Exploring the Impact of Artificial Intelligence Based Chatbot Towards User Experience

***Abstract*—The use of chatbots in people's lives has had an impact since the release of the ChatGPT website. According to research, chatbots utilize AI to replicate voice, text, and image communication according to user commands. With the rapid development of AI, chatbots play a role in improving user satisfaction. This development allows chatbots to be used in various existing technologies. However, with the development of chatbots, new problems arise, and this research has concerns about the impact that can occur on the user's experience in utilizing chatbots, such as their long-term engagement and personalization. Previous research mentions that chatbots are evolved and enhanced through personalization and by integrating AI-driven sentiment analysis, making them more humanlike in their responses and engagement with users. This research discussed the impact of AI-based chatbots on UX in existing fields through a systematic literature review based on previous research sources, an implementation of a PRISMA diagram, and an open survey about AI-based chatbot problems analyzed. Personalizations proved to play an important part in enhancing long-term engagement. This adds a milestone to this research: that it found a connection between two problems that appeared. This is proved by having data analysis of their usage pattern, bringing recommended answers users craved effectively and sufficiently.**

Keywords*— *User Experience, Chatbot, AI

I. Introduction

Integrating Artificial Intelligence (AI) in everyday technology has significantly changed how society functions across various environments [1]. This change is evident in the development of an AI-based chatbot. This computer program uses AI to replicate communication that mimics human interaction through text, voice, or images. However, there are sometimes misconceptions about the concept of chatbots.

In the use and development of chatbots, it is known that this technology has become more human-like in conversation exchanges. Nowadays, chatbot development has been implemented in video games and on websites, such as customer service platforms for companies, which can reduce the human resources needed by a company and optimize its profits and losses [2]. Beyond the economic side, the growing development of AI significantly impacts human perspectives and thought processes regarding provided chatbots [3], [4], highlighting their increasing effects on various environments.

This is evidenced in the professional environment, particularly through the implementation of AI in Replika, which plays a huge role in healthcare and significantly addresses users' psychological needs [3]–[5]. It's frequently used to gain comfort and mental support through a chatbot and virtual character to support its realistic user experience. Another key example of AI's impact is ChatGPT, which shows AI's ability to mimic and respond to human conversation, significantly improving how users interact with technology. Research highlights the use of AI-based chatbots, like ChatGPT, in addressing writing challenges, especially for those who aren't native English speakers. It brings up the the benefits of such tools to make writing clearer but also warns about potential problems like mistakes and the need to keep content original The creation of ChatGPT by OpenAI marks the inception of a model chatbot specifically designed to comprehend and produce human-like text. This innovative bot undergoes training with vast datasets, ensuring its accuracy in answering and having appropriate conversations [6], [7].

Within the evolving landscape of artificial intelligence (AI) in chatbots, extensive research has highlighted the relationship between sentiment analysis and the adoption of personalization to enhance user experience (UX). Don Norman, while working for Apple in 1993, coined the term "user experience" (UX) to describe a concept related to product design and interaction [1]. In short, UX refers to the experience users have while using a product, like interacting and behaving [8], [9]. Sentiment analysis, highlighted by [10] and emphasized through the development of chatbots with humanlike features [2], serves as a base for creating more empathetic and engaging interactions. Moreover, the effectiveness of personalization strategies in chatbot design, highlighted by studies such as [11] and [8], emphasizes the importance of research in optimizing user interactions and satisfaction. This research aligns with the paper's main objective of evaluating the role of chatbots in user experience through AI implementation.

Despite these advancements, the literature reveals certain gaps that this paper aims to address:

- Lack of improvement methods towards Long-term User Engagement: Research, notably by [10] on sentiment analysis, demonstrates how sentiment analysis can detect emotions in text ranging from positive and neutral to negative or mixed. However, another research from [2] on humanlike chatbots often focuses on immediate chatbot interaction effects, pointing out the potential for an enhanced user experience method but missing the broader picture of their long-term impact. A more thorough investigation into how these interactions affect sustained user engagement is necessary. This deeper examination is meaningful for assessing the enduring effectiveness of AI-based chatbots in enhancing user experiences over extended periods.
- Need for Deeper Analysis of Personalization Techniques: Studies by [11] and [8] on user satisfaction and user-

centered design, respectively, acknowledge the importance of personalization in chatbot design. However, there's a notable gap in understanding how personalization efforts effectively meet the varied needs of different user groups. A focused exploration into the effectiveness of diverse personalization strategies employed by chatbots with AI is crucial. Such research will significantly contribute to improving user interactions, aligning with the paper's aim to evaluate the chatbot's role in user experience through the implementation of AI, given that personalized interactions are key to achieving user satisfaction.

