Intelligent Chatbot for Customer Assistance: A Case Study in Fresh Produce Retail

Alberto Romero-Méndez ; Alejandra Zulema-Guevara ; Yakdiel Rodriguez-Gallo ; Héctor Cañas
Universidad Don Bosco, El Salvador, *josuejr7.m@gmail.com, alezulema456@gmail.com, yakdiel.rodriguez@ieee.org, hector.canas@udb.edu.sv*

Abstract– Chatbots play a crucial role in business digital transformation, offering efficient solutions for customer interaction and process optimization. This study provides an overview of intelligent chatbots for customer assistance. Additionally, it focuses on developing a customized chatbot for a fresh produce company to enhance customer service and expand its retail business. A system was implemented using Python, OpenAI's API with the GPT-3.5-turbo model, and libraries such as LangChain and Gspread to process queries, generate contextual responses, and record sales and complaint data. The results showed a 92% accuracy rate in responding to business-specific and general queries. A comparison with chatbots from leading companies highlighted strengths in generating personalized responses but also revealed challenges in identifying user intent. Future improvements focus on integrating advanced natural language processing models, applying continuous learning techniques, and incorporating multimedia capabilities to enhance contextual understanding and adaptability. In conclusion, chatbots provide a valuable opportunity for businesses, particularly SMEs, to optimize operations and enhance customer satisfaction in a highly competitive digital landscape.

Keywords--Chatbot, Customer service, Business Competitiveness, OpenAI, Artificial intelligence, Digital Transformation.

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I. INTRODUCTION

A key factor in business success is ensuring a positive customer experience and an effective strategy to achieve this is by providing excellent assistance [1]. With today's technological advancements, human assistance has also been influenced by these developments in business and across all human activities. There are various ways to support people in their tasks, such as programs that learn action patterns and repeat them or software that receives and executes instructions, among others [2].

With artificial intelligence (AI), one of the fields that have gained the most relevance is chatbots, which can learn and continuously improve, marking a significant step in how specific tasks are performed [3], [4], [5]. Similarly, keeping up with this topic is crucial given the broad range of areas where these advancements can be applied and provide significant value.

Today's most well-known AI chatbot is ChatGPT, created by OpenAI and launched in 2022. ChatGPT is a conversational chatbot that generates text based on user queries, responding initially and providing correct answers in most cases [6], [7]. Its benefits range from answering simple history questions to generating code snippets for various programming languages. The model operates by using internet pages as a database, regardless of their reliability, and based on this, it constructs and generates diverse texts and information authentically. Currently, the most advanced version is ChatGPT-4, which features 100 trillion parameters, enabling it to provide safer and more valuable responses [8], [9].

Another cutting-edge model is BERT (Bidirectional Encoder Representations from Transformers), developed by Google. Introduced in a 2018 research paper, BERT is based on bidirectional transformers pre-trained on large amounts of unlabeled text. Its training method, known as "filling in the blanks," enables it to grasp contextual relationships more effectively. Unlike ChatGPT, which focuses on text generation, BERT is designed for understanding and extracting information [10].

When discussing chatbots specialized in customer service, it is essential to look at first-world countries. A study reveals that 56% of users would be interested in ordering at restaurants using chatbots, and 34% have already done so at least once [11]. For example, business chatbots like SnatchBot can be used on smartphones, web pages, and social networks. JivoChat is compatible with almost all social networks and functions as an assistant capable of identifying users ready to become customers, notifying the team of operators to assist them directly [12]. Zendesk is another valuable tool for customer service management, providing an automated chat with real-time personalized responses and 24/7 support.

The main novelty of the developed chatbot lies in its specialized knowledge of the fresh produce sector, including seasonality indicators and specific quality parameters. A significant added value is the chatbot's ability to naturally and fluently record orders and sales data, automatically storing them in a tracking system, in this case, Google Sheets.

The article is structured as follows: the Overview section provides background information on intelligent chatbots for customer assistance, highlighting recent advancements and their impact on business digital transformation. The Materials and Methods section describes the programs, languages, and libraries used and explains the development process and the company's characteristics. The Results and Discussion section details how the model can be integrated with common commerce platforms and demonstrates its functionality. Finally, the Conclusion section presents the model's findings, recommendations, and limitations.

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II. BACKGROUND

Chatbots play a crucial role in customer service by increasing efficiency, lowering costs, and enhancing the user experience. Artificial intelligence empowers them to handle inquiries, provide real-time support, and allow human agents to focus on more complex tasks. Technologies such as natural language processing and machine learning have enhanced their accuracy and responsiveness.

