

**Project Report  
On**

**VocalMart: A Talking**

**Inventory Management AI Assistant**



**Submitted by:  
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# Introduction

Inventory management forms the backbone of any business involving goods, whether in retail, wholesale, or manufacturing sectors. Traditional inventory tracking methods involve manual counting, spreadsheets, and point-of-sale integrations, which are often tedious, error-prone, and inefficient. With advancements in Artificial Intelligence (AI) and Natural Language Processing (NLP), integrating a voice-controlled assistant for inventory management significantly optimizes these processes...

This project explores the development of a voice-driven inventory management system utilizing Kivy for frontend design, SQLite for database management, OpenAI APIs for natural language understanding, and ElevenLabs API for text-to-speech services. The solution is designed to assist small to medium enterprises in managing stock efficiently using simple voice commands.

## Problem Statement

The conventional methods of inventory management rely heavily on manual operations, which introduce multiple challenges:

- Human errors leading to inaccurate stock records.
- Time-consuming data entry and stock audits.
- High dependency on technical knowledge to manage software tools.
- Inefficient stock tracking resulting in business losses.
- Lack of real-time updates and alerts for low inventory.

There is a critical need for a smart, user-friendly, real-time solution that can handle inventory tracking through intuitive voice commands, minimizing manual effort and human errors.

## Objectives

- Develop a voice-activated inventory management system.
- Enable natural language interaction for checking stock, updating stock, viewing sales reports, and accessing the database.
- Provide real-time feedback using speech synthesis.
- Ensure system scalability and adaptability for future enhancements.
- Maintain a user-friendly, lightweight, and efficient frontend interface.

## Technologies Used

Technology	Purpose
Python	Core programming language
Kivy	Frontend development (GUI)
SQLite	Lightweight database management
OpenAI API	Natural Language Understanding
ElevenLabs API	Text-to-Speech generation
Pandas	Data export to Excel
FPDF	PDF generation for reports

## Methodology

### 1. Problem Understanding & Planning:

We began by identifying the common struggles of local shopkeepers , managing inventory, billing, and lack of digital tools and planned a voice-enabled AI solution.

### 2. Technology Stack Selection:

We chose Python for backend development, Kivy for GUI, SQLite for local database storage, ElevenLabs API for text-to-speech, and OpenAI's API for NLP.

### 3. Modular Architecture Design:

The project was divided into modules like Voice Input, NLP-based Chatbot, Sales Reporting, and PDF Export. Each module was built and tested independently.

### 4. Database & Inventory Integration:

We used SQLite to store product details, stock levels, and sales records, with automatic updates triggered by chatbot commands or user inputs.

### 5. Voice & Chat Functionality:

User speech was converted to text, interpreted by AI for intent, and responded back using ElevenLabs voice synthesis ,creating a natural assistant experience.