This research aims to provide insight into chatbots' influence on User Experience (UX) in the subsections that will be studied while also focusing on the impacts that can arise from chatbots on UX.

The impact study will represent several aspects as data on user experience. This research is expected to enlighten how AI can influence how chatbots function by providing a satisfying UX to users and advancing a more adaptive and responsive AI understanding. Therefore, two research questions that need to be addressed were prepared:

- **RQ 1**: How does the long-term user engagement improvement methods affect the sustained effectiveness of AI-based chatbots in enhancing user experiences?
- **RQ 2**: What is the effectiveness of different personalization techniques employed by AI-based chatbots in meeting diverse user needs and enhancing user interactions and satisfaction?

This study utilizes a two-step approach to gather insights through a Systematic Literature Review (SLR) and a user survey. The systematic review will involve a detailed examination of previous research to outline the current understanding of chatbots and their impact on user experience. It aims to spot trends and highlight any missing pieces in the study. Concurrently, the survey collects real-time user data to understand user experiences with chatbots. This approach combines the thoroughness of a literature review with direct feedback from users, ensuring a well-rounded exploration of how chatbots affect the user experience.

The Related Work section addresses various analyses across different papers, enhancing theoretical insights from fellow researchers. The upcoming section also provides the methodology used to improve theoretical testimonies further while offering constructive insights into identified issues. The Results and Discussions section presents the analysis outcomes of AI implementation, discussing emerging possibilities and exploring potential challenges. Lastly, the Conclusion section summarizes the study's findings and depicts prospective outcomes for future projects.

II. Related Works

A. History of Chatbots

The history of chatbots traces back to the 1960s when the first attempts were made to simulate human-like conversations between computers and humans. One of the earliest known chatbots, ELIZA, was presented in 1966 at MIT and developed by Joseph Weizenbaum. ELIZA was programmed to engage in text-based conversations themed with psychological well-being, primarily employing word matching for responses [2], [3], [9]. Despite its limitations due to the nascent state of natural language processing and machine learning technologies at the time, ELIZA has made a huge and unforgettable impact on chatbot evolution [3], [10].

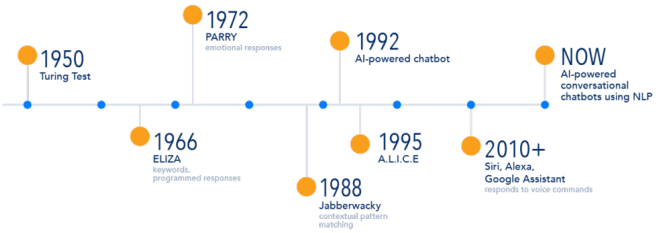

Fig. 1. The history timeline of chatbot development.

Following ELIZA's noble work, the concept of chatbots continued to evolve. While chatbots like JabberWacky and ALICE gained recognition in various contests, they fell short of passing the Turing Test [3], [9].

The advancement of artificial intelligence and machine learning in recent years has enhanced chatbots in the mainstream. Technologies such as IBM's Watson and Apple's Siri, introduced in 2011, mark significant milestones in conversational interfaces [3]. These advancements have played a crucial role in chatbot development, leading to its wide acceptance and use across various industries.

In the modern age of 2020s, chatbots have become universal, leveraging the increasing use of the internet, social media, and messaging platforms. Tech giants like Google, Apple, Facebook, and Amazon have added the integration of chatbots into their platforms, making the way for their widespread usage [3]. This adoption reflects the growing demand for efficient and accessible solutions to address users' needs effectively.

As chatbot technology evolves, its applications span diverse domains, ranging from customer service and healthcare to education and e-commerce [2]. This versatile usefulness highlights the transformative potential of chatbots in enhancing user experiences and making operations more efficient across various sectors.

In conclusion, the history of chatbots is a testament to the relentless pursuit of creating intelligent conversational agents that simulate human-like interactions from the Turing Test beginning shown in fig 1 to the sophisticated chatbots of today, the journey emphasizes the significant role of technological advancements in shaping the evolution of chatbot technology

[2], [3], [9].

B. UX and Chatbot Sentiment Analysis

To enhance User Experience (UX) through chatbots, there's a significant emphasis on giving these digital assistants humanlike features. This is because users tend to respond more positively to chatbots that have characteristics resembling human behavior and emotions. This kind of interaction creates a greater emotional connection between users and the chatbots and elevates the overall interaction quality. Chatbots can offer users a more relatable and comforting interaction experience by integrating human personality and responsiveness elements. Such advancements in chatbot development highlight the importance of humanlike attributes in elevating the UX [2].

