ManuBot

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MANUBOT: YOUR FACTORY'S AI VOICE COMMAND CENTER

Run Manufacturing Operations in Urdu & English - No Typing Required

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INTRODUCTION

1.1. Project Background:

The manufacturing sector, particularly small and medium-sized enterprises (SMEs), faces significant operational challenges due to reliance on outdated and inefficient systems like Excel for managing key processes. These challenges result in high inventory errors, production delays, and significant financial losses. ManuBot is an AI-driven ERP solution that aims to address these issues by offering a voice-activated, hands-free interface for workers, eliminating the need for touchscreens in noisy and physically demanding factory environments. This project addresses the pressing need for an affordable, efficient, and scalable ERP solution designed specifically for SMEs in the manufacturing industry.

1.2. Project Description:

ManuBot integrates AI-powered voice recognition with manufacturing workflows to provide an intuitive ERP system. It enables factory workers to manage inventory, monitor production, and perform maintenance tasks via voice commands in local languages, such as Urdu. This system eliminates the dependency on complex ERP systems like SAP or Oracle, which are often too expensive and cumbersome for SMEs. ManuBot's aim is to reduce operational inefficiencies and empower manufacturers with real-time data to drive smarter decision-making and operational improvements.

1.3. Project Scope:

This project will focus on developing and implementing a voice-powered ERP system for SME manufacturers in Pakistan. The scope includes:

- Designing a user-friendly interface that enables workers to interact with the system via voice commands.
- Implementing real-time stock tracking, production planning, and shop floor management features.
- Ensuring multi-language support to accommodate local languages and increase accessibility.
- Developing a robust backend system to integrate with IoT sensors and enable predictive maintenance for machines.
- Deploying the system in 10 pilot factories in Faisalabad and later expanding regionally.

1.4. Objectives:

Goal:
To create a cost-effective, voice-activated ERP system for small and medium-sized manufacturing enterprises to improve operational efficiency.

Objectives:

- Develop a voice interface that supports multiple languages (Urdu, English).
- Integrate inventory management, production planning, and maintenance tracking into a unified ERP system.
- Pilot the system in 10 factories in Faisalabad, Pakistan, and gather feedback for improvements.
- Scale the system regionally and globally after successful deployment in Pakistan.
- Achieving a minimum of 70% adoption among trial users by offering a free trial period.

2. PROJECT REQUIREMENTS

2.1. Functional Requirements

- **FR01:** User Authentication
    - FR01-01: System shall request a username and password from the user.
    - FR01-02: System shall authenticate the entered credentials.
    - FR01-03: System shall grant access if the credentials are valid.
    - FR01-04: System shall display an error message if the credentials are invalid.
- **FR02:** Inventory Management
    - FR02-01: System shall track stock levels in real time.
    - FR02-02: System shall alert the user when stock falls below a predefined threshold.

2.2. Non-Functional Requirements

- **NFR01:** System Availability
    - NFR01-01: System shall be available 24/7 for all users.
- **NFR02:** Performance

- NFR02-01: The system shall process user voice commands with a response time of less than 2 seconds.

2.3. Hardware Requirements

- Processor: Pentium(R) Core i3 CPU or higher
- Hard Disk: 40GB or more
- RAM: 256MB or more

2.4. Software Requirements

- Operating System: Windows 10, Windows 8.1, Windows 8, Windows 7
- Browser: Google Chrome, Mozilla Firefox, Safari, or Microsoft Edge

3. METHODOLOGY

3.1 Process Model

The project will follow the Agile Methodology, with incremental and iterative development cycles. Each phase will focus on delivering a functional component of the ManuBot system, with continuous feedback and testing to ensure alignment with the project objectives. The Agile model allows flexibility and faster iterations, ensuring the system meets user requirements effectively.

3.2 Tools & Technologies

The following tools and technologies are utilized in the development of the ManuBot system:

1. FRONTEND

- **Web Dashboard**:
  - **Tech**: React.js + Vite + Tailwind CSS + Next.js
- **Mobile App**:
  - **Tech**: React Native (Expo)
- **Voice Interface**:
  - **Tech**: Web Speech API + Custom Wake Word

- **Offline Mode**:
    - **Tech**: SQLite + React Native AsyncStorage
- **Real-time Updates**:
    - **Tech**: WebSocket (Socket.IO)

2. VOICE AI ENGINE

- **Speech-to-Text**:
    - **Tech**: OpenAI Whisper (Large-v3)
- **Wake Word**:
    - **Tech**: Porcupine (Picovoice)
- **Intent Recognition**:
    - **Tech**: GPT-4o-mini or Llama 3.1 8B
- **Text-to-Speech**:
    - **Tech**: ElevenLabs or Google Cloud TTS
- **Noise Cancellation**:
    - **Tech**: Krisp.ai SDK

3. BACKEND

- **API**:
    - **Tech**: Python FastAPI
- **Authentication**:
    - **Tech**: Supabase Auth or Clerk
- **Database**:
    - **Tech**: PostgreSQL (Neon / Supabase), MongoDB Atlas
- **ORM**:
    - **Tech**: SQLModel (by FastAPI creator)
- **Caching**:

