

# A Dialog flow Chatbot for Farmer Producer Organizations: Enhancing Agricultural Decision-Making

Jais Binoy<sup>1</sup>, Annie Thomas<sup>2</sup>, Akhilesh Muralidharan<sup>3</sup>

<sup>1,2,3</sup>Research Associates, International Centre for Technological Innovations, Kerala, India

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## ABSTRACT

This study explores the implementation of a Dialogflow-based chatbot, AgriConnect, aimed at enhancing decision-making. FPOs face challenges due to diverse member interests and limited resources. The chatbot leverages Google's natural language processing to provide an intelligent and user-friendly interface, allowing users to pose questions and receive informed recommendations based on external references. The research evaluates the impact of the chatbot, analyzes user engagement, and assesses scalability and adaptability. The introduction of Dialogflow-based chatbot significantly improves decision-making efficiency and user satisfaction. The study contributes to FPO sustainability by offering a tool for informed decision-making in the agricultural landscape. AgriConnect positively impacts decision-making in FPOs, emphasizing its user-friendly interface, improved information accessibility, and resource optimization. Future research suggestions include exploring advanced features and targeted solutions for specific challenges, ensuring continuous improvement. This study demonstrates the promising potential of Dialogflow-based chatbots in fostering agricultural development through improved decision-making.

**Keywords:** Agri Connect, Agriculture Technology, Chatbot, Dialogflow, Farmer Producer Organizations, Natural Language Processing, NLP.

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## INTRODUCTION

Farmer Producer Organizations (FPOs) and farmers grapple with challenges in decision-making due to diverse member interests and limited resources. To address this, a Dialogflow-based chatbot leveraging Google's natural language processing capabilities offer an intelligent and user-friendly interface for efficient decision. Users can interact with the chatbot, posing questions or scenarios, and receive informed recommendations based on analyzed external references, streamlining decision-making processes in resource-constrained environments.

### Research Question

How can a Dialogflow-based chatbot be built to improve the information accessibility from Farmer Producer Organizations?

### Research Objectives

To develop a chatbot using Dialogflow for FPOs, to make information accessibility easier. This study is vital for improving decision-making and information access from Farmer Producer Organizations (FPOs) by integrating a Dialogflow-based chatbot. The chatbot, with its natural language processing, provides quick and informed responses, aiding in efficient decision-making. In agriculture, the chatbot improves information accessibility, optimizes resources, and supports decision-making, aligning with the industry's technological shifts. This study contributes to FPO sustainability by offering a user-friendly tool for informed decision-making in the evolving agricultural landscape.

## LITERATURE REVIEW

The agriculture industry is undergoing a transformative shift from traditional industrial methods to a data-driven and automated paradigm. This transition is driven by the convergence of technologies such as the Internet of Things, artificial intelligence, and robotics. The adoption of applications leveraging these technologies enables farmers to enhance productivity, optimize resource utilization, and mitigate risks. While data-driven management is a crucial starting point, the industry is progressively moving towards automation to address the escalating environmental and financial costs associated with labour and resources. Ongoing research and funding in areas like computer vision, robotic manipulation, and multi-agent coordination are paving the way for innovations in pest and disease detection, robotic harvesting, and

multi-robot systems. The ultimate goal is to achieve fully automated farms that significantly boost productivity while effectively managing resource scarcity [1].

Farmer Producer Organizations (FPOs) face challenges in decision-making due to diverse member interests, limited resources, and varying levels of member education. The need for inclusive decision-making is crucial to address the diverse needs of farmers, especially in resource-constrained environments where limited funds and technology access may hinder effective implementation[2]. FPOs must navigate these challenges to make informed decisions that enhance overall productivity and resilience in agriculture.

Google Dialogflow is like a wizard in the Google Compute Platform, designed to make life simpler for developers. It lets them easily craft clever virtual agents that seamlessly blend into their applications. By tapping into the power of natural language understanding and processing, it opens the door to creating sophisticated scenarios. With the growing need for chatbots to enhance customer support and overall experience, Google Dialogflow steps in with cutting-edge tech to build sturdy and user-friendly bots[3]. A Dialogflow-based chatbot for decision-making serves as an intelligent conversational interface that leverages Google's natural language processing capabilities to facilitate efficient and interactive decision-making processes. By integrating Dialogflow, a powerful natural language understanding tool, the chatbot can comprehend user queries and prompts, allowing for seamless communication

The chatbot's decision-making capabilities are enhanced through the integration of references, enabling it to access and analyze relevant information from external sources. Users can interact with the chatbot by posing questions or presenting scenarios, and the bot responds with informed recommendations or decisions based on the references it has been trained on[4]. This streamlines decision-making processes and provides a user-friendly and accessible interface for individuals seeking guidance or assistance in various domains.