Building on this foundation, integrating Artificial Intelligence (AI) in chatbots is an essential area of research, notably for implementing AI-driven sentiment analysis within these chatbots. Sentiment Analysis is a crucial tool in this effort, as it allows chatbots to determine whether the user's experience during the interaction is positive or negative [10]. This approach is critical to understanding and processing human emotions and opinions during interactions by identifying how sentiments are expressed in text, either positively or negatively. Despite its challenges, such as analyzing complex sentences that contain mixed emotions, this technology empowers chatbots to deliver responses that are not only relevant to the context but also aligned with the user's emotional state, making the interaction more natural and engaging [10]. Therefore, Sentiment Analysis within chatbots significantly provides a more nuanced and humanlike communication experience, enhancing the user experience. This technology enables chatbots to offer contextually relevant responses in tune with the user's feelings, thereby giving a more natural and engaging interaction.

Humanlike features in chatbots play a crucial role, suggesting that integrating sentiment analysis can significantly enhance the user experience by enabling chatbots to respond more empathetically [2]. A similar sentiment is mentioned in Carlsson's research, which examines the user experience in voice-controlled services, proposing that sentiment analysis could be crucial in improving the ability of voice interfaces to understand and adapt to user emotions, thus enhancing the quality of service provided [12].

C. Interactive Chatbot and Its Personalization

Recent advancements in AI technologies have led to innovative approaches in chatbot development, focusing on enhancing the user experience through more accurate and intelligent interactions.

In recent years, significant progress has been made in AI chatbots, focusing on three key areas: enhancing user experience through intuitive design, developing more advanced interactive capabilities, and personalizing chatbot-user interaction. These advancements represent a shift towards creating more user-friendly and responsive chatbots.

The evolution of chatbot design to include more humanlike features, as explored by Jakobsen [2], marks a considerable advancement in making chatbots more relatable and engaging for users. This progress indicates a shift from basic task-oriented bots to those capable of sustaining more complex and satisfying conversations, thereby improving the overall user experience.

Le's work on chatbot applications for travel showcases advancements in user-centered design, demonstrating how feedback-driven development cycles lead to chatbots more aligned with user expectations and needs [8]. This focus on user feedback as a critical component of the design process represents a significant shift towards more adaptive and personalized chatbot services.

Furthermore, the varied approaches used in the development of chatbots, highlighted in studies by Chung and Lee [4] and ARREZA and ESGUERRA [11], illustrates how understanding human behavior, language use, and sound design are crucial in making chatbots more effective. Chung and Lee emphasize the critical role of visual design and emotional intelligence in building trust and comfort with users. This research supports the idea that for chatbots to be truly supportive, especially in sensitive sectors like mental healthcare, they need to go beyond functional interaction to offer empathetic and engaging communication. Adding to this, the study by Arreza and Esguerra on airline chatbots shows how people have mixed experiences with these chatbots, especially in customer service, highlighting the importance of building chatbots that can form a real connection with users, not just to complete tasks. This suggests that chatbot developers should start focusing more on creating interactions that feel meaningful to users. Together, these studies ensure that chatbots are technically proficient and capable of meaningful interactions, offering personalized experiences based on user preferences and behaviors.

III. Methodology

The research methodology used in this paper is a systematic literature review, with the consideration of using a quantitative survey to help enhance the data we need for this paper. The PRISMA flowchart was used to evaluate the paper further.

A. PRISMA Diagram

This usage helps the reader and other researchers understand the data collection flow and enhances transparency while briefly showing the screening process. The diagram flowchart of PRISMA is demonstrated in fig 2.

In the identification step, this work searched through the Google Scholar database, mainly focusing on paper titles. Based on the title as input, while adding keywords such as "user experience," "chatbots," and "artificial intelligence," the authors uncovered approximately 344 papers. During the screening section, this paper narrowed our selection to papers published at least five years prior. By doing so, the papers collected were reduced to 316, excluding the other 28 that didn't fulfill the criteria.

