Stand-alone Canteen and Inventory Management System

1. Objective

This document presents the comprehensive functional and technical requirements for implementing an Automated Canteen and Inventory Management System (ACIMS) that will replace the existing manual, Excel-based operation. The new system aims to create a seamless and integrated digital ecosystem that connects canteen operations, inventory control, procurement, and HRMS attendance data into a unified platform.

At the core, the solution will automate the entire meal tracking process through facial recognition hardware, ensuring accurate, real-time validation of employee meal eligibility based on their shift and attendance status. Parallelly, it will maintain auditable inventory records covering the entire lifecycle of raw materials from procurement and stock entry to meal-based consumption and cost reporting.

The overall objective is to build a transparent, accountable, and efficient canteen management system that reduces manual intervention, prevents misuse, and provides real-time visibility across all operational layers.

1.1 Core Objectives

1. **Automate Meal Tracking:**
   Deploy face detection devices at all canteen entry points to automatically register meal attendance for over 3,500 employees, across 7–9 meal sessions daily. The system will synchronize facial data with existing biometric records and HRMS attendance data to validate meal eligibility.

2. **Real-Time Inventory Control:**
   Establish a centralized inventory system that tracks every movement of raw materials — from procurement ("Bazar") to consumption — ensuring transparency and auditability.

3. **Financial Transparency and Cost Allocation:**
   Generate automated monthly cost summaries, linking each department's meal consumption with procurement and inventory valuation for financial reporting.

4. **Seamless System Integration:**
   Implement secure API connections between the canteen system, HRMS (for employee, attendance, and shift data), and Biometric Systems (for facial recognition synchronization).

2. Scope of Work

The ACIMS will consist of four major interconnected subsystems:

1. **HR & Meal Access Management:**
   Handles employee registration, shift-based meal eligibility, facial verification, and meal logging.

2. **Inventory Management:**
   Controls stock-in, stock-out, and real-time balance tracking of all raw materials.

3. **Procurement and Financial Workflow:**
   Manages demand generation, vendor selection, purchase approvals, bill verification, and payment tracking.

4. **Reporting and Analytics Dashboard:**
   Offers real-time operational insights, historical data analytics, and monthly cost breakdowns for administrative review.

3. User Roles and Responsibilities

Role	Key Responsibilities in System	Modules Accessed
Store Keeper / Inventory Admin	Record stock receipts, stock issuance for cooking, stock reconciliation, and maintain stock accuracy.	Inventory, Procurement (Receipts)
Canteen Manager	Generate daily meal demands, oversee meal scheduling, track meal consumption dashboards, and ensure hardware uptime.	Meal Planning, Inventory (Issue), Dashboard
Department Head	Submit daily meal commitments, manage guest meal requests, and monitor departmental consumption.	Meal Planning, Guest Meal Management
Purchase Committee	Approve demand lists, select vendors, and authorize purchase orders.	Procurement, Vendor Management
HR / Admin	Manage employee eligibility, handle guest meal approvals, and oversee attendance-to-meal linkage reporting.	HR Integration, Reporting, Notifications

4. Detailed Functional Requirements

4.1 HRMS and Biometric System Integration

Requirement	Detail
Employee Data Sync	Integrate with HRMS via API to pull data of all permanent and vendor employees (Employee ID, Name, Department, Shift, Status). Must support attendance data synchronization for both permanent (700 employees) and vendor-based (700 employees) systems.
Face Data Sync (Critical)	Connect with the existing Biometric System to import facial templates for all employees. The synchronized facial data will populate all canteen entry-point devices for real-time recognition.
Attendance Validation	System will cross-check employee attendance and shift data before allowing meal access. Only employees marked present for the relevant shift will be allowed meals.
OT Eligibility	System must automatically grant eligibility for overtime meals (e.g., Midnight Tea) based on verified OT data from the HRMS.

4.2 Canteen Access and Real-Time Meal Eligibility Validation (Face Detection)

One of the system's most critical features is real-time face-based validation at the canteen entry points. The workflow will operate as follows:

1. Employees will approach canteen entry gates equipped with ZKTeco-compatible facial recognition devices.
2. The system will instantly capture and match their facial data against the synchronized biometric database.
3. A large display screen connected to the device will show the employee's photo, name, and meal eligibility status.
4. The system will check — through API integration — the employee's shift attendance data from both HRMS platforms (one for permanent employees and one for vendor-based employees).
5. If the employee is eligible for that specific meal (based on attendance and shift timing), the screen will flash a green signal, confirming meal authorization.