The impact of chatbots on online shopping was examined in [13], with emphasis on their effect on customer satisfaction, purchase intention, and chatbot reuse. The results indicate that user satisfaction has a greater influence on reuse than on purchase intention. Moreover, the quality of chatbot communication plays a key role in improving the customer experience. Based on an online survey with 210 participants and analysis using structural equation modeling, these effects were validated. Businesses can leverage these results to optimize their chatbots, foster customer loyalty, and improve their competitiveness in the digital market.

The study "Service chatbots: A systematic review" [14] analyzed the development and evaluation of chatbots between 2011 and 2020. It highlights the increasing use of deep learning and reinforcement learning architectures to enhance chatbot understanding and response. Twitter is the most commonly used dataset in open-domain scenarios, while ATIS and Ubuntu Dialog Corpora are common in closed domains and technical support. Chatbots are primarily used in open domains, air services, and technical support. The review highlights their technological evolution and emphasizes the importance of advanced techniques, diverse data, and robust metrics to enhance their performance.

In contrast, the use of AI-based chatbots in customer service and public administration was explored in [15]. They emphasize their effectiveness in handling automated inquiries and their application across various sectors, including financial services, customer support, and meeting scheduling. While their use in public administration is limited, the potential to enhance service management and delivery is emphasized.

Chatbots have become essential tools for customer service in the food industry, improving user experience and optimizing service delivery through artificial intelligence. They assist in ordering by suggesting options based on preferences and dietary restrictions. Additionally, some advanced chatbots can create personalized meal plans for individuals with specific health conditions, such as obesity or diabetes, although they require supervision from nutrition experts to ensure accuracy [15], [16]. A study conducted in [17] found that young people with food allergies often experience anxiety when dining out due to the lack of reliable information. To address this, they developed AllergyBot, a chatbot designed to help find safe restaurants. The trials were well-received, emphasizing its friendly interaction and potential to enhance the gastronomic and social experiences of these users.

Chatbots in the sale of fresh products improve customer experience and operational efficiency by offering immediate, personalized assistance. They help gather preferences and feedback, enabling retailers to customize their offerings. Furthermore, effective chatbot interactions build consumer trust, minimizing the perceived risk in online purchases [18], [19]. A study on AI and online shopping behavior [20] found that AI-based personalization significantly increases purchase intention ($\beta = 0.35$, $p < 0.001$), as well as chatbot effectiveness ($\beta = 0.25$, $p < 0.001$) and the use of predictive analytics ($\beta = 0.20$, $p < 0.001$). Although social media interaction also has an influence ($\beta = 0.15$, $p < 0.01$), its impact is more minor. Moreover, these technologies improve consumer satisfaction while integrating ethical considerations into AI strengthens user trust and engagement ($R^2 = 0.55$, $p < 0.001$). On the other hand, the use of chatbots as online sales assistants was analyzed in [21], highlighting that personalized messages and real-time visual information, such as augmented reality, improve consumer understanding and increase purchase intention, especially in fresh product retail. Additionally, the impact of anthropomorphism in chatbots on consumer purchase decisions was explored in [22], which could be relevant for fresh product retail by improving customer interaction and potentially influencing buying behavior through a more relatable and humanized experience.

AI-powered chatbots have proven to be essential tools in customer service, enhancing operational efficiency and reducing costs. Their ability to handle real-time inquiries and offer personalized support optimizes the user experience, leading to greater customer satisfaction and loyalty, particularly when interactions are tailored. The integration of advanced technologies such as deep learning and predictive analytics has improved the effectiveness of chatbots in sectors like fresh product retail, where they help collect preferences and customize offerings. Furthermore, anthropomorphized chatbots and the use of technologies like augmented reality have positively influenced purchasing decisions by fostering more humanized and trustworthy interactions. In specific sectors, such as the food industry, chatbots also play a critical role in assisting individuals with food allergies and enhancing safety and the user experience. In summary, chatbots not only optimize operational efficiency but also strengthen consumer relationships, creating a positive impact on purchase intention and customer loyalty.

III. MATERIALS AND METHODS

A. Company Characteristics

The chatbot was developed for a fresh produce company that offers both wholesale and retail services, with its primary market being businesses. Table 1 shows the available products, quantities, and prices for each sales modality.

The company seeks to expand its retail business by implementing a chatbot. The coexistence of wholesale and retail operations often leads to confusion among various customers, from small businesses to supermarket chains.

