



ZETDC AI POWER CHATBOT

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ABSTRACT

Over the last decade, communicating with customers through live chat interfaces has become an increasingly popular means to provide real-time customer service in many e-commerce settings and chat services have become the preferred option to obtain customer support [1]. However, most recently and fuelled by technological advances in artificial intelligence (AI), human chat service agents are frequently replaced by conversational software agents (CAs) such as chatbots, which are systems such as chatbots designed to communicate with human users by means of natural language [2]. chatbots, are systems designed to communicate with human users by means of natural language often based on artificial intelligence (AI). AI technologies and machine learning allow AI enabled chatbots to mimic human behaviour and enter conversational situations [3]. However, one important area in which CA/chatbots are used is the customer service activity, AI enabled

chatbots are seen as a promising technology for service providers by providing automated customer service [3]. This paper presents the deployment of a WhatsApp based AI-powered voice and text chatbot designed to modernize customer support systems at the Zimbabwe Electricity Transmission and Distribution Company (ZETDC). The solution leverages natural language processing, and large language models to understand and respond to user intents via WhatsApp.

1. INTRODUCTION

The Zimbabwe Electricity Transmission and Distribution Company (ZETDC), a subsidiary of ZESA Holdings, is responsible for electricity distribution and retail across Zimbabwe. As a public utility, ZETDC receives thousands of customer inquiries daily, ranging from billing complaints to power outage reports. Chatbots can prove to be an interesting solution here, since it Increase customer service quality, Customer service staff can lose enthusiasm when they spend

excessive time answering repetitive queries. By employing chatbots to handle routine questions and passing them over when more insight is needed [4], making their efforts more rewarding. Increase audience engagement capacity, Chatbots operate without the time and energy restrictions of humans, enabling them to answer questions from customers worldwide at any time [4].

Maintain consistent communication, Chatbots provide consistent information and messaging, helping to ensure that every customer receives the same level of service. This consistency, derived from the knowledge base, helps to maintain brand integrity and accuracy in customer communications [4]. Maintain composure Anyone can have a bad day, which might cause customer service agents to react in ways they might later regret. Also, customer service calls often begin with customers venting their frustrations from a prior experience [4]. This enables the composed customer service chatbot to absorb most of the frustration [4].

2. PROBLEM STATEMENT

The Zimbabwe Electricity Transmission and Distribution Company (ZETDC) is facing significant challenges in delivering efficient customer service due to increasing electricity demand and evolving customer expectations. Key issues include inconsistent information provided by human agents, which arises from varying levels of knowledge and experience, as well as the high operational costs associated with maintaining a large customer service team. Additionally, the management of customer data and interactions is overwhelming, leading to missed opportunities for personalized service. These challenges hinder ZETDC's

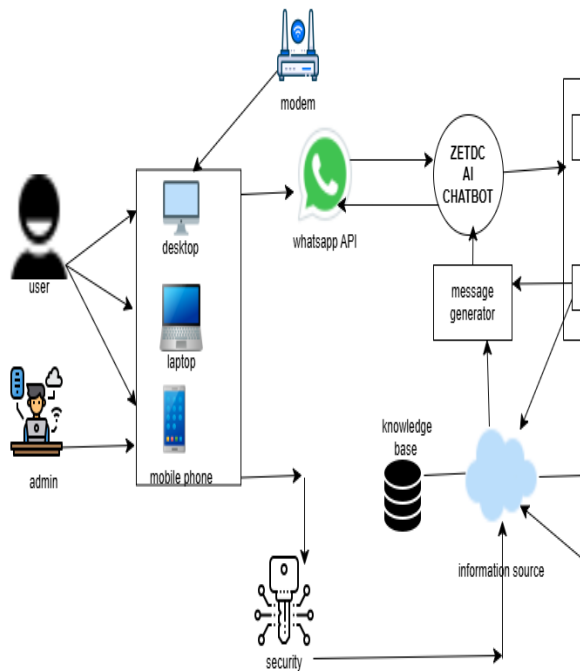
ability to meet customer needs effectively. Therefore, there is a pressing need to implement a voice-powered chatbot solution that can streamline customer interactions, provide consistent and accurate information, and enhance overall service efficiency. This innovative approach aims to improve customer satisfaction while simultaneously reducing operational costs, positioning ZETDC as a leader in modern customer service within the energy sector.

OBJECTIVES

- To create a WhatsApp-based platform featuring an interactive voice chatbot for notifications and inquiries with standardized responses, ensuring consistency in the information provided to customers.
- To handle a significant number of inquiries simultaneously, providing immediate responses and reducing the load on human agents.
- To collect and analyse customer data during interactions, providing insights that help tailor future communications and improve service.
- To allow customers to receive assistance anytime, improving customer satisfaction.

3. System Architecture

Fig 1.



4. SYSTEM OVERVIEW.

- User Interface: WhatsApp serves as the primary interface for user interaction, allowing voice or text commands.
- Voice Recognition Module: Converts spoken input into text using technologies such as Whisper AI or Google Speech-to-Text.
- Natural Language Processing Engine: Processes the text input to understand user intent and generate appropriate responses using models like GPT4.1.
- Response Generation Module: Constructs responses based on the processed input and predefined templates or AI-generated content.
- Data Storage: Logs user interactions for analysis and improvement purposes.

- Cloud Infrastructure: Utilizes cloud services (Google Cloud) for scalability and reliability.

