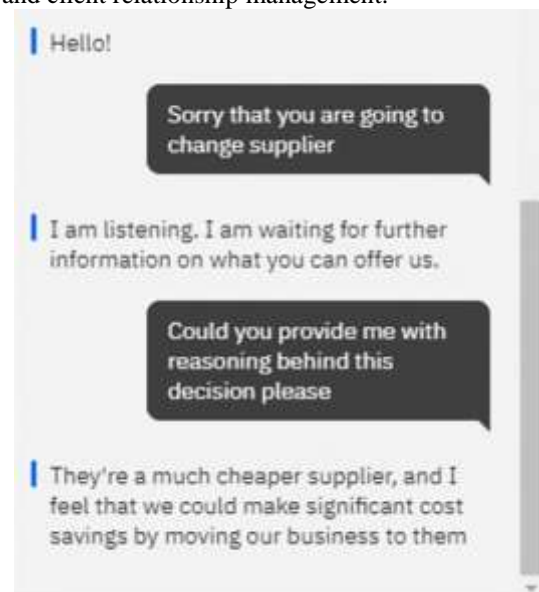


Figure1. A snapshot of a simulation chatbot's answer

4.2 Chatbots for Educational Applications

A reading list bot has been created to assist in teaching users of a recently released piece of educational software called the digital reading list. Many UK institutions have lately adopted a computerised reading list system to help librarians, lecturers, and students better manage the library's reading materials [12]. For each of their courses, teachers can create a digital reading list. Students may examine these lists, which, depending on the data supplied in the list, tell them precisely where, when, and how to access each book in the library. As a freshly released instructional programme, a sizable portion of users are unaware of how to utilise this software. As a virtual instructor, the chatbot will show teachers and students how to use the programme and prepare them to handle simple technical problems on their own as needed. The samples of several chats are shown in Figure 2 below.

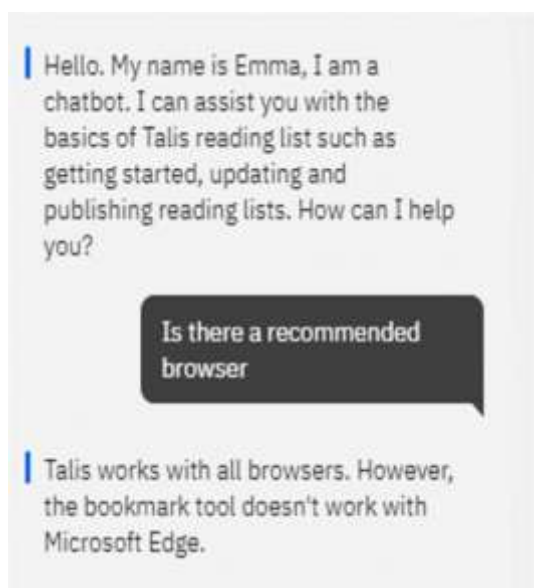


Figure2.Snapshot of a reading list chatbot's answer

4.3 Chatbot for Help Desk Support

As the number of queries received by our university's major departments continues to rise, we are constantly seeking ways to improve our customer support experience. However, during peak seasons, heavy workloads and staff shortages can make it challenging for our helpdesk to respond to inquiries promptly. In order to address this issue, we have developed a chatbot to provide immediate assistance to our students and employees. The chatbot is powered by AI and is able to respond to frequently asked questions and provide guidance for submitting helpdesk requests to the appropriate departments. Conversations with the chatbot are shown in Figure 3

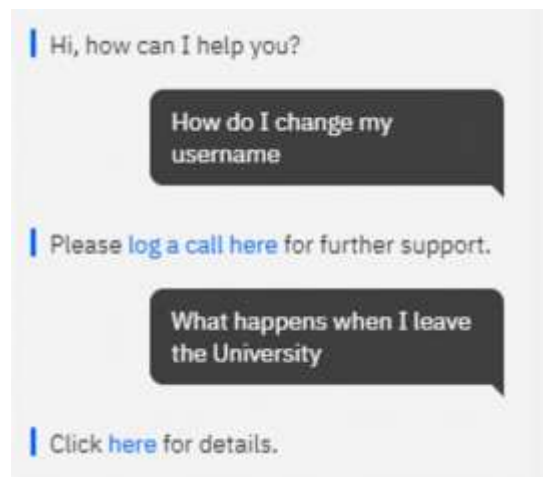


Figure3.Snapshot of a help desk chatbot responding

4.4 Techniques for Developing Chatbots

We followed the four major processes outlined below to create each chatbot.