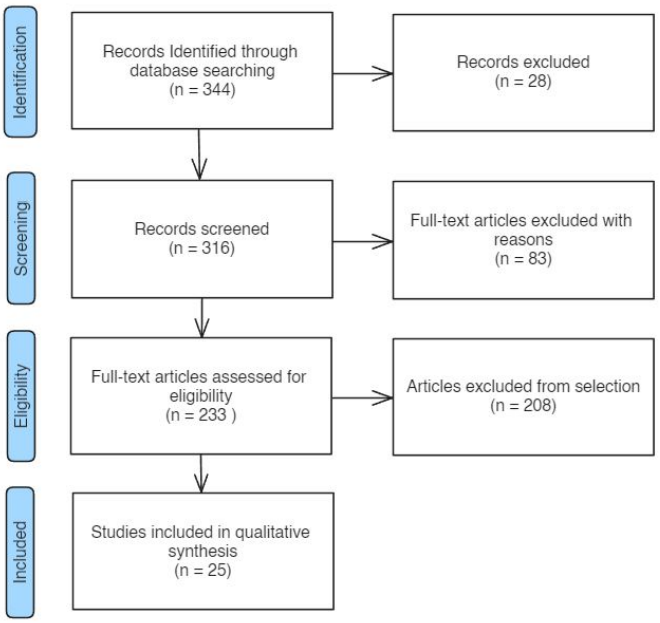

Fig. 2. PRISMA Diagram Flowchart

The eligibility is focused on filtering it based on their *accessibility* while also skimming which paper would be included for the final section. The papers collected significantly reduced to 233, excluding the other 83 papers that didn't fit the format and accessibilities. After skimming and selecting the selected papers, this paper included 25 fixed papers used as references, excluding the other 208.

B. Survey Instrument

The quantitative data collection process the authors used for this paper is an online survey intended to help provide information for our research questions. The survey has four main components, which are explained below:

1) **Usage**: refers to users' personal chatbot usage patterns, such as frequencies, duration's, and consistencies.
2) **Satisfaction**: refers to users' satisfaction about the chatbots interaction.
3) **Effectiveness**: refers to chatbot's effectiveness and relevancy towards fulfilling users' needs.
4) **Personalization**: refers to how chatbot responds and adapt to users' changing personal preference requests.

Fig 3 shows questions related to the chatbot components. The survey also asks participants' demographic information that will be summarized in Table I.

C. Filling the Survey

The authors distributed this survey to their direct contacts, specifically targeting computer science majors in higher education, who then shared it with their peers. The survey was conducted from May 19 to May 24.

Please answer this survey question with rating 1 (lowest value) - 5 (highest value)							
Usage							
Rarely	1	2	3	4	5	Often	Q2
Unlikely	1	2	3	4	5	Likely	Q4
Decreased	1	2	3	4	5	Increased	Q5
No						Yes	Q7
Satisfaction							
Dissatisfied	1	2	3	4	5	Satisfied	Q3, Q11
Effectiveness							
Ineffective	1	2	3	4	5	Effective	Q8, Q13
Irrelevant	1	2	3	4	5	Relevant	Q10
Personalization							
Poorly	1	2	3	4	5	Well	Q9, Q12
Basic Needs						Specific	Q14

Fig. 3. G-Form Survey

The participants completed the survey of the related research topic using Google Forms[1]. At the start of the survey, the form explains the selection purpose differs for each question shown in fig 4.

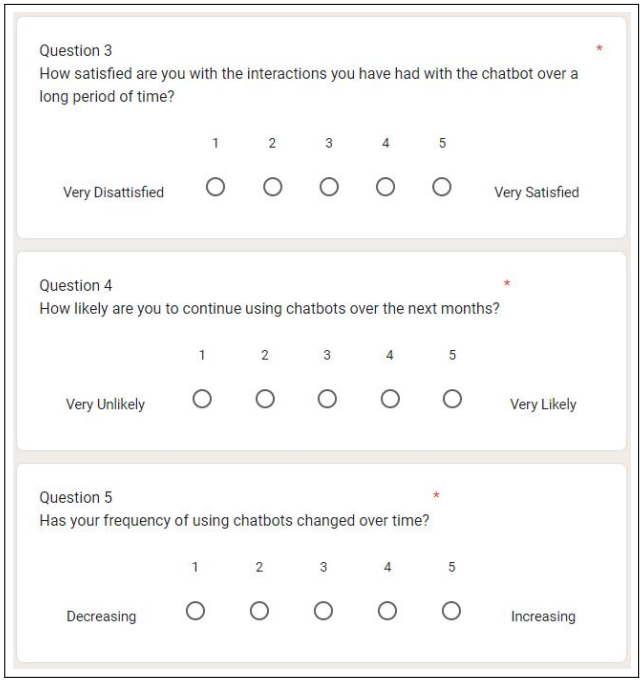

Fig. 4. Data Collection Process - Scoring

IV. Results and Discussion

The authors address the proposed research questions in this section by providing information and insights from the systematic literature review.

