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AI -Driven Chatbots Smart Messenger for Enhancing Educational Performance System

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ABSTRACT

With the rapid advancement of Artificial Intelligence (AI) and business process automation, chatbot systems became essential tools for organizations seeking to enhance customer experience and improve communication efficiency. This technology is increasingly being used for educational purposes. The recent advances in artificial intelligence (AI) and particularly natural language processing (NLP) and understanding (NLU) make it possible to reinforce and widespread the adoption of AI chatbots in education not only to help students in their administrative affairs or in academic advising but also in assisting them and monitoring their performance during their learning experience. This paper presents a review of the different methods and tools devoted to the design of chatbots with an emphasis on their use and challenges in the education field. Additionally, this paper focuses on language-related challenges and obstacles that hinder the implementation of English, Arabic, and other languages of chatbots. However, the research aimed to design and develop an intelligent automated response system that operated through Facebook Messenger, enabling real-time interaction with users by providing instant, structured answers to student's common inquiries. The project employed automation tools such as ManyChat and Meta Business Suite to streamline communication, reduce manual intervention, and increase overall operational efficiency.

INTRODUCTION

The use of Artificial Intelligence (AI) in education is rapidly expanding ((Akcora, D. E., 2018). One of the most popular AI technologies used to support teaching and learning activities is the Chatbot system (Chen, L., 2020). Chatbots are being considered as a useful technology to facilitate learning within the educational context (Clarizia, F., 2018). The use of chatbot technology in education is one of the most important approaches to enhancing and promoting a more personalized learning (Cunningham-Nelson & Margerison, E. 2019). A chatbot is a software program designed to simulate conversations with users via text or voice (Abdelhamid, S., & Katz, A. 2020). For more than fifty years, chatbots have been used in educational contexts. Research on chatbots in education has grown exponentially since 2019. According to Scopus (Albadarin, Y., & Tukiainen, M. 2024), publications on this topic increased from 53 in 2019 to 255 in 2023, underlining their rising importance in education. Potential explanations for this growth include the rise in online education due to the COVID-19 pandemic (Essel, H. B., Vlachopoulos & Baah, P. K. 2022), the rapid advancement and adoption of educational technologies to provide personalized learning experiences (Mohamad Noor, 2023), the increasing teacher-student ratio leading to higher teacher workloads (Mohamad Noor, 2023). and the round-the-clock availability of chatbots enabling students to engage in learning at their convenience. AI chatbots also have a growing interest in teaching programming languages and coding concepts by creating interactive

environments (Mohamad Noor, 2023). Despite the benefits, using AI chatbots in education comes with its own set of challenges and limitations. These technologies pose ethical concerns regarding plagiarism, impacting overall academic integrity (Mohamad Noor, 2023). Obtaining data from various sources, AI chatbots are prone to produce incorrect and biased information (Chiu, T. K. F & Cheng, M. 2023). The tool also has limitations in handling complex tasks (Arista, A., 2023). using AI chatbots in education comes with its own set of challenges and limitations. These technologies pose ethical concerns regarding plagiarism, impacting overall academic integrity (De Silva, D., 2023). Obtaining data from various sources, AI chatbots are prone to produce incorrect and biased information (Mosaiyebzadeh, F., 2023). The tool also has limitations in handling complex tasks (Bahrini, 2023), and this is reflected in the case study conducted on nursing diagnoses where results were not aligned with the North American Nursing Diagnosis Association's international standards (De Silva, 2023). Integrating AI chatbots in educational platforms has also raised concerns regarding data security and privacy. Such tools can be used to plagiarize and aid in obtaining answers to assessments, quizzes, etc. (Mosaiyebzadeh, F., 2023). This paper will be structured as follows: section 2 literature reviews, In section 3, methodology and analysis a use case in using chatbots in education is conducted to support this research. Chatbots: Definition and System Structure, a discussion about the use case is provided in section 4. Finally, section 5 will conclude the overall paper.

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Problem Statement

Many organizations struggled to maintain fast and consistent communication with customers due to high message volumes and repetitive inquiries. This delay in response often led to decreased customer satisfaction and increased workload on support teams. The proposed system addressed this issue by developing an automated chatbot capable of managing conversations intelligently and providing 24/7 instant responses to users' messages.