6. **If the employee is not eligible, a red signal and "Meal Not Authorized" message will appear. The employee will be required to visit HR to update their attendance record.**

7. **Once HR updates the attendance, the canteen system will detect the change via API synchronization. The employee can then re-scan their face, and eligibility will automatically update to "Authorized."**

Requirement	Detail
Hardware Mandate	Install face recognition devices at every canteen gate capable of real-time API communication.
Verification Process	Employee face must be verified instantly from synchronized data with latency < 500ms.
Visual Feedback	Device and screen display to show name, department, and eligibility status in real time.
Transaction Logging	Log every verified meal event with Employee ID, Meal Type, Timestamp, and Device ID.
Eligibility Enforcement	Block employees not marked for that meal/shift, ensuring no unauthorized food distribution.
Dashboard Update	All verified meal events must update the Meal Dashboard instantly.

4.3 Meal Planning and Scheduling

Requirement	Detail
Daily Meal Commitment	Department Heads must submit or upload the daily meal count per session for the following day.
Complex Meal Schedule	Handle up to 9 daily meal sessions — including breakfast, snacks, lunch, dinner, and OT meals.
Shift-Based Eligibility	Automatically determine meal eligibility by cross-checking attendance and shift timing. Non-shift employees arriving at 8 AM, for example, will not be eligible for breakfast.
Guest Meal Workflow	Manage guest meal requests and route them through approval workflow involving HR/Admin.

4.4 Inventory and Store Management

Requirement	Detail
Stock In (Receipt)	**Record all received raw materials with quantity, cost, vendor details, and invoice reference.**
Stock Reconciliation	**Capture previous and current stock levels to ensure accurate consumption tracking.**
Stock Out (Consumption)	**Deduct consumed items based on meal type and date to maintain transparency in usage.**
Real-Time Status	**Provide up-to-date stock value and item quantity visualization.**
Restock Alerts	**Auto-notify when stock drops below predefined thresholds.**

4.5 Procurement and Financial Workflow

Requirement	Detail
Demand Generation	**Generate daily/weekly demand lists based on meal commitments and recipe data.**
Committee Approval	**Route demands to the Purchase Committee for vendor selection and approval.**
Financial Data Capture	**Allow parsing/importing of existing Excel-based vendor bills to ensure accounting continuity.**
Payable Tracking	**Maintain monthly summaries of vendor purchases, payments, and outstanding balances.**

5. Reporting and Analytics Requirements

Report/Dashboard	Details & Key Metrics
Real-Time Meal Dashboard	Live view of meals taken per type and time slot (e.g., 2,300 lunches served today).
Monthly Cost Summary	Calculates per-department and per-person meal costs with total monthly summary.
Item-Wise Consumption	Shows opening stock, receipts, consumption, and closing balance with values.
Vendor Financial Report	Monthly purchase and payable summary for all vendors.
Inventory Audit Log	Tracks every stock transaction along with audit verification status.
Guest Meal Report	Lists all guest meals by department for internal billing purposes.

6. Notification System

Requirement	Trigger/Recipient
Daily Meal Consumption Alert	Sent post-lunch to Department Heads showing total employees who took meals.
Low Stock Alert	Sent to Store Keeper and Canteen Manager when stock drops below reorder level.
Guest Meal Approval Alert	Sent to HR/Admin upon new guest meal request.
Commitment Deadline Alert	Reminder sent before daily meal commitment cutoff.

7. Non-Functional Requirements

Category	Requirement
Performance	Face verification latency must be under 500 ms per event to prevent queueing.
Scalability	Must support 5,000 users and retain 5+ years of historical data.
Security	Role-Based Access Control (RBAC) must ensure strict data segregation by department and role.
Maintainability	APIs for HRMS and Biometric integrations must be well-documented.
Database	Must use a robust SQL-based database (PostgreSQL/MySQL) ensuring data consistency.