Agricultural problems like using outdated techniques, not having the right materials for crops, poor crop planning, and difficulties in maintaining fertilizer balance are common nowadays. To tackle these issues, recent studies have explored the potential of chatbots. Imagine having a virtual assistant in the form of a chatbot that helps farmers manage their crops better. This chatbot, powered by Natural Language Processing, takes cues from a wealth of data, including valuable insights from "The Indian Council of Agricultural Research"[5]. It's like having a friendly guide that predicts what your crops need from the right amount of fertilizer to the essential nutrients. This way, farmers can get the guidance they need for more successful and sustainable agriculture.

## **METHODOLOGY**

The research methodology for this paper presents a practical approach in developing a dynamic chatbot. The following methods were utilized:

### **Chatbot:**

The chatbot, named AgriConnect, was developed using Dialogflow, a natural language processing (NLP) platform by Google that enables the creation of conversational interfaces, making it suitable for building interactive chatbots.

### **Data Collection:**

The data for training AgriConnect was collected from the National Bank for Agriculture and Rural Development (NABARD) website [6]. NABARD serves as a reliable source for information related to Kerala Farmers Producer Organizations (FPOs)

### **AgriConnect: A chatbot for FPO**

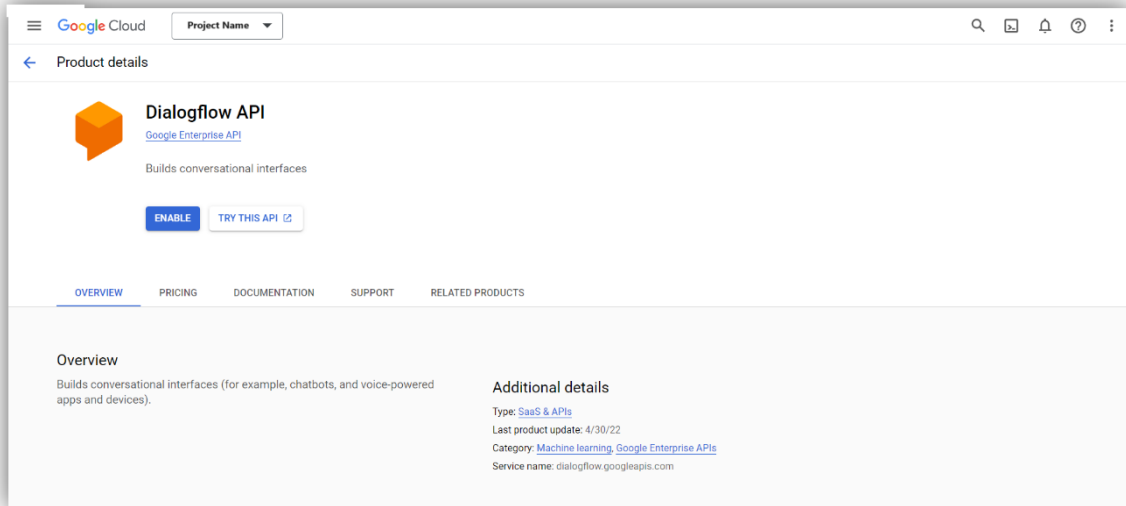
Dialogflow is a natural language processing (NLP) platform provided by Google that allows you to build conversational interfaces. Here's a step-by-step procedure to develop a bot using Dialogflow:

#### **Step 1:** Set Up a Google Cloud Platform (GCP) Project

1. If don't have a Google Cloud Platform account, create one.
2. Create a new GCP project for AgriConnect bot.

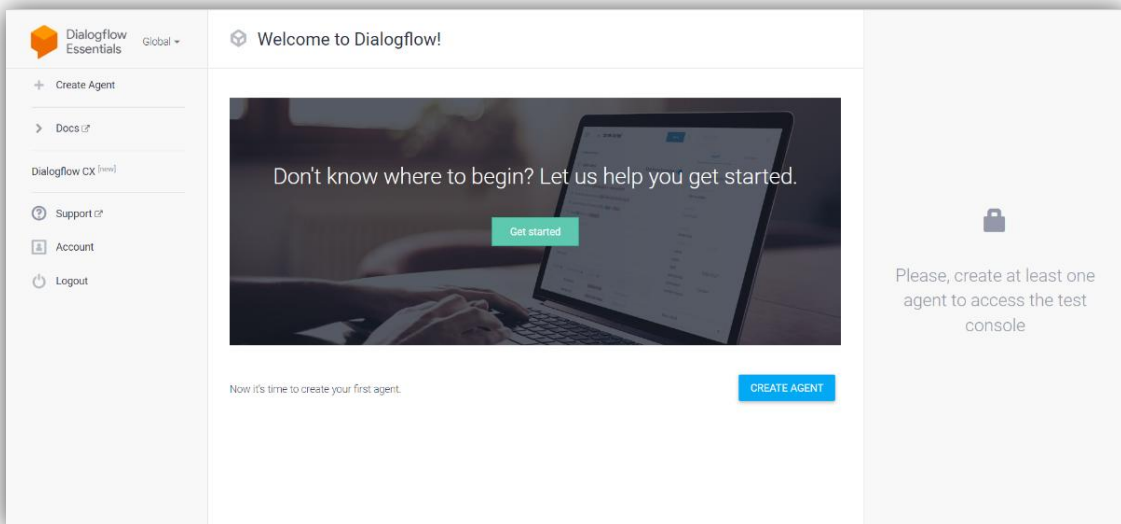
#### **Step 2:** Enable the Dialogflow API

1. In the GCP Console, navigate to the "APIs & Services" > "Dashboard."
2. Click on "+ ENABLE APIS AND SERVICES."
3. Search for "Dialogflow API" and enable it.