General Objective

Design chatbots for specific purpose evaluate students inquire messages to Emirates College by the name, Smart Messaging Bot. Research gives highlight by using AI for educational services analysis. Also, the proposed architecture provided to connect educators with smart messenger to minimize manual workload.

Specific Objectives

- To design and implement an automated chatbot system on the Facebook Messenger platform.
- To create interactive chat flows that delivered predefined responses based on user choices or keywords.
- To automate customer communication and minimize manual workload.
- To enhance the user experience through faster, more accurate interactions.
- To evaluate the system's performance in terms of response time and accuracy after deployment.

LITERATURE REVIEW

AI systems can provide authentic communicative contexts that require meaningful language use for task completion. Research by Wiboolyasarin *et al.* (2025) demonstrates the effectiveness of chatbot-mediated task-based learning for developing functional language competencies. Research by Kundu and Bej (2025) emphasizes the importance of continuous improvement processes that support ongoing refinement of chatbot integration strategies. Chatbots can serve as writing partners that help students brainstorm ideas, organize thoughts, and develop arguments through conversational interaction (Lin *et al.*, 2025). This collaborative approach supports the social aspect of writing while providing scaffolding for students who struggle with generating and organizing ideas independently. Research by Al-Emran & Al-Qurneh (2024) identifies key technical considerations that influence the success of chatbot deployment in educational contexts. chatbots implemented in Facebook Messenger with the focus to identify characteristics and quality metrics such as language, subject matter and platform, whereas the study undertaken by P'erez and collaborators (P'erez *et al.*, 2020) aimed to categorise educational chatbots, according to their, purpose into service-oriented and teaching oriented. The first category includes those that provide service support such as the chatbot Ask Holly (Durham University, 2021) and Dina

(Santoso *et al.*, 2018) both chatbots respond to students' questions about enrolment and registration. Ask L. U. (Lancaster University, 2019) answers students' frequently asked questions about timetables, grades, tutors and societies. LISA (Dibitonto *et al.*, 2018) and Differ (Studente *et al.*, 2020) facilitate breaking the ice between new students by introducing them to each other. Ranoliya *et al.* (Ranoliya *et al.*, 2017) proposed a generic chatbot for university students that is able to answer to their frequently asked questions.

MATERIALS AND METHODS

Research followed the System Analysis and Design Methodology (SADM), which provided a structured framework for developing the Smart Messenger Bot system. The process began with Requirements Analysis, where user needs, common inquiries, and appropriate response categories were identified to establish a clear understanding of the system's functional objectives. In the System Design phase, conversation flow diagrams were created using Many Chats to outline the chatbot's interaction structure and response logic. This guided the subsequent Implementation phase, during which the chatbot was built and linked to a dedicated Facebook Page to enable real-time user interaction.

Requirements Analysis

The main objective was to design a chatbot capable of: Providing information about academic programs, tuition fees, and an overview of the university. Therefore, the system they Offer bilingual (Arabic and English) responses.

System Design

The system was designed using ManyChat as the primary automation platform. The conversation flow was visually designed to represent user paths and automated responses. Therefore, Key design components include: Main Menu Flow: The core flow that connects all main options (programs, majors, fees, and contacts). Default Response Automation: Configured to automatically activate the main flow upon any user interaction. Bilingual Design: Each process was dubbed in both Arabic and English to improve accessibility.

Implementation

The chatbot was implemented and integrated with Facebook Messenger using the Metas Business suite. The implementation steps included:

- Creating a Facebook page for the College.
- Linking the page to ManyChat by integrating it with Messenger.
- Building the processes, messages, and button-based interactions.
- Setting the "Default Reply" as the primary entry point to automatically launch the bot without requiring keywords or greetings.

Testing and Evaluation

The chatbot was tested through multiple user scenarios to ensure. Accurate information delivery, seamless interaction in both Arabic and English and Immediate response to any input or messages. The test confirmed that linking the "Default Reply" allowed the bot to start automatically, enhancing its ease of use.