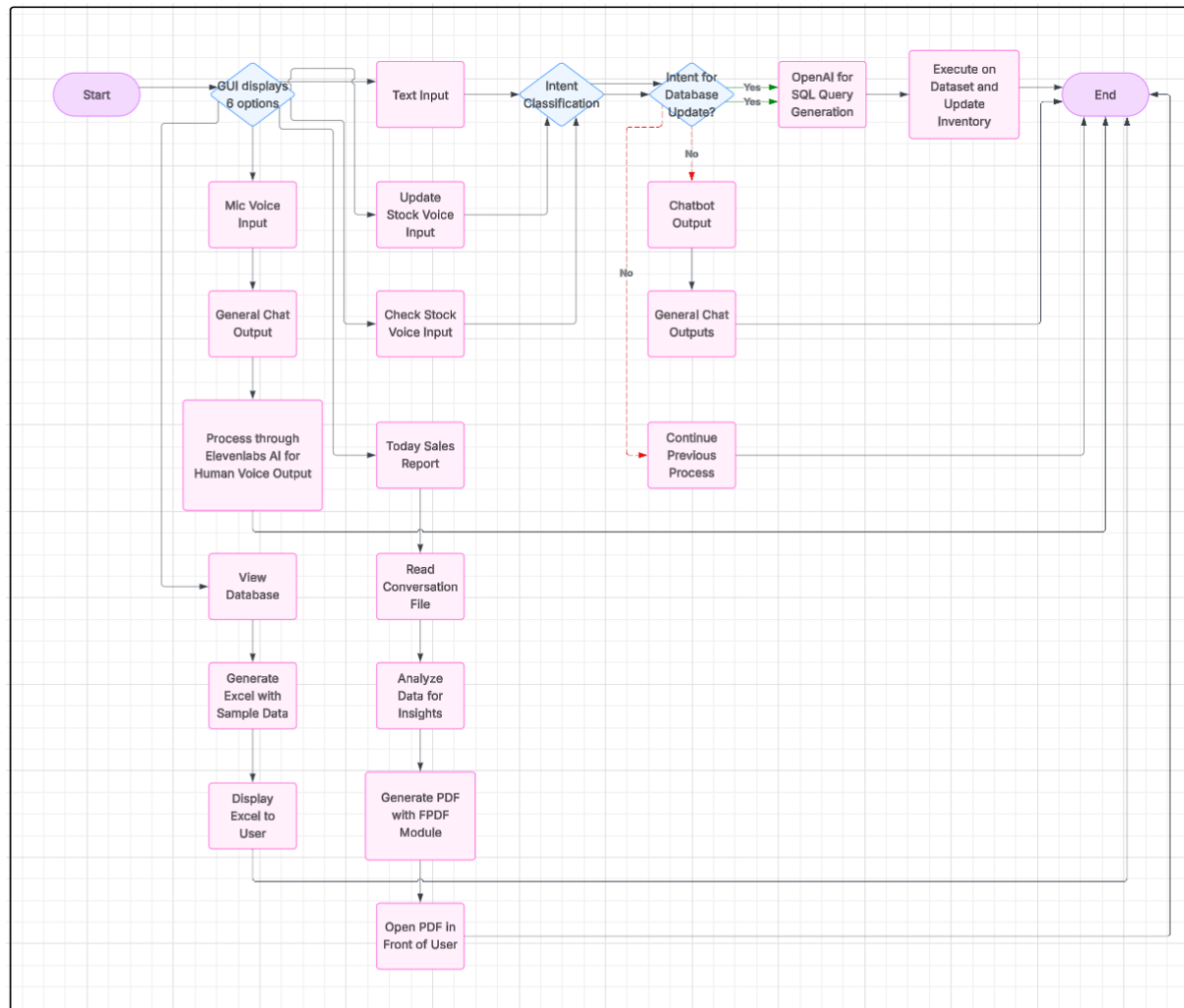
### 6. UI/UX Design:

A simple, one-screen interface was designed with Kivy to minimize user confusion and provide quick access to essential functions like viewing inventory or exporting reports.

### 7. Testing & Iteration:

The system was iteratively tested with various inputs and scenarios, including invalid commands, and multi-step queries, to improve reliability and user-friendliness.

## System Design and Architecture (Workflow):



## Process Steps:

### 1) GUI-Based Option Selection:

Upon launching the assistant, the user is presented with a GUI displaying 8 core options such as stock update, sales report, and chat with the assistant — offering a user-friendly entry point.

### 2) Dual Input Modes – Text and Voice:

Users can interact via voice (mic input processed by ElevenLabs AI) or text. Both input modes are directed toward intent detection to identify the user's requirement.

### 3) Intent Classification & Action Routing:

The system uses Open AI-powered NLP to classify the intent of input — whether it's a database update, general query, or analytics request — and routes it to the appropriate module.

#### **4) SQL Query Generation via Open AI + Action Execution:**

If the intent involves database updates (like stock changes or sales logging), the assistant generates corresponding SQL commands using OpenAI and executes them on the SQLite database.

#### **5) Data Output & Reporting Modules:**

Users can view real-time stock status, export Excel sheets with sample data, and generate dynamic PDF reports using the FPDF module based on conversation history and insights.