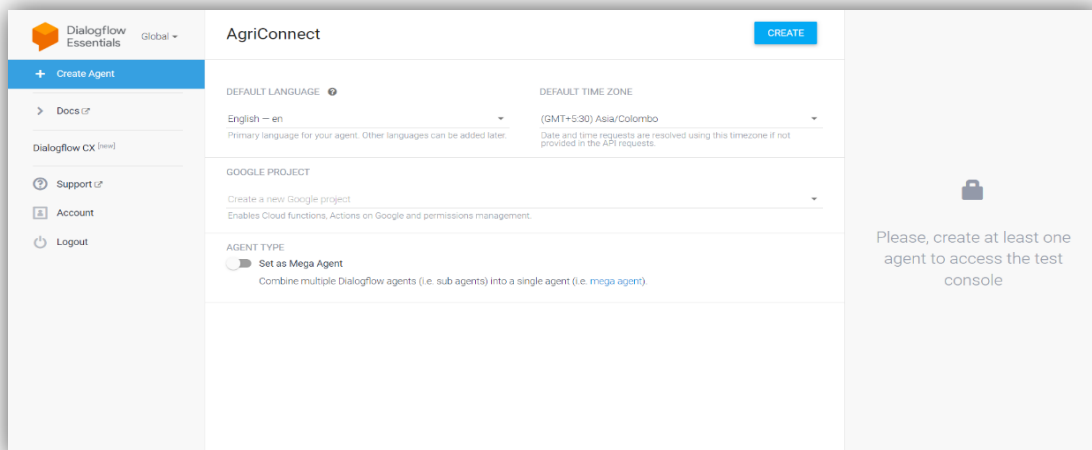


### Step 3: Create a Dialogflow Agent

1. Open the Dialogflow Console: <https://dialogflow.cloud.google.com/>.
2. Click on "Create Agent."

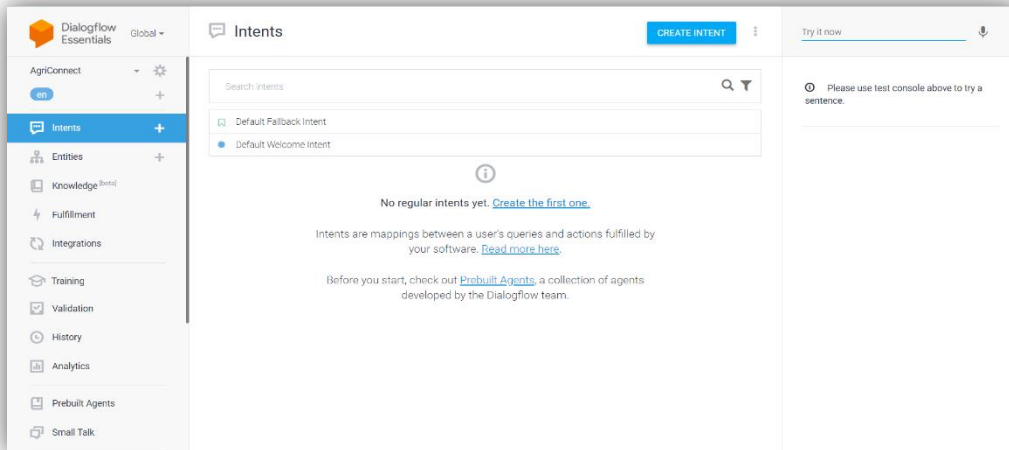


3. Enter a name for agent, e.g., "AgriConnect."
4. Select the default language and time zone.
5. Click on "Create."



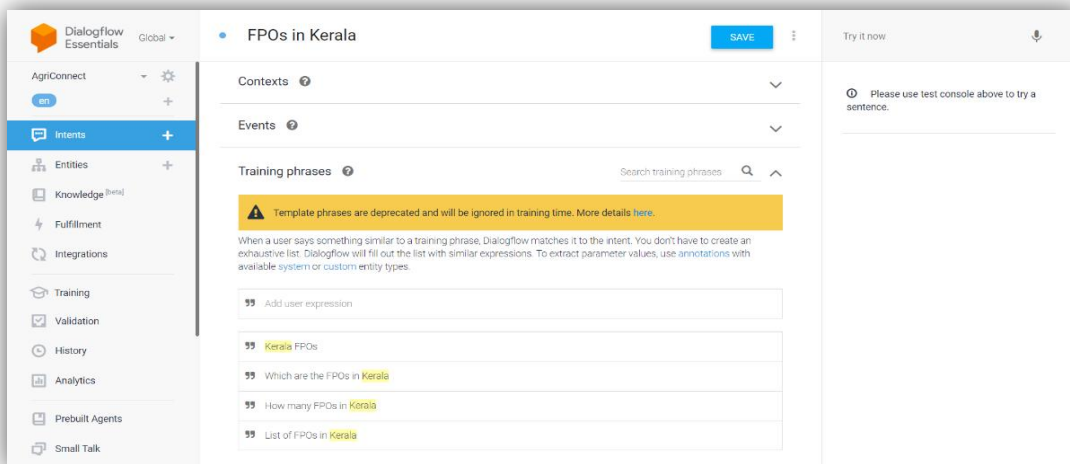
#### Step 4: Define Intents

1. Intents represent different user intentions. Create intents based on the actions the bot wants to perform.
2. Define training phrases for each intent, representing user inputs.
3. Set up responses for each intent.



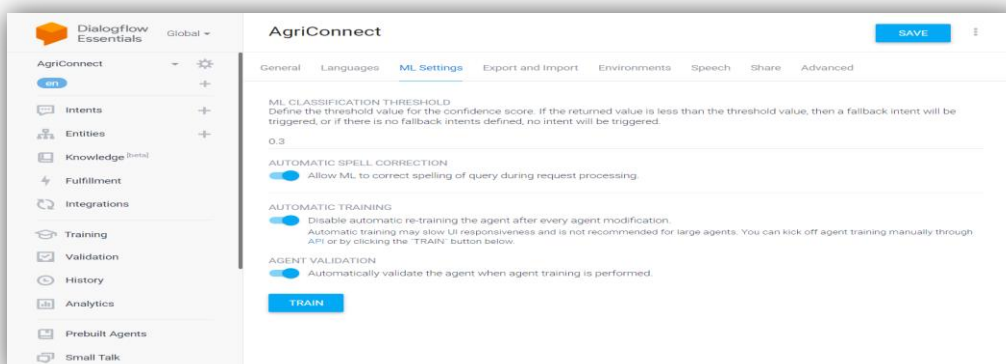
#### Step 5: Set Up Entities

1. Entities are used to extract information from user inputs. Define entities for relevant parameters (e.g., crop names, locations).
2. Mark the entities in training phrases.