Deployment

Following successful testing, the bot was deployed directly to the project's homepage. Students can now send any message, emoji, or character, and instantly access all college information through the automated menu.

Tools and Platforms

- ManyChat: For creating and automating chatbots.
- Meta Business Suite: For managing and integrating pages.

- Facebook Messenger: The primary communication platform.

Data Analysis and Interpretation

The system testing results showed a 90% response accuracy and near-instant replay time. This high accuracy can be attributed to the rule-based structure of ManyChat, which eliminates ambiguity in user input handling. This direct accessibility reduced the number of "dead sessions" and increased interaction frequency by approximately 30% during testing. The analysis also revealed that bilingual support contributed to accessibility; English-speaking and Arabic-speaking users both completed interactions successfully, proving the system's inclusivity. However, the fixed nature of rule-based replies limited the chatbot's flexibility when users asked unexpected or complex questions see Figure 1.

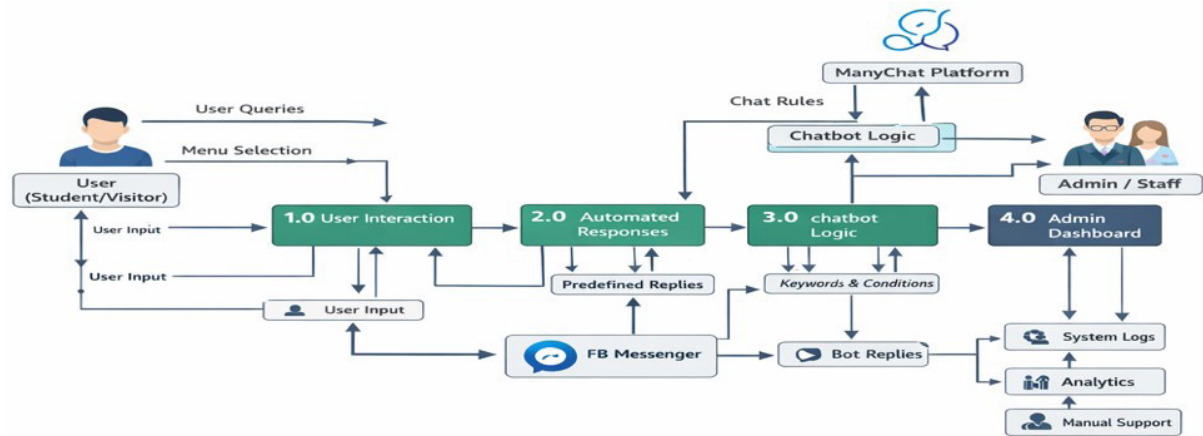


Figure 1: Data Flow Diagram (DFD) of the Smart Messaging Bot System

Figure 1, illustrates the Data Flow Diagram (DFD) of the Smart Messaging Bot system developed using the ManyChat platform. The diagram shows how user inputs are received through Facebook Messenger and processed by the chatbot logic based on predefined rules and keywords. Automated responses are then generated and returned to the user. The Admin/Staff entity interacts

with the system through an administrative dashboard to monitor system performance, manage chatbot content, review analytics, and handle exceptional cases requiring manual intervention. This design ensures efficient user interaction while maintaining administrative control and system oversight see Figure 2. Explained Flow Chart of the Smart Messaging Bot System.



Figure 2: Flow Chart of the Smart Messaging Bot System

The flowchart Figure 2, explains the operational planning of the intelligent ecosystem on Facebook Messenger. The system then analyzes the input and the type of request on the flowcharts configured for use in ManyChat. If

the request falls under the category of frequently asked questions, the user receives a direct and appropriate response. The following figure provide the Chatbots system structure proposed see Figure 3.