#### **6) Multimodal Feedback System:**

All outputs, whether general queries or data insights, are presented visually on screen and vocally using ElevenLabs' lifelike voice, ensuring accessibility even for non-tech users.

#### **7) Looping and Continuation Flow:**

If the chatbot output doesn't match a defined function, it loops back to the chat flow and allows the user to continue with previous processes — making the system adaptive and seamless.

## **Working Model**

The voice assistant processes user commands through the following workflow:

- 1. Voice Input:** The user presses the mic button and issues a voice command.
- 2. Speech Recognition:** Captured audio is converted to text.
- 3. Command Interpretation:**
  - Check stock commands (e.g., "How much sugar is left?").
  - Update stock commands (e.g., "Sold 5 packets of flour.").
  - View today's report.
  - View full database.
- 4. Database Interaction:** Based on classified intent, appropriate SQL queries are executed.
- 5. Feedback:**
  - Text response shown on the interface.
  - Audio feedback using ElevenLabs TTS.
- 6. Export:** Sales reports generated as PDFs; Inventory exported to Excel.

## Sample Commands and Outputs

User Command: "How much wheat do we have?"

- Assistant Response: "You currently have 12 kilograms of wheat."

User Command: "Sold 3 packets of biscuits."

- Assistant Response: "Inventory updated successfully!"

User Command: "Show today's sales report."

- Assistant Response: "Today's report generated and opened."

## Benefits

- Hands-free operation.
- Fast inventory updates.
- Easy access to reports and stock status.
- Minimization of stock-outs and overstocking.
- Enhanced decision-making with real-time data.
- Time and cost savings.

## Challenges Faced

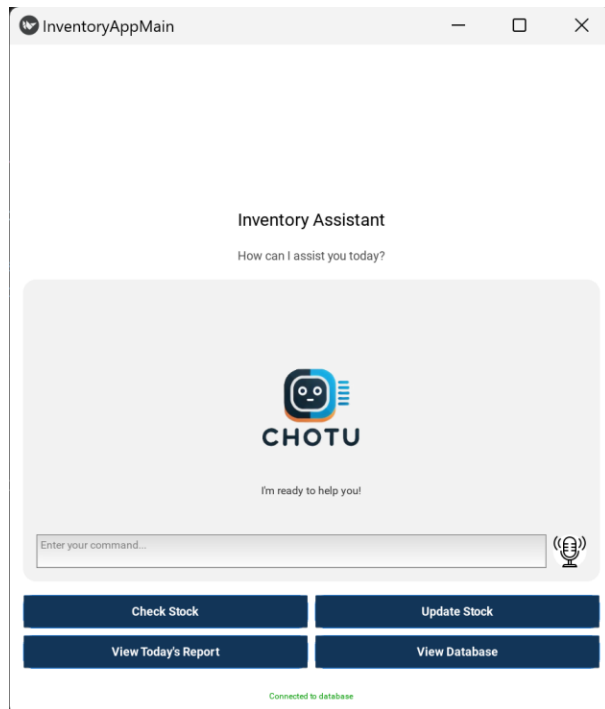
- Ensuring accurate speech recognition across different accents.
- Handling network failures during API calls.
- Designing an intuitive yet powerful GUI with Kivy.
- Synchronizing database updates with real-time voice responses.
- Managing session states between commands.

## Future Enhancements

- Integration with barcode/RFID scanning.
- Mobile application version (Android/iOS compatibility).
- Voice biometrics for user authentication.
- Predictive analytics for demand forecasting.
- Multilingual voice support.
- Dashboard for graphical sales and stock insights.
- Cloud database migration for multi-device access.

