

Warehouse Management System (WHM) Project Document

Company: Codedu Software Technologies Pvt Ltd

Region Focus: Global

Technology Stack: Python + Django

The Warehouse Management System (WHM) project aims to streamline and optimize warehouse operations for businesses globally. The system is designed to manage inventory, improve accuracy, enhance logistics efficiency, and integrate seamlessly with other enterprise systems.

Objectives:

1. Automate inventory control and warehouse operations.
2. Provide real-time stock visibility and reporting
3. Reduce errors and improve operational efficiency
4. Support multi-warehouse operations and global standards

Functional Scope:

1. Inventory Management (Add/Edit/Delete/View stock items)

☐ Add Stock Items – Register new products into the system

Purpose: To register new products entering the warehouse.

- Enter **product details**: name, SKU, category, supplier, unit price, batch number, expiry date (if applicable).
- Define **quantity and warehouse location** (rack, zone, shelf).
- Automatically assign a **unique SKU or barcode**.
- Validate **duplicate entries** to prevent errors.
- Optional: Attach product images for easy identification.

☐ Edit Stock Items – Update product details or quantities.

Purpose: Update product information or stock levels.

- Change **product details** like name, category, price, or supplier info.
- Update **stock quantity** after receiving new inventory or adjustments.
- Edit **warehouse location** if product is moved.
- Track **audit logs** for each change to maintain traceability.

☐ **Delete Stock Items** – Remove obsolete or damaged products.

Purpose: Remove obsolete, expired, or damaged products.

- **Soft delete** preferred (mark as inactive) instead of permanent deletion for audit compliance.
- Prevent deletion if there is **pending stock movement** or **linked orders**.
- Maintain history for reporting and audits.

☐ **View Stock Items** – Access real-time inventory data, including reports and filters.

Purpose: Allow users to see inventory in real time.

- Display **list of all stock items** with details (SKU, name, quantity, location, supplier).
- Apply **filters**: by category, warehouse, low stock, expiry date.
- Search **by SKU or product name**.
- Generate **reports**: current stock, stock valuation, slow-moving items.
- Option to export to **Excel or PDF**

1. SKU Management and Barcode/RFID Integration

SKU (Stock Keeping Unit) Management and Barcode/RFID integration is critical for modern warehouse operations. It allows you to uniquely identify every item, track its movement, and automate data entry to reduce errors and improve operational efficiency.

- Assign unique identifiers (SKUs) to every product or item.

SKU = Unique identifier for a product variant (e.g., size, color, batch).

Example: PROD123-BLUE-L could represent a blue, large-sized t-shirt.

Example of an SKU:

If a company sells T-shirts:

Product Size	Color	SKU Code
Cotton T-Shirt M	Black	TS-M-BLK-001
Cotton T-Shirt L	White	TS-L-WHT-002
Hoodie XL	Blue	HD-XL-BLU-003

Helps differentiate similar products in inventory.

Automatic SKU Generation:

1. System can generate SKUs automatically based on category, supplier, and product attributes.
2. Example: CAT-SUP-001 → Electronics-Airpod-001.

Unique Identification:

1. Each SKU is unique within the warehouse/global system.
2. Prevents duplication and stock confusion.

SKU Hierarchy & Mapping:

1. Map SKUs to categories, suppliers, and warehouses.
2. Enables reporting by category or location.

SKU Attributes:

1. Name, description, batch, expiry date, supplier, unit price.
2. Optional images for easy identification.

Audit Trail:

1. Track SKU creation, updates, and movements.

Automate tracking using Barcodes or RFID tags.

- **Generate barcode for every SKU automatically.**
- **Scan items for:**
- **Inbound:** Receiving and adding stock.
- **Outbound:** Picking and dispatching orders.
- **Internal Movement:** Stock transfers between locations.
- Real-time **inventory updates** on scanning.
- Print barcode labels for racks, pallets, or individual products.

Enable fast scanning for inbound, outbound, and internal movements.

RFID = Radio Frequency Identification. Uses RFID tags on items and RFID readers to track products without line-of-sight scanning. Ideal for large warehouses with fast-moving goods.

- **Automatic item detection:** Scan multiple items at once.
- **Real-time stock location tracking:** Track which shelf or zone items are stored.
- **Faster warehouse operations:** Reduces manual scanning time.
- **Integration with workflow:** Supports picking, packing, and dispatch automation.

1. Goods Receipt Note (GRN) & Putaway

- **GRN:** Document confirming that goods ordered have been received. It records quantity, quality, and condition of items.
- **Putaway:** Process of moving received goods from the receiving dock to their **designated storage location** in the warehouse.

☐ **Goods Receipt Note (GRN), Purpose & Features**

- Verify received goods against purchase orders (POs).
- Record quantities, batch numbers, expiry dates, and quality checks.
- Automatically update inventory levels in the system.