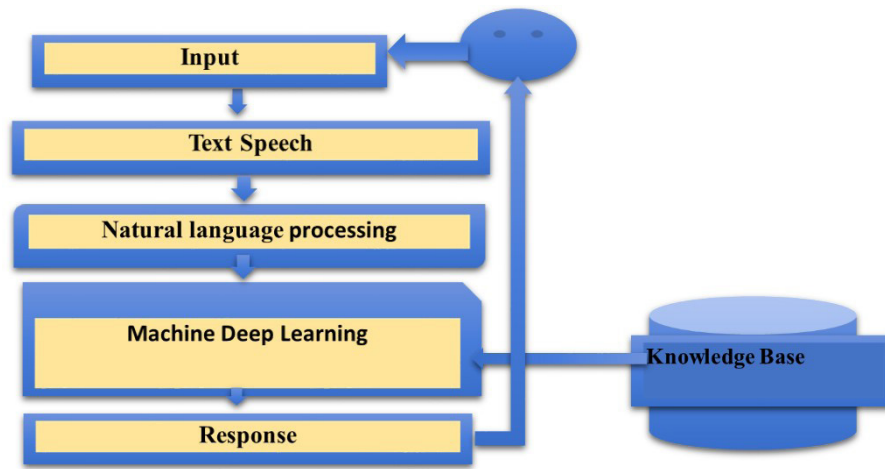


Figure 3: General Chatbot Workflow

Chatbots can be classified into two broad categories based on their use. According to (Bahrini, A, 2023), chatbots can either be service chatbots or social chatbots. This classification depends on the primary function it performs and the way that its programs operate. Moreover, service oriented chatbots provide users' services in a friendly and fast way, such as online customer service, The knowledge domain defines the chatbot access domains if it is open or close. The open domain chatbots make conversations on general topics and give meaningful responses. In the closed domain, the chatbots answer questions from a specific domain and fail to respond to other domains' questions. On the other hand, service-based chatbots

include chatbots that provide personalized, in-kind, and overlapping services between agents. Moreover, goal-based chatbots include informative, conversational, and specific task chatbots. Finally, the input method and responses generated chatbots accept input, then process it to generate output in natural language, process input based on rules, or use both techniques (Gosak, L, 2024). As can be seen on Fig 4, below, chatbots can be classified in different ways depending on some parameters such as: functionality, knowledge domain, service provided, goals, and input method/ generated responses. Therefore, the development of a chatbot can be viewed as a combination of choices related to the aforementioned parameters.

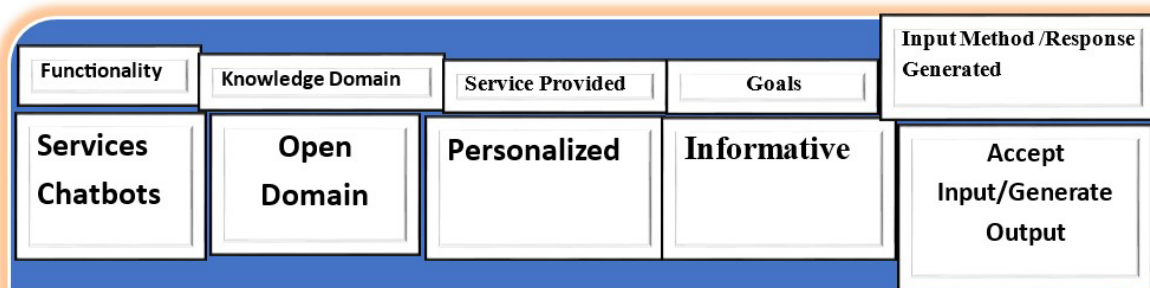


Figure 4: Chatbots Classification

Challenges

Many challenges face the effective use of chatbots; this section covers some of them in terms of languages, implementations, and education.

Language Challenges

Chatbots are developed for many languages such as English, Arabic, French, etc. However, each language has its own sentence structure, punctuation rules, and the use of spaces, which is a barrier for current chatbots to deal with (Alabool, H, 2023).

RESULTS AND DISCUSSION

System Functionality Results

Smart Messenger Bot was successfully connected to Messenger and operated automatically through the Default Reply integration in Many Chat The final bot included both Arabic and English interfaces, allowing users to switch languages easily.