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These misunderstandings primarily revolve around price differences, delivery methods, and product sizes.

Currently, sales advisors assist customers in ensuring accurate purchases. The chatbot will automate basic inquiries, enabling employees to concentrate on more critical tasks.

TABLE I
EXAMPLE OF PRODUCTS SOLD BY THE COMPANY

Product	Retail Quantity	Retail Price ($)	Wholesale Quantity	Wholesale Price ($)
Onion	Unit	0.25	Sack	16
Potatoes	Unit	0.1	Sack	12.5
Chayote	Unit	0.5	Sack	11.5
Cassava	Unit	0.25	Sack	10
Tomato	Unit	0.2	Sack	15
Broccoli	Unit	1.72	Sack	12
Carrot	Unit	0.5	Sack	10
Strawberries	Pound	3.5	5 pounds	15
Grapes	Pound	3.5	5 pounds	15
Peach	Unit	0.35	5 pounds	16
Blueberries	470 g	4.15	5 pounds	18
Raspberries	470 g	4.75	5 pounds	20
Blackberries	470 g	2.75	5 pounds	11
Watermelon	Unit	1.5	Sack	15

B. Algorithm developed for customer assistance

The algorithm is based on OpenAI's existing knowledge, a leader in AI, and is enhanced with a new dataset from the company. This combination of diverse and updated information allows the system to deliver more accurate and relevant responses.

The process starts with the user's request (Fig. 1). The input text is processed through a pre-trained model via the OpenAI API [23]. This API analyzes the text using a specific model to comprehend its context and generate a coherent and relevant response based on the knowledge and language patterns learned during training on large volumes of textual data. Finally, the API returns the generated response to the user.

At this stage, the system's database, which contains comprehensive information about the products and the company, is ready for queries. To handle these queries, the libraries provided by LangChain are utilized upon receiving user input [24]. The algorithm retrieves information from the database, stored in text file format (TXT), by reading and processing its content. When generating responses through the ChatGPT API, the algorithm accesses this data to refine the responses produced by the language model, allowing for customization based on the specific information in the database. This approach results in an assistant with complete knowledge of the business.

After continuous interaction and response generation, when the user decides to purchase, submit a complaint, or place a request, the system connects to an Excel file using libraries such as Python's Pandas. The process involves loading the existing file, selecting a worksheet, reading and writing data in specific cells, and saving the changes.
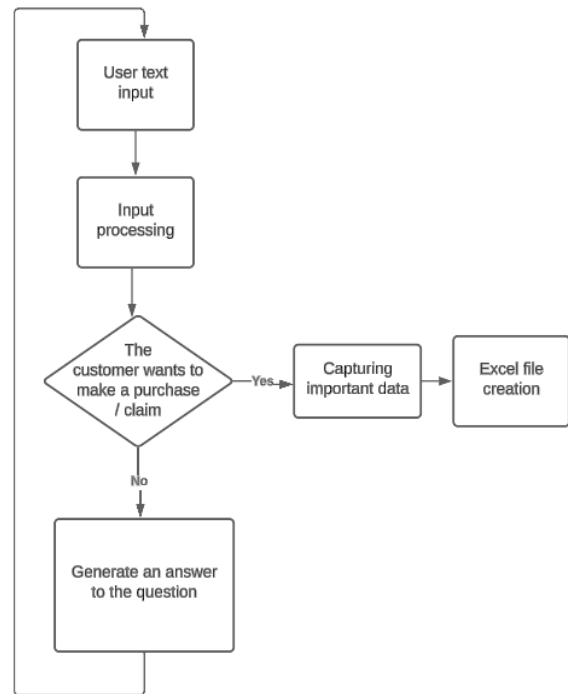

Fig. 1 Flow diagram of the Chatbot developed for the fresh produce company.

Depending on the situation, this file stores relevant information such as names, phone numbers, and products. It serves as a reference for employees, enabling them to consult it anytime to address customer requests efficiently.

The developed algorithm operates by waiting for the user's text input. Once received, it processes the request and analyzes the customer's intent. Based on this analysis, it captures key data and records the relevant information in an Excel table for specific requests. If the user is merely asking a question, the chatbot provides the answer directly. This process is depicted in the flow diagram in Fig. 1.