## Outputs :

- Frontend GUI with kivy



- Conversation between assistant and user

```

conversation_log.txt
1  User: 10 notebooks sold
2  Assistant: Inventory updated successfully! 2025-04-29, 20:04:54, Tuesday
3  User: 10 kilo Aalu Bik Gaye
4  Assistant: Inventory updated successfully!2025-04-29,20:05:18,Tuesday
5  User: 2 kg paneer sold
6  Assistant: Inventory updated successfully!2025-04-29,20:06:02,Tuesday
7  User: one bottle of soft drink soul
8  Assistant: Inventory updated successfully!2025-04-29,20:06:49,Tuesday
9  User: hello my name is
10 Assistant: Hello! How can I assist you today?
11 User: can you tell me my name
12 Assistant: I don't have your name at the moment. Could you please tell me your name?
13 User: hello my name is Kunal
14 Assistant: Nice to meet you, Kunal! How can I assist you today?
15 User: aaj ka din bahut bekar hai main bahut Pareshan hun
16 Assistant: Mujhe sun kar afsos hua, Kunal. Aapko pareshani kis baat ki hai? Shayad main madad kar sakoon.
17 User: Nahin Nahin Koi Nahin
18 Assistant: Samajh gaya. Agar aapko kabhi baat karni ho ya kisi bhi tarah ki madad chahiye ho, toh zaroor batayein. Kya aapko kisi aur cheez ke baare mein jaan na hai?
19 User: can you recall my name
20 Assistant: Yes, your name is Kunal. How can I assist you today?
21 User: ok thank you for today I am closing the program
22 Assistant: You're welcome, Kunal! If you need assistance in the future, feel free to reach out. Have a great day!

```

- Today's sales report pdf(according to the conversation)

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**\*\*Sales Report\*\***

Date: 2025-04-29

1. **\*\*Item:\*\*** Notebooks

**\*\*Quantity Sold:\*\*** 10

**\*\*Time of Sale:\*\*** 20:04:54

2. **\*\*Item:\*\*** Aalu

**\*\*Quantity Sold:\*\*** 10 kg

**\*\*Time of Sale:\*\*** 20:05:18

3. **\*\*Item:\*\*** Paneer

**\*\*Quantity Sold:\*\*** 2 kg

**\*\*Time of Sale:\*\*** 20:06:02

4. **\*\*Item:\*\*** Soft Drink

**\*\*Quantity Sold:\*\*** 1 bottle

**\*\*Time of Sale:\*\*** 20:06:49

**\*\*Summary:\*\***

Total Number of Sales: 4

Most Selling Item: Notebooks (10 sold)

Lowest Selling Item: Soft Drink (1 bottle sold)



- Viewing dataset button usage

The screenshot shows a Kivy IDE window with the following code in `frontend.py`:

```

from kivy.uix.label import Label
from kivy.uix.button import Button
from kivy.uix.widget import Widget
from kivy.lang import Builder

InventoryAppMain
  
```

Below the code editor is a window titled `InventoryAppMain` showing a blank application window.

Below the IDE is an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J	K
1	id	name	quantity	unit							
2	505	apples	10	kg							
3	506	bananas	30	dozen							
4	507	tomatoes	25	kg							
5	508	potatoes	100	kg							
6	509	onions	80	kg							
7	510	carrots	40	kg							
8	511	lemons	15	kg							
9	512	rice	199	kg							
10	513	wheat	150	kg							
11	514	sugar	90	kg							
12	515	salt	50	kg							
13	516	turmeric pc	20	kg							
14	517	lentils	60	kg							
15	518	chickpeas	40	kg							
16	519	milk	90	liters							
17	520	curd	40	kg							

The Excel spreadsheet has a formula bar showing `id` in cell A1. The sheet is named `Sheet1`.

## Conclusion

The voice-activated inventory management system presents a modern, efficient solution to traditional stock management challenges. By leveraging AI, NLP, and voice technology, it enhances accuracy, reduces manual workload, and provides a seamless, user-friendly experience. With planned future improvements, the system holds the potential to become a comprehensive smart inventory assistant for businesses of all sizes.

## References

- OpenAI Documentation - <https://platform.openai.com/docs>
- Kivy Documentation - <https://kivy.org/doc/stable/>
- ElevenLabs Text-to-Speech API - <https://elevenlabs.io/>
- SQLite Documentation - <https://sqlite.org/index.html>
- Pandas Documentation - <https://pandas.pydata.org/>