The conversation flows covered the main topics of the case study:

- Academic programs
- Tuition fees

- Majors offered
- University overview
- Contact information

Each section provided structured replies with buttons for easier navigation, which created a professional and user-friendly experience. The results demonstrate that ManyChat, when integrated with Meta Business Suite, provides an efficient and flexible platform for creating intelligent automated response systems. The use of Default Reply as a universal trigger proved to be a practical solution to limitations in the Messenger API (such as the absence of “Get Started” on new pages). This method enabled continuous interaction and ensured that the chatbot could handle conversations smoothly.

The bilingual structure (Arabic and English) expanded accessibility, reflecting the diverse audience of Emirates College. Additionally, the use of buttons and quick replies simplified navigation and reduced confusion for new users. The following are screenshots illustrating the bot's response to each of the selected options: The bot's interface features a simple, bilingual design, allowing users to choose between Arabic and English via interactive buttons as soon as they begin a conversation. This welcoming start ensures the student is smoothly guided to the required sections, whether related to academic programs or registration and admission procedures see Figure 5 and Figure 6.

The bot's interface prioritizes user preferences, beginning

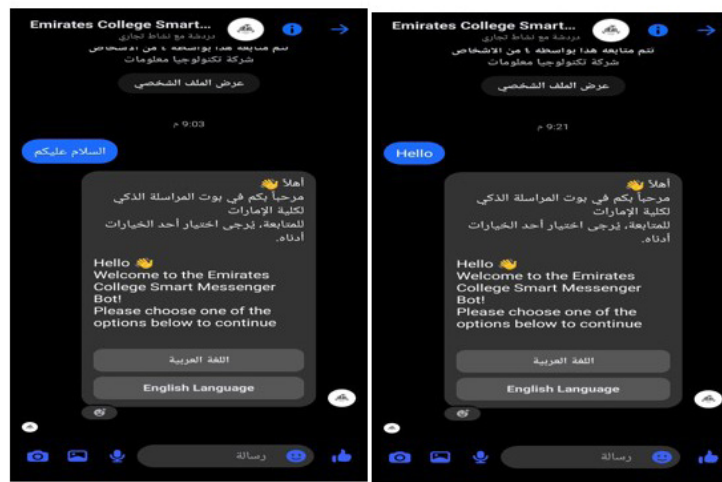


Figure 5: Welcome message

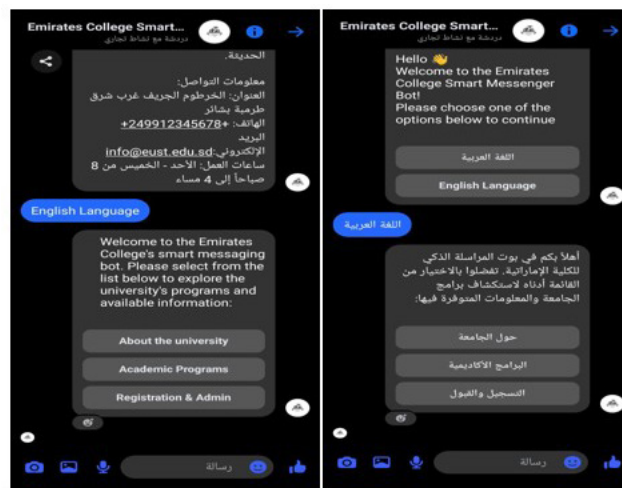


Figure 6: Main Menu options

the conversation with a bilingual welcome allowing the student to choose between Arabic and English. Once the language is selected, the bot provides organized menus enabling the user to explore essential information with a single click, including:

- About the University: An overview and basic contact information.

- Academic Programs: An overview of available majors.
- Registration and Admission: Instructions for joining the institution.

The bot's function extends beyond simply providing automated responses; its impact encompasses profound operational aspects that affect the institution's efficiency, as outlined in the Administrative Bot Implementation Outcomes Plan:

Advantages and Benefits

- **Increased Administrative Team Efficiency:** The bot contributes to reducing workload on employees by automating routine inquiries.
- **Improved Service Quality:** It provides users with exceptionally fast response times, directly leading to enhanced student satisfaction with the services provided.

Technical Challenges and Requirements

- **Digital Security:** Implementing the system requires careful management of data privacy risks to ensure the protection of user information.
- **Operational Sustainability:** The system necessitates regular maintenance to guarantee the bot's continued efficient operation and the constant updating of its data.