Step one: Is to collect pairs of example questions and responses.

For the development of each chatbot prototype, we conducted data collection by reaching out to instructors and support staff. From these valuable sources, we gathered an extensive set of around 30 example question and reply combinations of 200 pairs for each chatbot. This comprehensive dataset serves as a foundation for training and refining the chatbots' responses to ensure they can effectively address a diverse range of queries and interaction

We enlarged the initial 30 question and response pairings to produce a total of 150 pairs in order to take into consideration variances in how end users could pose comparable queries. This guarantees that the chatbot can efficiently respond to questions that users may submit in various ways.

Step two: select the sorts of conversational responses

To determine which chatbots to use for different types of inquiries, we take into account the duration of the conversations. Some questions can be handled through chatbots, while others require human support. A few select queries may need to be directed to other departments, both within and outside our organization. This approach ensures that we provide efficient and effective customer service through appropriate and optimized channels. Step three: create the prototypes for the chatbots.

Stepthree:Create the prototypes of chatbots

After creating our chatbots, the subsequent step was to choose a suitable bot development engine that would facilitate hosting our chatbot applications.Stepfour:Examine or review the prototypes of chatbots.

Stepfour:Examine the prototypes of chatbots

We evaluated the prototypes of our chatbots to determine if the primary benefits we identified could be supported by the existing technology. We conducted this assessment by comparing the chatbot prototypes with the potential benefits we had learned about from books and prior job experiences. By doing so, we were able to

determine if our chatbots were capable of delivering the desired benefits and make any necessary adjustments to enhance their functionality.

V. OPPORTUNITIESANDCHALLENGE S

In this section, we begin by outlining the possible advantages that our chatbots hope to attain. The gaps and technological difficulties that chatbot developers are now encountering are then covered. Each of the outstanding problems will be thoroughly discussed.

Table1.An analysis of the simulated bot

Potential advantages / possibilities	Can the present prototype meet this requirement?	Can this be implemented soon?
A1: Students may keep the consumer by offering four must-have selling aspects that the existing organization possesses when speaking to the chatbot.	Yes	NA
A2: The chatbot can distinguish between products mentioned by students as necessary and optional purchases.	Yes	NA
A3: If pupils become stuck when interacting with the chatbot, it can prompt them.	Yes	NA
A4: Students won't be aware that they are conversing with a robot rather than a person.	Noyet	Notsure
A5: Students can ask challenging questions right away, and the instructors will receive them.	Noyet	Yes

A4&A5:The development of chatbots still faces the challenge of being able to address all types of queries that users may have. While it is not always possible to anticipate all conceivable interaction scenarios during the bot-building process, some platforms like IBM Watson are now incorporating search functionality to connect with internal databases and direct inquiries to human agents via messaging systems like Intercom [13,14]. However, it is important to note that these features may not be available or accessible to all chatbot creators.

B2:Updating and altering chatbot responses need significant AI comprehension and technological

expertise. Nonetheless, as demonstrated in Table 2, many teaching and support staff in charge of maintaining or upgrading chatbot responses lack such knowledge. To overcome this difficulty, a user-friendly interface within the chatbot-building framework is required. This interface would allow non-technical employees to easily update chatbot content without disrupting the entire system. Regrettably, currently existing technologies on the market do not provide such user-friendly alternatives.

B5:One of the primary difficulties that must be solved

is the capacity to give individualized experiences to users, which includes taking their emotional state into account during chats. Some suppliers advocate employing 'tone analysis' to analyze customers' emotional states and respond appropriately [15,16].

However, implementing this functionality needs substantial AI programming expertise, which most chatbot designers do not currently have. As a result, improving chatbot technology to create better customer experiences remains a critical area of focus.