☐ **GRN Features**

- **PO Matching:** Cross-check items received against purchase order details.
- **Quality Inspection:** Mark items as accepted, damaged, or returned.
- **Batch & Expiry Tracking:** Assign batch numbers and expiry dates automatically.
- **Barcode/RFID Scanning:** Scan items to register receipt in the system.
- **GRN Document Generation:** PDF/Printable GRN for record keeping.
- **Partial Receipt Handling:** Record partial deliveries if full quantity isn't received.

Workflow: GRN → Putaway

1. **Receive Goods** at dock.
2. **Scan items** using barcode/RFID.
3. **Create GRN** in the system, verify against PO.
4. **Quality check** and record batch/expiry details.
5. **System recommends storage location** (Putaway).
6. **Move items to location**, confirm via scan.
7. **Stock updated automatically** in warehouse database.
8. **Generate GRN and Putaway reports** for audit purposes.

1. **Picking, Packing, and Dispatch Processes**

A. Purpose

- Identify and retrieve items from warehouse storage to fulfill orders.
- Optimize time and effort while maintaining accuracy.

B. Packing Features

1. **Order-based Picking:**
 - Generate picking lists automatically for each order.
 - Include SKU, quantity, location, batch, expiry date.
2. **Zone-based Picking:**
 - Assign pickers to specific zones for efficiency.
 - Reduce travel time in large warehouses.
3. **Batch/Cluster Picking:**
 - Pick multiple orders in a single trip for efficiency.
4. **Barcode/RFID Scanning:**
 - Scan items during picking to confirm correct SKU and quantity.
 - Prevent picking errors.

5. **Pick Confirmation:**

- Update inventory automatically once items are picked.

Packing Process:-

A. Purpose

- Ensure items are properly packed for delivery.
- Prevent damage and ensure compliance with shipping regulations.

B. Features

1. **Packing Slip Generation:**

- Auto-generate packing slips with SKU, quantity, and order details.

2. **Packaging Recommendations:**

- Suggest packaging based on product size, weight, fragility.

3. **Barcode/RFID Confirmation:**

- Scan items as they are packed to confirm correctness.

4. **Batch Packing:**

- Pack multiple orders efficiently while avoiding mix-ups.

5. **Weight & Dimension Tracking:**

- Record package weight and dimensions for logistics and shipping cost.

Dispatch Process

A. Purpose

- Move packed orders from warehouse to **delivery partners or customer locations**.

B. Features

1. **Dispatch Scheduling:**

- Auto-generate dispatch schedule based on order priority and delivery location.

2. **Carrier Integration:**

- Integrate with logistics providers (FedEx, DHL, local carriers) for tracking.

3. **Barcode/RFID Scan at Dispatch:**

- Confirm all items leave the warehouse.
- Update inventory and order status to “Dispatched.”

4. **Tracking & Notification:**

- Provide tracking numbers and status updates to customers.

5. **Partial Dispatch Handling:**

- Handle orders dispatched in multiple shipments.

6. **Analytics & Reporting:**

- Track dispatch times, errors, and order fulfillment efficiency.

- **Workflow Example: Picking → Packing → Dispatch**

1. **Order Received:** System creates a picklist.

2. **Picking:** Warehouse staff pick items using barcode/RFID scanners.
3. **Packing:** Picked items are packed with correct slips and scanned for verification.
4. **Dispatch:** Packed orders are handed to courier/logistics. Inventory and order statuses are updated automatically.
5. **Customer Notification:** Tracking number sent, and order status updated in system.

1. Stock Adjustments and Reconciliation

Stock adjustments and reconciliation ensure that physical stock matches system stock. Discrepancies may occur due to:

- Damage, theft, or loss
- Manual counting errors
- Returns or supplier discrepancies
- Stock movement errors

This module helps maintain data integrity, comply with audits, and improve decision-making.

Stock Adjustments

A. Purpose

- Modify inventory records to reflect **actual stock changes** that are not captured automatically.
- Handle exceptions like damaged goods, theft, or stock misplacement.

B. Features

1. **Manual Adjustments:**
 - Warehouse staff or managers can increase or decrease stock for specific SKUs.
2. **Adjustment Reasons:**
 - Categorize adjustments (e.g., damaged, lost, found, promotional sample, expiry).
3. **Approval Workflow:**
 - Adjustments may require approval from supervisors or managers.
4. **Batch & Location Specific:**
 - Adjust stock at specific warehouse locations or batches.
5. **Barcode/RFID Verification:**
 - Scan items to ensure accuracy before adjusting.
6. **Audit Trail:**
 - Every adjustment is logged with user, date, reason, and quantity change.