C. Tools used for Chatbot implementation

Well-established tools in AI and natural language processing were used to develop the chatbot. The implementation was done in the Spyder v5.0 code editor, which provides an integrated development environment (IDE) and the Anaconda development environment for package and dependency management. The programming language chosen was Python v3.11.7, appreciated for its versatility and the broad selection of libraries it offers.

The "GPT-3.5-turbo" model from OpenAI was used to enhance advanced text generation, providing cutting-edge

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natural language processing capabilities. Together, these tools formed an intelligent and conversational chatbot capable of effectively comprehending and addressing user queries. LangChain, Chromad, and Unstructured libraries integrated the database and connected it with text processing. The Gspread library was used to create Excel files containing client information. This combination of technologies enabled the development of a robust and functional system.

To run the program and link it with WhatsApp, the Ngrok and Twilio libraries and resources were used. Ngrok creates a secure tunnel that exposes the server (the computer running the code) to the internet, while Twilio establishes the connection with the messaging application. It is important to note that Meta requires application verification for widespread use. However, Twilio allows connection to WhatsApp without verification for testing purposes, as demonstrated in this case. Additionally, the code was implemented as a web application using Flask to simplify the connection. This setup ensures seamless integration between the chatbot and the messaging platform.

IV. RESULTS AND DISCUSSION

Fig. 2 illustrates the different responses generated by the chatbot to various customer inquiries. The algorithm can differentiate between questions or requests it can handle and those it cannot, ensuring accurate responses in most cases, as long as the queries are clearly defined. Additionally, the creativity and adaptability of the responses can be fine-tuned by adjusting the 'temperature' parameter.
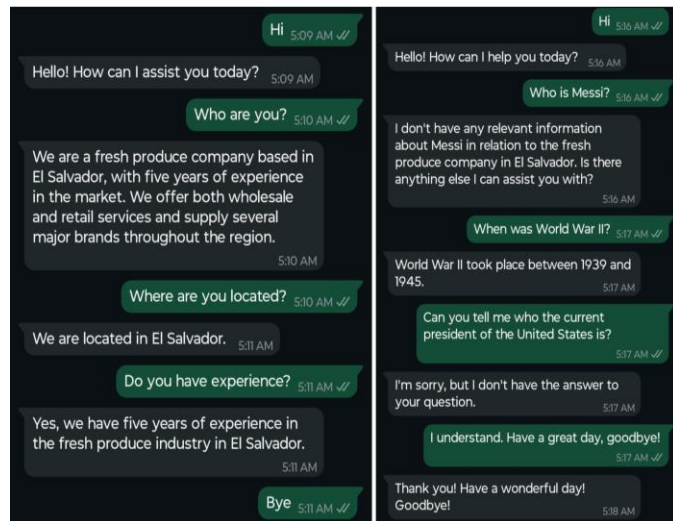

Fig. 2 Chatbot response to user questions.

When the user's intent is detected, the chatbot records this intention in a table. If the customer intends to purchase or file a complaint, the chatbot saves the relevant information in an Excel file, storing it in a database similar to Table 2.

TABLE II
DATABASE OF USER INFORMATION STORED BY THE CHATBOT IN EXCEL

Intention	Name	Phone	Summary
Purchase	Josue	1234567	2 carrots
Complaint	Carlos	9638527	Bad product
Complaint	Roberto	7894561	Refund
Purchase	Alejandra	6598741	2 sacks of potatoes

When a purchase intention is detected, the chatbot algorithm asks specific questions to capture the most relevant user data. This information lets the business representative contact the user and follow up as needed. Fig. 3 illustrates the chatbot's behavior in response to questions related to products and purchase intentions.
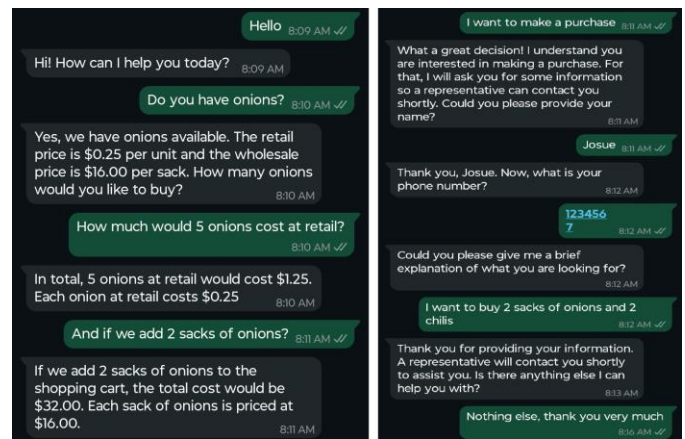

Fig. 3 Chatbot behavior in response to questions related to products and purchase intentions.