Table2.An analysis of the reading list bot

Potential advantages / possibilities	Can the present prototype meet this requirement?	Can this be implemented soon?
B1: The chatbot's responses are easy to read and follow since they are concise.	Yes	NA
B2: The chatbot's replies may be rapidly and easily modified by the training personnel.	Noyet	Notsure
B3: When consumers want further help, more resources are made available, including email addresses and URLs.	Yes	NA
B4: The chatbot can nevertheless understand inputs that are grammatically and typographically incorrect.	Yes	NA
B5: The chatbot has the capacity to recognize the user's emotions throughout the discussions and to offer appropriate emotional support as needed.	Noyet	Notsure

Table3.An analysis of the support desk bot

Potential advantages or possibilities	Can the present prototype meet this requirement?	Can this be put into action soon?
C1: Users can follow the chatbot's instructions to make requests to the relevant teams.	Yes	NA
C2: Sending queries to the right teams or people may be done automatically by the chatbot.	Not yet	Possiblye s

C3:In order to save customers time, the chatbot might direct users to websites that are relevant to help desks..	Yes	NA
C4:In the course of communicating with people, the chatbot can automatically fill up the request form.	Notyet	Notsure
C5:The chatbot is entirely compatible with contemporary universities worldwide.	Notyet	Notsure

C2: According to the results in Table 3, employees and students may face difficulties in determining which teams within the department are appropriate to handle their helpdesk queries. This can result in an increased workload for the helpdesk staff as they need to redirect these queries to the appropriate teams. As a result, helpdesk employees require a high level of knowledge to effectively guide users to the appropriate team. Some chatbot development platforms offer features that automatically distribute user requests to pre-defined teams [13,14,15,16,17,18]. Unfortunately, this functionality is not yet accessible to bot creators.

C4: By completing user request forms automatically and sending requests to the relevant team while interacting with clients, chatbots may reduce workload and save time (see Table 3). Most chatbots allow users to provide extra information by providing a menu of options to pick from or by answering additional questions [13,14,15,16,17,18]. However, as previously stated, we are presently experiencing difficulties in automatically routing user inquiries to the appropriate team.

C5: Following their development, the chatbots must be completely compatible with institutions' existing IT infrastructure in accordance with their data security and privacy standards. Websites, VLEs, mailing systems, and help desk systems are examples of common systems used by universities. Although they have not yet been properly linked with current systems, these chatbots are still separate programs at this time (see Table 3).

VI. CONCLUSION AND FUTURE WORK

This research paper makes recommendations and assesses the advantages of using three AI chatbots for learning and teaching,

educational training, and customer service. Additionally, we discuss the technological difficulties a university department internationally faces, as well as our experiences creating these chatbots. Our study highlights the potential advantages of AI chatbots in education, providing students with individualized and engaging learning experiences. Additionally, we demonstrate how chatbots may help teach educational applications to be flexible and adaptable. Furthermore, we examined how chatbots may minimize human resource effort while increasing the efficacy of helpdesk service by giving rapid responses to a variety of customer concerns and difficulties. Our study also looks into the technological challenges we encountered when developing and deploying these AI chatbots, as well as the solutions we devised to overcome them. Finally, our research gives practical insights into the use of AI chatbots in many businesses, demonstrating their ability to streamline operations and deliver tailored, efficient services.

We hope that this paper will be informative and inspirational to our colleagues in education who hold teaching, research, or administrative positions who are considering using chatbots in the classroom.

We also hope to improve knowledge of educational institutions' pedagogical and operational expectations, which differ from those of other sectors, within the chatbot development business, particularly among chatbot engine suppliers. The bulk of popular chatbot creation platforms were not designed to assist educational activities from the start.

To summarize, our efforts to create and implement AI chatbot prototypes have uncovered significant technological challenges that must be overcome before they are deemed suitable for practical usage. Our next phase involves collaborating with university technical teams or external industrial partners to address these technical difficulties. Upon successful resolution of

these challenges, we intend to involve additional stakeholders to test the prototypes further. With the help of this step, we will be better able to comprehend how AI chatbots can provide individualized educational services to faculty, staff, and students in a university context.

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