- **Tech**: Redis

- **File Storage**:
  - **Tech**: AWS S3

4. AI & ML PIPELINE

- **Model**:
  - GPT-4o-mini
  - Fine-tuned Llama 3.1
  - Prophet / LSTM
  - YOLOv8

5. IoT & Hardware Integration

- **PLC Machines**:
  - **Tech**: Modbus TCP/OPC-UA
- **IoT Sensors**:
  - **Tech**: MQTT
- **Barcode Scanner**:
  - **Tech**: Zebra SDK
- **Rugged Tablets**:
  - **Tech**: Getac ZX70

6. Infrastructure & DevOps

- **Hosting**:
  - **Tech**: Render, AWS S3, MS Azure
- **CI/CD**:
  - **Tech**: GitHub Actions
- **Monitoring**:

    - **Tech**: Sentry + LogRocket
- **Analytics**:
    - **Tech**: PostHog
- **Backups**:
    - **Tech**: Daily PostgreSQL dumps to S3

4. PRODUCT FEATURES

- **Inventory Management:** Real-time stock tracking, automatic reorder triggers, and supplier management.
- **Production Planning:** Work order management, machine scheduling, and quality control.
- **Shop Floor Management:** Digital work instructions, voice-based time tracking, and issue reporting.
- **Maintenance:** Predictive maintenance, equipment lifecycle tracking, and downtime analysis.
- **Analytics:** Real-time production efficiency metrics, cost analysis, and custom dashboards.

5. MARKET RESEARCH & ANALYSIS

- **Local Market (Pakistan)**: Over **30,000 SME factories** in industries such as textiles, automotive parts, food processing, and pharmaceuticals, representing a **$1.8 billion** opportunity annually.
- **Global Market**: The global market for SME manufacturers exceeds **5 million companies**, with a total addressable market (TAM) of **$50 billion**.

6. COMPETITIVE ANALYSIS

ManuBot's Competitive Edge:

- **SAP & Oracle**: Too expensive for SMEs, with implementation costs upwards of **$500K**.
- **Odoo & ERPNext**: Generic systems that lack manufacturing workflow specialization and voice integration.
- **Excel**: Error-prone, inefficient, and costly due to operational delays.

ManuBot is **10x more affordable** than traditional ERP systems, with a unique focus on manufacturing workflows, voice technology, and multi-language support.

7. BUSINESS MODEL & REVENUE STREAMS

ManuBot operates on a subscription-based **SaaS model** with three pricing tiers:

- Offer a **3-month free trial**
- **Starter**: 30K/month (1 location, 50 users)
- **Growth**: 100K/month (3 locations, 200 users)
- **Enterprise**: 150K/month (unlimited locations/users)

Additional revenue streams include:

- **Implementation Services**: One-time setup fees ranging from **50K to 200K**.
- **Custom Modules**: Additional development services priced between **10K to 50K**.

8. GO-TO-MARKET STRATEGY

- **Phase 1**: Pilot program in **Faisalabad**, targeting 10 factories. Offer a **3-month free trial** to attract early adopters, with a goal to convert **70% of trial users** into paying customers.
- **Phase 2**: Regional expansion into **India, Bangladesh, and Vietnam** by partnering with manufacturing associations.
- **Phase 3**: Global expansion into the **US** and **Europe**, with a potential white label offering for equipment manufacturers.

9. FINANCIAL PROJECTIONS (5 Years)

- **Year 1**: **358K ARR** from 100 factories
- **Year 2**: **3.6M ARR** from 1,000 factories
- **Year 3**: **18M ARR** from 5,000 factories
- **Year 5**: **72M ARR** from 20,000 factories

10. TEAM REQUIREMENTS

- **Full-Stack AI Engineer**: Expertise in AI chatbots and IoT integration.

- **Sales Lead**: Preferably an ex-factory manager with deep industry experience.
- **Mobile Developer**: To develop and support the mobile app.
- **Customer Success Manager**: Ensure smooth onboarding, customer support, and retention.

11. RISK ANALYSIS & MITIGATION

- **Voice Accuracy**: To ensure high accuracy in noisy factory environments, **ManuBot** will utilize noise-canceling microphones and fine-tune **Whisper AI** for factory-specific language.
- **Adoption**: ManuBot will offer free trials, on-site training, and strong customer support to ensure smooth adoption.
- **Data Security**: End-to-end encryption and an option for local hosting will meet privacy and security requirements.

12. IMPLEMENTATION ROADMAP

- **Months 1-3**: Develop the MVP, including voice login, stock check, purchase order creation, and job status updates.
- **Months 4-6**: Conduct pilot testing in **10 factories** in Faisalabad, collect feedback, and refine the system.
- **Months 7-9**: Begin expanding to 100 factories, collect case studies, and improve the system based on real-world feedback.
- **Month 12**: Regional scaling to **India, Bangladesh, and Vietnam**, and prepare for global market expansion.