Stock Reconciliation

A. Purpose

- Compare **physical stock (actual inventory)** with **system stock** and identify discrepancies.
- Essential for audits and compliance.

B. Features

1. **Cycle Counting:**
 - Perform periodic counts on selected SKUs or locations instead of counting all inventory.
2. **Full Inventory Count:**
 - Count all items in warehouse periodically (monthly, quarterly).
3. **Discrepancy Reports:**
 - Highlight differences between physical and system stock.
4. **Automated Recommendations:**
 - Suggest adjustments to correct discrepancies.
5. **Batch & Location Tracking:**
 - Identify discrepancies by batch, warehouse zone, or shelf.
6. **Integration with GRN & Dispatch:**
 - Ensure adjustments consider recent receipts and shipments.

Workflow: Adjustments & Reconciliation

1. **Identify Discrepancy:**
 - Triggered by stock audit, cycle count, or manual check.
2. **Verify Stock:**
 - Scan items via barcode/RFID to confirm actual quantity.
3. **Create Adjustment:**
 - Record quantity difference, reason, and request approval.
4. **Approve & Update Stock:**
 - Supervisor approves adjustment; system updates stock automatically.
5. **Generate Reports:**
 - Discrepancy, adjustment history, and audit logs for management.

A. FIFO (First In, First Out)

- **Definition:** The items received first are the ones shipped or used first.
- **Purpose:** Ensures older inventory moves before newer stock to reduce spoilage or obsolescence.
- **Common Use:** Non-perishable products, standard stock rotation.

B. FEFO (First Expiry, First Out)

- **Definition:** Items with the **earliest expiry date** are used or shipped first.
- **Purpose:** Prevents expired or near-expiry products from reaching customers.
- **Common Use:** Perishable goods, pharmaceuticals, food, chemicals.

C. Safety Stock

- **Definition:** Minimum quantity of stock kept in inventory to prevent **stockouts** during demand fluctuations or delays in supply.

- **Purpose:** Ensures **continuous availability** of critical items.

Features in WHM

A. FIFO/FEFO Management

1. **Automated Stock Selection:**
 - System automatically selects inventory based on **oldest arrival (FIFO)** or **earliest expiry (FEFO)**.
2. **Batch & Lot Tracking:**
 - Track batch numbers, manufacturing, and expiry dates for FEFO.
3. **Inventory Alerts:**
 - Warn when older stock is not moving (FIFO) or approaching expiry (FEFO).
4. **Integration with Picking & Dispatch:**
 - Picking lists prioritize items based on FIFO/FEFO rules.
5. **Reporting:**
 - Reports on stock rotation, expired items, and shelf life utilization.

Safety Stock Management

1. **Minimum Threshold Setting:**
 - Define safety stock for each SKU based on demand and lead time.
2. **Automatic Alerts & Reorder Suggestions:**
 - System triggers alerts when stock falls below safety level.
3. **Dynamic Safety Stock Calculation:**
 - Adjust thresholds automatically based on historical demand and supply variability.
4. **Reporting:**
 - Safety stock vs. current stock comparison, projected stockouts.

- **Workflow**

Step	FIFO/FEFO	Safety Stock
Receive goods	Record arrival date & batch	Update total stock
Store in warehouse	Track location per batch	Monitor cumulative stock
Picking for orders	Pick oldest stock (FIFO) or earliest expiry (FEFO)	Ensure safety stock not breached
Alerts	Notify for near-expiry stock	Notify if stock falls below threshold
Replenishment	Trigger reorder for low stock	Automatic PO suggestions

1. Reporting & Analytics

Purpose:

- Provide real-time and historical insights into warehouse operations.
- Enable managers to monitor **inventory levels, stock movements, order fulfillment, and operational efficiency**.
- Support **data-driven decision-making** and compliance reporting.

Key Users: Warehouse Managers, Inventory Supervisors, Finance, and Operations Teams

Reporting Features

A. Inventory Reports

- **Current Stock Levels:** Shows quantity on hand per SKU, warehouse, or location.
- **Stock Valuation:** Calculates total stock value based on cost or selling price.
- **Low Stock & Safety Stock Alerts:** Highlight SKUs below minimum thresholds.
- **Batch & Expiry Reports:** Identify near-expiry or expired items.
- **Stock Movement History:** Track all additions, removals, adjustments, and transfers.

B. Order & Fulfillment Reports

- **Pending Orders:** List of orders not yet picked/packed/dispatched.
- **Order Fulfillment Rate:** Percentage of orders completed on time.
- **Picking & Packing Accuracy:** Track errors during outbound processing.
- **Dispatch Reports:** Orders dispatched per day/week/month and associated couriers.