[1]https://forms.gle/ruvcUSHcN6iBygcB8

TABLE I
PARTICIPANT DETAILS SUMMARY

Variable	Measurement	Frequency	%
Age	18-21	28	93.3
	22-24	2	6.7
	Total	30	100
Major	Comp. Sci	18	60
	Other	12	40
	Total	30	100
Experience with Chatbot	Yes	28	93.3
	No	2	6.7
	Total	30	100
Recommended chatbot	Yes	21	75
	No	7	25
	Total	30	100

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A. Participant Details

Thirty participants volunteered to evaluate their usage of chatbots based on their experience, usage, personalization, and effectiveness [11], [13], [14]. Table I shows the summary of participant details before filling in the main survey questions.

B. Evaluation Results

According to the survey findings regarding its components, the utilization of chatbot usage proves highly effective and significantly improves the chatbot user experience, with 56.8% of participants having a favorable rating out of the related questions. In terms of satisfaction, 80.4% of participants are very satisfied with the chatbot's interaction and UX. An analysis scaling on its effectiveness also proves that 75% of the participants find AI-based chatbot gives promising and effective results to their needs. However, regarding the personalization of responses, opinions are very mixed, with 46.4% users satisfied with it's personalization, 35.7% are only partially satisfied with the results, and 17.9% are dissatisfied with its personalization. The scores are shown in Fig. 5, made using a pie chart.

C. Comparative Analysis

Based on qualitative research compared with quantitative surveys, Long-term user engagement methods for improvement and personalization techniques play a crucial role in enhancing the sustained effectiveness of AI-based chatbots in improving user experiences. This is proved by the AI chatbot focusing its strategies on maintaining user engagement, and it is supported by analyzing through UX UX-provided survey. AI chatbots can continuously provide valuable and personalized interactions, enhancing user satisfaction and loyalty towards the user. These methods are gained by analyzing the captured

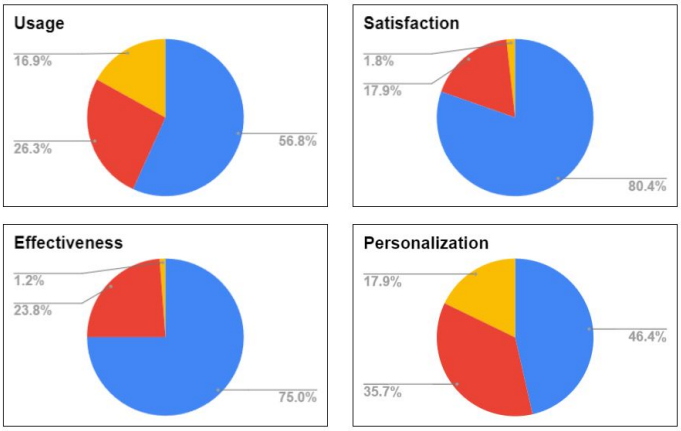

Fig. 5. Survey Evaluation Result

data by users' prompt and interest, allowing practical recommendations [11], [15], [16].

Personalization and adaptation are also the main components of these strategies mentioned. This means that the data collected before creates relevant and fulfilling experience [10], [11], [15]–[18]. Applying an AI-trained emotion recognition model also potentially improves the engagement towards the human-like part of the chatbot. This factor can significantly increase the believability part of a chatbot, increasing long-term engagement with users. [2], [3], [13].

Practical qualities implemented, such as functionality and efficiency, combined with the emotional attributes of chatbot interaction can improve the effectiveness in enhancing UX overtime, which satisfies functional and emotional user needs [17]–[21]. Advanced techniques can also be applied to increase the range of effectiveness by implementing NLP (Natural Language Processor) to process user sentiments and their context, making interactions also engaging [21]–[25].

V. CONCLUSIONS AND FUTURE WORKS

In conclusion, by comparing qualitative and quantitative analyses, the integration of long-term engagement strategies and personalization techniques significantly enhances the effectiveness of AI-based chatbots. This is proved by giving recommendations based on analyzing user data and from the survey conducted. Usage patterns also have a high value in determining user satisfaction. On the other side, personalization techniques that enhance UX and fill user needs could be proven by integrating NLP while also adapting to personalization that users made to keep satisfying users' various needs. These approaches meet diverse user needs and foster sustained engagement effectively and human-like, improving overall user satisfaction, usability, and frequency usage of chatbots.

Although this research aims to fill two significant gaps that other researchers have identified, the survey authors conducted reveals that despite the various techniques used to enhance UX analyzed in these papers, the survey results indicate that users' experiences with personalization still lack satisfaction.

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