5. DATA FLOW

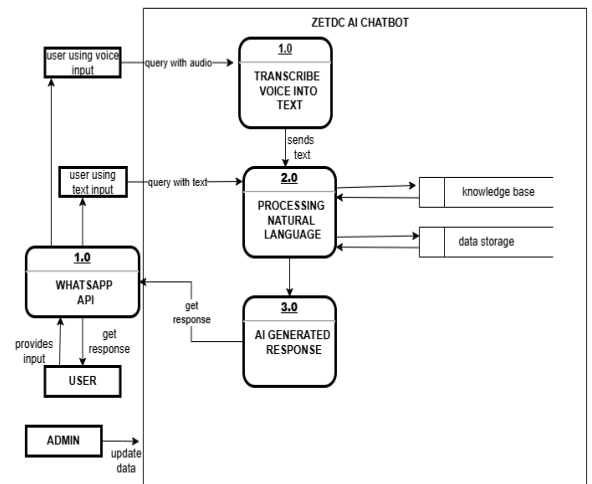
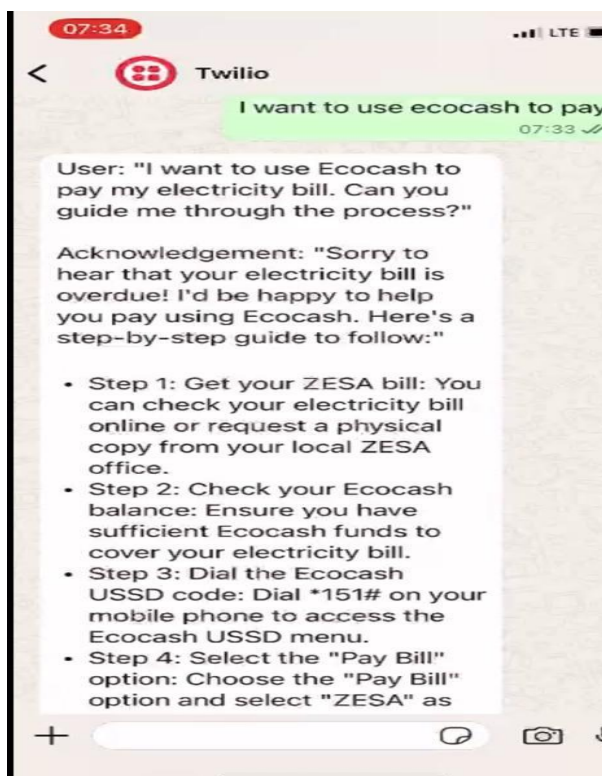
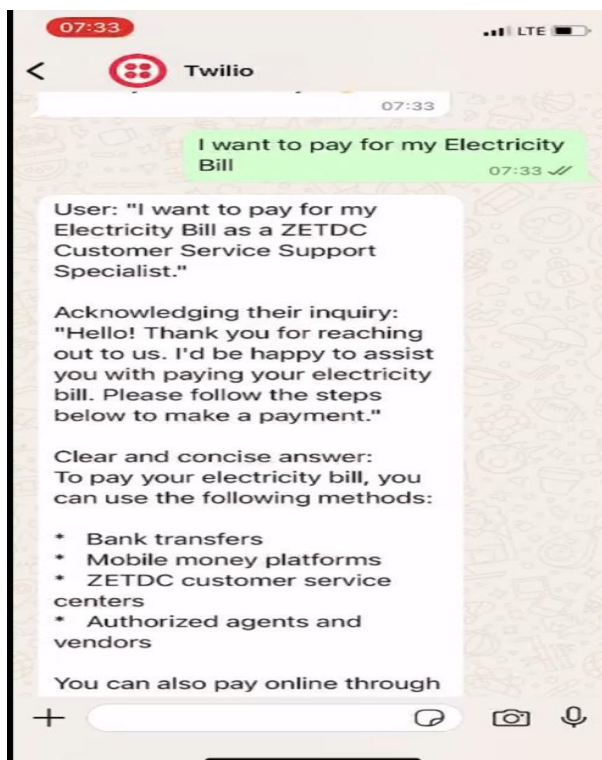


Fig 2

The data flow within the system is illustrated as follows:

- User Interaction: The user initiates a conversation by sending a voice or text message via WhatsApp.
- Voice Recognition: The voice message is converted to text.
- Intent Recognition: The text is analysed to determine the user's intent.
- Response Generation: The system generates a response based on the identified intent.
- Response Delivery: The response is sent back to the user through WhatsApp.

6. RESULTS



7. Challenges and Lessons Learned

Voice Clarity: Background noise affected voice recognition; improved with pre-processing filters.

Intent Ambiguity: Initial models struggled with vague inputs; fine-tuning LLM prompts improved accuracy.

Data Privacy: Ensuring secure handling of customer data was critical; compliance with data protection laws was enforced.

8. FUTURE WORKS

-Full Integration with Fault Tracking Database: Connect the chatbot to the PostgreSQL database so that fault reports are stored in real time and users can retrieve live updates on previously reported issues.

-Admin Dashboard for ZETDC Staff: Build a simple web-based control panel for ZETDC technicians to view, update, and resolve reported faults. This would close the loop and make the chatbot operational in a real-world environment.

-Multilingual Support (Shona Language Integration): To improve accessibility and inclusiveness, a key area for future development is adding support for the Shona language. This will ensure that users who are more comfortable with local languages can interact with the chatbot naturally and confidently.

9. CONCLUSION

The development of the AI-based WhatsApp voice chatbot represents a significant advancement in customer service technology. By leveraging voice recognition and natural language processing, the chatbot enhances user engagement and provides timely support. The project demonstrates the potential of AI to transform traditional customer

service paradigms, offering a scalable and efficient solution for businesses.

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