C. Warehouse Operations Reports

- **Inbound vs. Outbound Analysis:** Compare goods received vs. shipped.
- **Location Utilization:** Warehouse zone or shelf occupancy rates.
- **Cycle Counting Reports:** Results of physical stock audits and discrepancies.
- **Labor Productivity:** Track performance of pickers, packers, and other staff.

D. Analytics & Dashboards

- **Trends Analysis:** Inventory turnover, stock aging, demand patterns.
- **Predictive Analytics:** Forecast future stock requirements based on historical demand.
- **Customizable Dashboards:** Managers can visualize KPIs, charts, and graphs.
- **Export & Sharing:** Export reports to PDF, Excel, or integrate with BI tools.

Dashboard Integration(UI/UX & Backend)

- Use **Django Templates + Chart.js** or **Plotly/Dash** to create **interactive visualizations**.
- Example charts:
 - Inventory Aging Chart
 - Monthly Dispatch Volume
 - Stock Turnover Rate
 - Low Stock Alerts

Workflow

1. **Data Collection:** All inbound, outbound, and adjustment transactions are recorded in the system.
2. **Data Aggregation:** System aggregates transactions per SKU, warehouse, and date range.
3. **Report Generation:**
 - Standard reports: Current stock, pending orders, low stock.
 - Custom reports: Filter by category, location, or batch.
4. **Visualization:** Display KPIs and trends in dashboards with charts.
5. **Decision Making:** Use insights to plan purchases, optimize warehouse layout, and improve fulfillment.

User Access Control and Security

- **Purpose:**
 - Ensure **only authorized users** can access certain warehouse functions or data.
 - Protect inventory, financial, and operational information.
 - Maintain audit trails for accountability.
- **Key Users:**
 - Admins, Warehouse Managers, Inventory Supervisors, Storekeepers, Logistics Staff, Finance/Accounts, External Vendors/Clients.
- **Security Goals:**
 - Role-based access control (RBAC)
 - Authentication and authorization
 - Data confidentiality and integrity
 - Audit logging

User Roles & Permissions

Role	Responsibilities / Access
Admin	Full system access, user management, system configuration, assign roles.
Warehouse Manager	Oversee all warehouse operations, approve stock movements, access reports.
Inventory Supervisor	Manage inventory accuracy, adjustments, cycle counts.
Storekeeper	Add/Edit/View stock items, execute GRN, putaway, picking/packing.
Logistics/Delivery Staff	Access dispatch, track shipments, update delivery status.
Finance/Accounts	View financial reports, stock valuation, integration with accounting.
External Users (Vendors/Clients)	Limited access to stock or order status.

Permissions

- Define permissions at **module, action, or object level**.

Examples:

- Can **add/edit stock**: Yes/No
- Can **approve adjustments**: Yes/No
- Can **view reports**: All/Restricted

3. Authentication & Authorization

A. Authentication

- Ensure **only verified users** can log in.
- Methods:
 - Username + Password
 - Two-Factor Authentication (2FA) for Admins
 - Single Sign-On (SSO) integration for global warehouses

B. Authorization

- Control **which modules, functions, or data each user can access**.
- Example: Storekeepers can pick and putaway, but cannot approve adjustments.

Security Features

A. Role-Based Access Control (RBAC)

- Assign roles to users.
- Map roles to **permissions** for CRUD operations and reports.
- Easy to modify access without changing code.

B. Data Protection

- Encrypt sensitive fields (e.g., financial data, passwords).
- Use HTTPS for all web traffic.
- Restrict direct database access.

C. Audit Trails

- Track every critical action:
 - Stock adjustments
 - User login/logout
 - Picking, packing, dispatch actions
 - System configuration changes

Session Management

- Set session timeouts for inactive users.
- Limit simultaneous logins if needed.

E. Alerts & Monitoring

- Notify admins on suspicious activities (failed logins, unauthorized access attempts).
- Maintain logs for security audits.

Workflow

1. **User Login:** Authenticate user credentials.
2. **Role Verification:** Check user role and associated permissions.
3. **Access Control:** Allow/deny access to modules, actions, and data.
4. **Action Logging:** Record every critical action in audit logs.
5. **Periodic Review:** Admin reviews roles and permissions to maintain security.

Project Modules

- Inventory Control
- GRN & Putaway

- Picking, Packing, Dispatch
- SKU & Barcode/RFID
- Stock Adjustments & Reconciliation
- FIFO/FEFO Management
- Multi-Warehouse Operations
- Reporting & Analytics
- Inbound & Outbound Logistics
- User Access & Security

✓ 1. Localization & Language Support

✓ Arabic + English (Bilingual System)

Full RTL (right-to-left) UI support

User can switch between Arabic/English

Arabic labels on forms, reports, and invoices

Unicode support for SKU/item names in Arabi