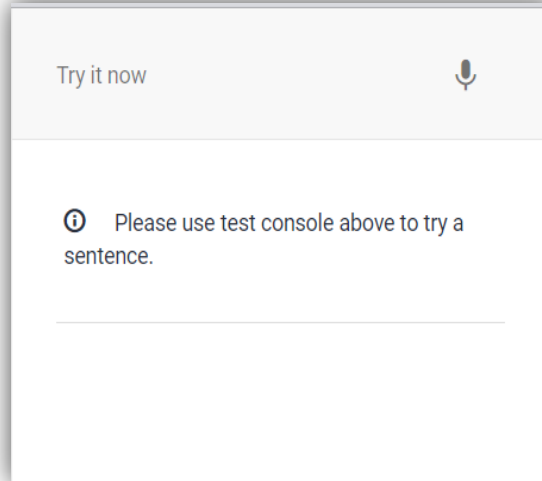
#### Step 6: Train the Agent

1. Click on the "Train" button to train the agent based on the defined intents and entities.
2. Dialogflow will analyze the training data and make the bot more accurate.



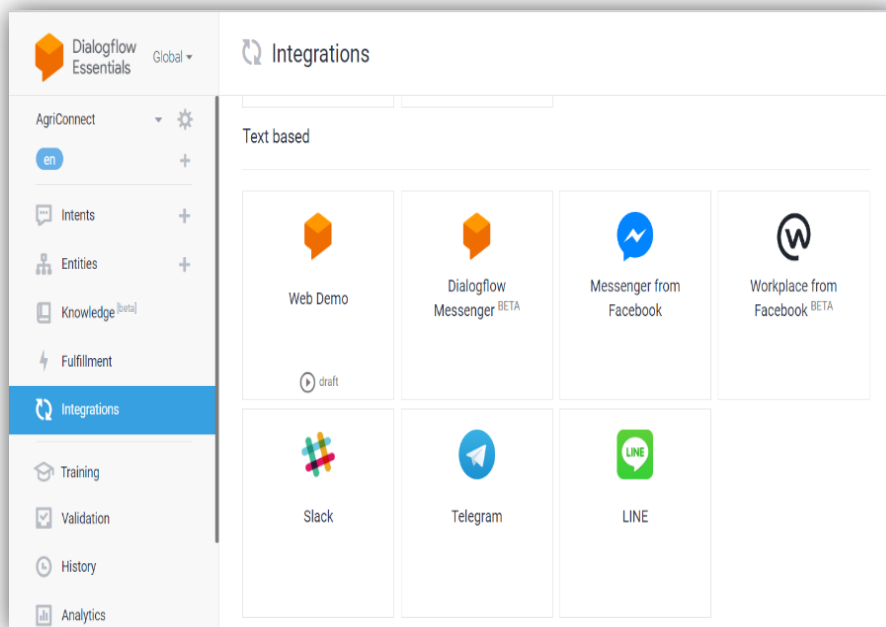
**Step 7: Test the Agent**

1. Use the "Try it now" section in the Dialogflow Console to test the agent with sample inputs.
2. Refine the intents and entities based on the test results.



**Step 8: Integrate with Platforms**

1. Dialogflow allows integration with various platforms like Websites, Google Assistant, Facebook Messenger, etc.
2. Follow the integration guides provided by Dialogflow for the preferred platform.



**Step 9: Deploy the Agent**

1. Once satisfied with the testing, deploy the agent to make it live.
2. Set up any necessary fulfillment (webhook) for complex actions.