The chatbot has access to both the company's internal and internet databases. It is important to carefully regulate this access to ensure that the chatbot remains focused on the primary goal of the conversation: assisting users with sales processes, complaints, and other specific requests.

On the other hand, the use of chatbots in business environments has grown significantly in recent years, driven by the need to enhance customer service, streamline internal processes, and deliver personalized experiences. A key factor is the essential role that chatbots play in the digital transformation of companies [25]. These automated conversation systems deliver quick and accurate responses to customer inquiries, while also facilitating data collection, trend analysis, and the creation of business reports. This empowers companies to make more informed decisions and more effectively respond to the demands of a constantly evolving market [26], [27].

Another key aspect is the continuous improvement of the technology behind chatbots, such as natural language processing (NLP) models and AI. Advances in these areas have enabled the development of more sophisticated chatbots that can better understand user context and intentions. This results in more natural and satisfying interactions, improving

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brand perception and strengthening customer relationships [28], [29].

However, despite technological advancements, chatbots still face significant challenges and limitations. Ensuring accuracy and consistency in responses remains a major challenge, particularly in complex situations or when handling ambiguous queries. Moreover, integrating chatbots into existing company systems requires careful planning and overcoming technical and organizational obstacles [30]. To address this challenge, future iterations propose the incorporation of advanced language models such as BERT, as well as hybrid approaches that combine rule-based logic with transformer-based models, to enhance precision and contextual understanding during interactions.

To evaluate the performance of the developed chatbot, a comparative analysis was conducted with Siman's chatbot, a leader in the Central American region [31]. The comparison highlighted notable differences between the systems in functionality, user experience, and customization capability.

The SIMAN chatbot is notable for its integration with the corporate website, offering real-time updates on products, promotions, and services, and the ability to send images upon user request (Fig. 4). In comparison, the developed chatbot provides a more interactive and conversational experience, allowing users to make complex inquiries and receive personalized responses. However, it currently lacks the functionality to send images.

Fig. 4. Response from SIMAN's chatbot (store oriented to Spanish-speaking customers in El Salvador).

In terms of user experience, SIMAN's chatbot excels with its intuitive interface and efficient guidance through various options. However, the developed chatbot offers a more immersive and dynamic interaction, as it can understand natural language and adapt to the unique needs of each user.

Regarding customization, SIMAN's chatbot mainly depends on predefined rules and conversation flows, limiting its ability to adapt to individual user preferences. In contrast, the developed chatbot utilizes advanced natural language processing technologies, such as OpenAI's GPT-3.5 Turbo model, allowing it to generate contextually relevant and personalized responses in real-time.

It is important to emphasize that the effectiveness of these projects depends on the specific needs of the end customer. Therefore, it is not appropriate to claim that one chatbot is superior to the other; both serve their purpose according to the particular requirements of each business. This analysis is limited to comparing the functionalities of both systems without making value judgments about their overall quality.

Another relevant comparison involves The North Face store's chatbot [32], which is designed to assist users. As shown in Fig. 5, its conversation flow efficiently follows user intentions. However, its responses are somewhat limited. This example highlights how different chatbots have specific strengths and weaknesses, adapting to the unique needs of each brand or company.
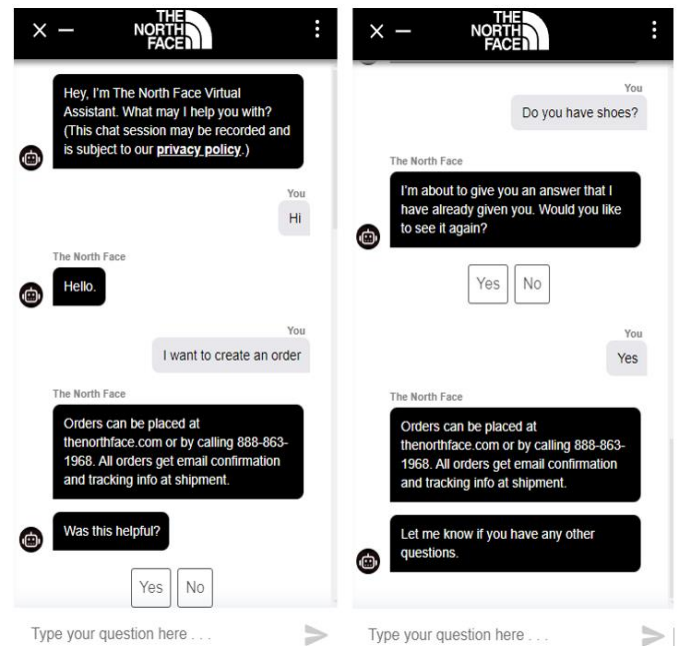

Fig. 5 Interaction with The North Face chatbot showing limited responses.