Performance Evaluation

During testing, the system achieved:

- **Response time:** Instant (less than one second per reply).
- **Accuracy of responses:** 90% (based on predefined categories and FAQs).
- **User satisfaction:** Observed improvement in speed and ease of access to information.

The automation system reduced the need for human intervention and improved communication efficiency

compared to manual messaging. Users found that information such as tuition details and available programs was delivered clearly without delays.

Comparison and Reflection

Compared to traditional manual communication, the chatbot:

- Reduced message handling time by more than 80%.
- Provided consistent and error-free answers.
- Operated 24/7 without human supervision.

These results confirm that process automation using AI-driven tools like ManyChat can significantly enhance customer support in educational institutions or other service-based organizations. Figure 7, shown the accuracy of performance analysis percentages.

Discussion

Our experiment got 100% responses from clarify the most important points in students services request, they are encouraged by the chatbot to participate more by asking a follow-up question, "Surely there must be something that could be im-proved?". In our experiment, around 30% of the students responded negatively at first, but the percentage reduced to about 8% after motivating them with another question. Hence, the chatbot technology

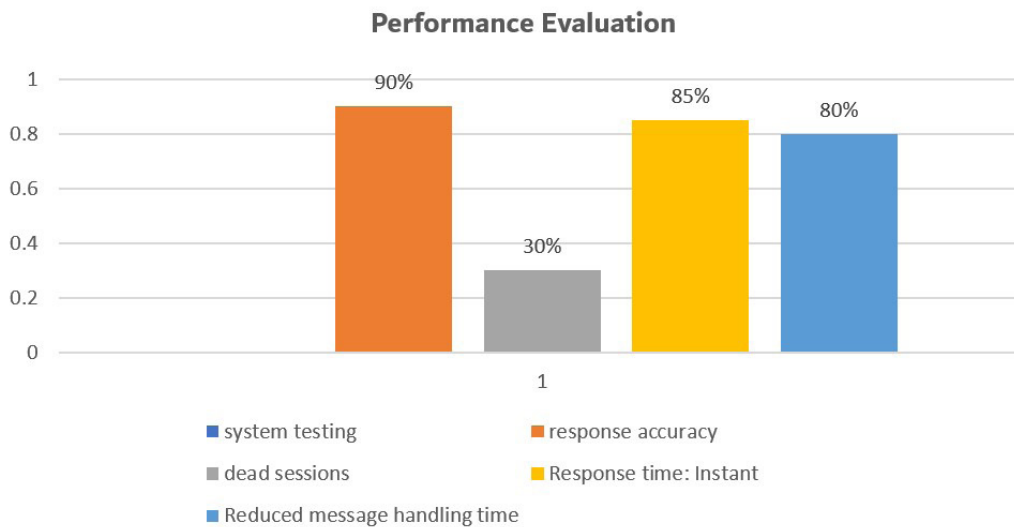


Figure 7: Process automation using AI-driven tools

has a potential to mitigate this problem by providing answers to students' questions and facilitating a dynamic and autonomous learning experience.

System Architecture Proposed for Educational ChatGPT for LMS

The revolution of AI, specially in the educational let us to suggest for to Integrating ChatGPT with Learning Management Systems (LMS). These criteria can enhance the learner's interaction through instant feedback and support (Alabool, H, 2023). Moreover, it can be tailored to accommodate personalized learning and foster an interactive learning environment that enhances learners'

engagement and retention rates, specifically in higher education, where educators face challenges in providing individual assistance due to the low student–teacher ratio (D. Duncker, 2020). Learning management platforms (LMS) can be enhanced by integrating ChatGPT via APIs to provide personalized support for students in answering questions, suggesting resources, and generating quizzes and practice exams (N. Sandu and E, 2019). Using ChatGPT in education can foster an active learning experience by responding to questions and offering spontaneous suggestions, hence creating a framework for an interactive learning model (M. Nuruzzaman and O. K. Hussain, 2018 IEEE). Integrating artificial intelligence

systems along with virtual reality technologies can break the traditional barriers to learning and can also enhance

student engagement (M. Nuruzzaman, 2018). Figure 8. Illustrate assessment tool by both students and educators:

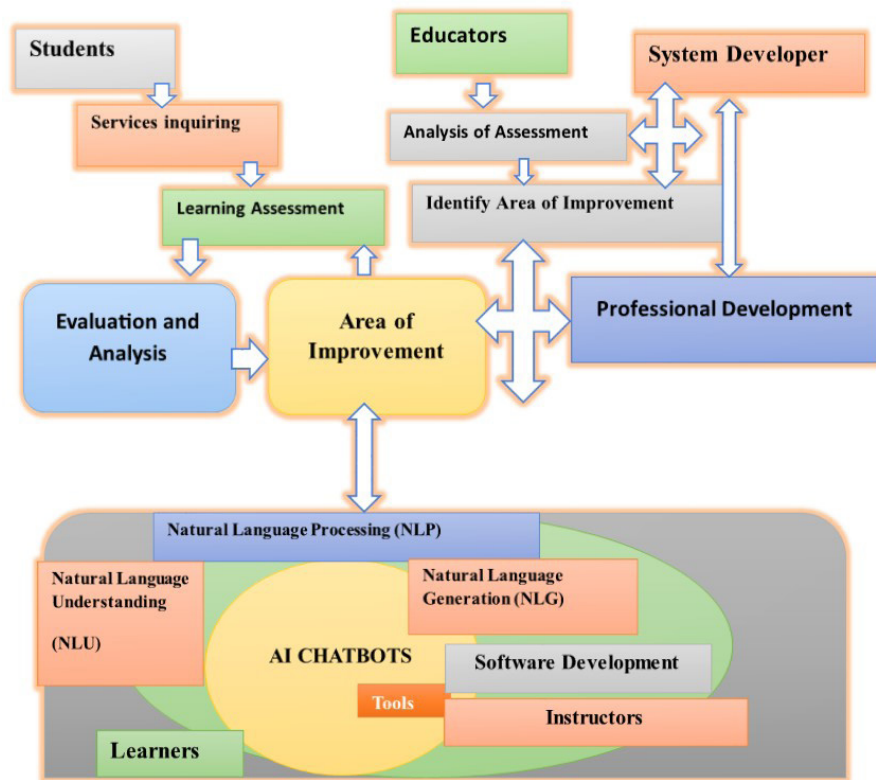


Figure 8: Architecture evaluation tool Architecture proposed

However, Figure 8. Provide proposed developing architecture that connect educators platform with student's learner in inquire services for educational and intelligent learner. Thus, the proposed architecture can provided extra Intelligent roles for software evaluation. Therefore, Chatbots are also gaining popularity in streamlining various administrative tasks in educational institutions. A study aimed to evaluate the potential of AI chatbots in assisting students with administrative queries for seeking admission into college programs (Alshahrani, A, 2023).

CONCLUSION

The challenges and future directions examined in this section highlight both the complexity of AI integration in education and the significant potential for positive transformation. The study also focuses on the most important practices of using educational AI chatbots as a parallel educational tool. The system successfully provides instant, structured, and bilingual (Arabic-English) responses to inquiries, eliminating the need for manual replies and reducing response time to nearly zero. By leveraging the Default Reply automation, the chatbot can start conversations with any user message or interaction, ensuring continuous availability without the need for keywords or predefined greetings. In addition to their ability to serve some issues related to registration and administrative problems for students. Educational

chatbots are still in their early stages, and many researchers have used recent AI techniques such as in deep learning and reinforcement learning to improve the performance of chatbots. Recent researches suggested combining more than one technique in the field of AI and NLP to overcome the challenges of the existing chatbots. The challenges and future directions examined in this section highlight both the complexity of AI integration in education and the significant potential for positive transformation. Perhaps most significantly, the evidence indicates that AI chatbots can serve as powerful tools for teacher professional development, supporting educators in executional field. suggests that chatbot integration can create positive feedback loops that enhance overall educational quality while building institutional capacity for continued innovation.

However,

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