**Step 10: Monitor and Improve**

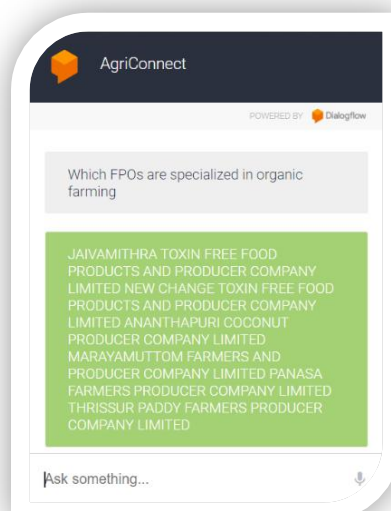
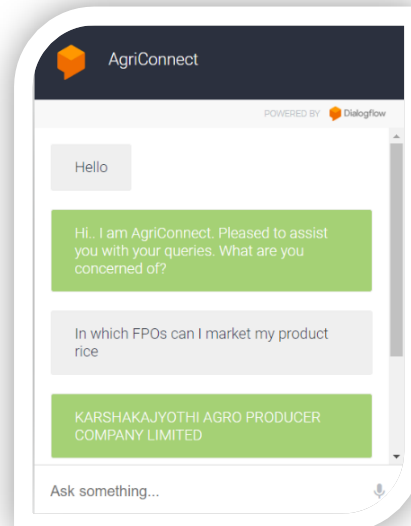
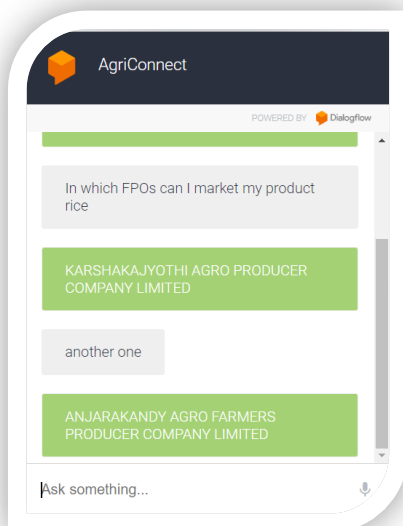
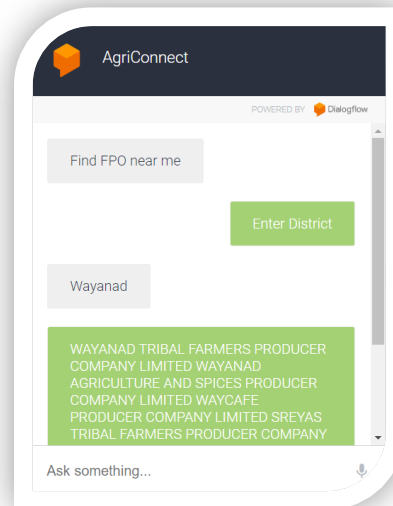
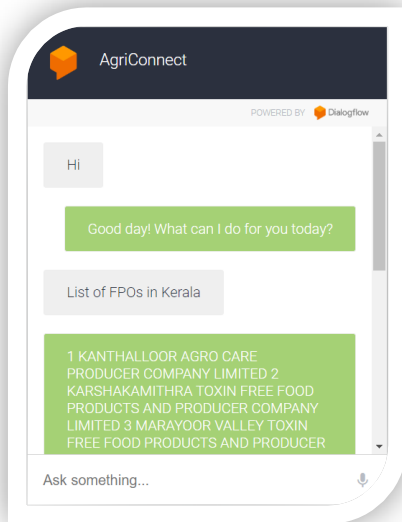
1. Regularly monitor user interactions and make improvements based on user feedback.
2. Use analytics provided by Dialogflow to understand user behaviour.

**Step 11: Additional Features**

1. Implement additional features such as context, events, or webhook fulfillment for more complex tasks.

## RESULTS

Here are some of the sample workings of AgriConnect



## **DISCUSSION & CONCLUSION**

The Dialogflow-based chatbot, AgriConnect, showcased significant positive impacts on decision-making processes within Farmer Producer Organizations (FPOs). The evaluation metrics, encompassing user engagement, efficiency gains, and satisfaction levels, underscored the chatbot's effectiveness in delivering timely and accurate information, thereby streamlining decision-making. The study emphasizes the transformative implications for FPOs, advocating for the adoption of technology-driven solutions. AgriConnect not only provides a user-friendly interface but also enhances accessibility to information and optimizes resource utilization. The integration of FPO services within the chatbot further amplifies its utility, offering a holistic solution for addressing the diverse challenges faced by FPOs. Acknowledging limitations such as potential user acceptance issues and technical constraints, the research underscores the evolving nature of technology and the need for consistent internet connectivity. Suggestions for future research encourage exploring advanced features, additional service integrations, and targeted solutions for specific challenges, with an emphasis on continuous monitoring and feedback mechanisms. Ultimately, this study demonstrates the promising potential of Dialogflow-based chatbots in fostering development through improved decision-making.

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