When comparing both chatbots, the one developed in this study shows superior ability in generating responses, handling open-ended questions, and delivering more human-like answers. However, The North Face chatbot excels in accurately identifying user intentions, outperforming the chatbot developed in this study in that regard.

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The accuracy of responses depends on the language model used, in this case, "GPT-3.5 Turbo," which manages all-natural language processing and response generation. Different levels of accuracy have been assessed based on the application area and the associated database. For example, in the medical field, specifically for answering cancer-related questions, an accuracy of 86.4% has been reported [33].

For the commerce-focused model developed in this study, 100 detailed questions were posed to evaluate its response capability, covering both the available product database and general non-commerce-related topics. Of these 100 questions, the model answered 92 correctly, achieving an accuracy of 92%. It is important to note that this result is significantly influenced by the model's assigned temperature, the database structure, and the clarity of the questions. The complete list of questions is provided in Table 3.

TABLE III
CORRELATION COEFFICIENTS.

Question type	Correct	Incorrect	Total
Vegetables	67	3	70
General knowledge	25	5	30
Total	92	8	100

Although the chatbot shows acceptable accuracy in answering questions, it has a limitation in identifying intentions due to its reliance on specific commands rather than a broader understanding of natural language. The chatbot requires users to enter predefined phrases to activate specific functionalities or conversation flows. For example, to detect the intention to make a purchase and trigger the corresponding question flow, the user must input an exact phrase like "I want to make a purchase" or another preconfigured option in the database. If the user deviates from these predefined commands, the chatbot may fail to recognize the intention and not initiate the expected interaction.

This limitation diminishes the chatbot's flexibility in understanding and responding to user needs, which could result in a less intuitive experience and reduce its effectiveness in customer service and sales. To overcome this, integrating models like BERT could improve the chatbot's ability to autonomously identify user intentions, reducing the dependence on rigid command structures. This enhancement is part of future implementation plans. Furthermore, incorporating active learning and continuous feedback mechanisms would greatly improve the chatbot's ability to adapt to evolving user needs.

Despite these limitations, an improvement has been observed in several key customer service metrics, particularly in overall customer satisfaction. In general, by reducing the First Response Time (FRT), other related metrics have also improved automatically. However, it is crucial to maintain the accuracy of responses, as focusing solely on response speed without ensuring quality could be counterproductive. A detailed breakdown of the metrics is presented in Table 4.

TABLE IV
CUSTOMER SERVICE KPI´S

KPI	Before Chatbot	6 months After
First Response Time (FRT)	12 minutes	1.5 minutes
Customer Satisfaction (CSAT)	78%	88%
Abandonment Rate	12%	5%
Net Promoter Score (NPS)	35	45

As a final consideration, it is essential to ensure the ethical use of artificial intelligence and data, which involves maintaining transparent interactions with users, clearly informing them when they are interacting with an automated system and rigorously safeguarding the protection and privacy of all collected information.

V. CONCLUSIONS

In the current landscape of rapid digital transformation, chatbots have become a key strategy for maintaining business competitiveness in a globalized market. This study highlights the versatility and potential of chatbots as dynamic tools for customer interaction, offering significant growth and cost-efficiency benefits. Despite some limitations, their ability to adapt to various business contexts is impressive, with promising opportunities for future development, such as integration with enterprise management systems and the use of data analytics technologies to predict customer needs and deliver more personalized experiences. These tools represent a valuable opportunity for SMEs aiming to strengthen their presence in an increasingly digital landscape. Their ability to optimize processes, cut costs, and enhance customer satisfaction makes them a key asset for future business development.

Future research could focus on integrating chatbots with emerging technologies, such as AI-driven predictive analytics and advances in natural language processing, to further improve personalization and customer satisfaction. Also, further investigations could be oriented toward integrating the chatbot with enterprise resource planning (ERP) systems to optimize order management and customer data handling. Additionally, exploring the impact of chatbot anthropomorphism and emotional intelligence on customer loyalty and long-term engagement will offer important insights into the evolving role of chatbots in customer relations.

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