**ENTERPRISE SYSTEMS ASSIGNMENT**

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**MED** **Pharma** Manufacturing Company Ltd

**1.1 Introduction**

#### MED Pharma is a pharmaceutical company based in Rwanda that produces brand-name and generic drugs. **As a health company dealing with the manufacturing of medicines, it works in a Mixed-mode encompassing Make-to-Order (MTO) and Make-to-Stock (MTS) manufacturing model, **a****llowing it to respond flexibly to market needs****.** There are some contexts in which it cannot work due to its nature. These include Engineer-to-order (ETO) and** Configure-to-order **(CTO).**

#### **Despite all efforts to help in our health sector, MED pharma currently operates without an Integrated Enterprise Resource Planning(ERP), which presents challenges to the daily business process.** Business functions such as procurement, manufacturing, inventory control, finance, and compliance operate in silos, resulting in communication struggles and duplicated efforts increasing financial costs.

#### Additionally, **the absence of an ERP leads to scattered, redundant data, limited coordination among business units, inefficient inventory, and production management. Moreover**, tracking product batches, managing quality assurance, and adhering to pharmaceutical regulations become cumbersome and error-prone.

#### This work focuses on designing an ERP architecture tailored for MED Pharma’s pharmaceutical environment. The system architecture covers core business functions and is designed to ensure that business units are all integrated to streamline communication and data flow.

#### 1.2 Abstract

MED Pharma is a pharmaceutical manufacturing business that creates both name-brand and generic medications. Due to the lack of an integrated Enterprise Resource Planning (ERP) system, the firm has severe operational issues. Among these difficulties include ineffective inventory control, inadequate production scheduling, restricted data visibility, a lack of departmental cooperation, and trouble fulfilling quality and regulatory requirements. As a result, Decision-making is delayed and efficiency is hampered when business divisions are unable to communicate effectively with one another. The goal of this assignment is to design a customized ERP system architecture for MED Pharma that will increase operational efficiency, optimize internal processes, improve regulatory compliance, and present real-time data for strategic decision-making.

**2.1 System Integration**

System integration at MED Pharma aims to unify various IT systems into one cohesive environment, allowing smooth data flow and communication across departments. This integration supports real-time data sharing, automates key workflows, strengthens regulatory compliance, improves batch tracking and quality assurance, and provides centralized dashboards for better operational oversight—all crucial for the company's mixed MTO/MTS pharmaceutical model

#### 1. Logical Integration

#### Logical integration ensures data visibility and seamless workflow across business functions:

#### Implement cross-functional business processes that cut across silos.

#### Align systems with business processes (not just department functions).

#### Use standardized data models to ensure consistent information.

#### 2. Physical Integration

#### Physical integration refers to the actual connection of software and hardware systems:

#### Adopt a three-tier ERP architecture: Web Tier (User Interface), Application Tier (Business Logic), Data Tier (Databases).

#### Introduce middleware tools to connect legacy applications with the new ERP.

#### Utilize web services and API gateways for real-time interactions with third-party systems (e.g., logistics, regulatory portals).

#### Steps to Achieve Integration

| Step | Description |
| --- | --- |
| 1. Resource Categorization | Identify key applications and infrastructure to support ERP. |
| 2. Compliance & Standards | Implement single sign-on, encryption, and role-based access. |
| 3. Legacy System Support | Create policies to interface with or phase out existing systems. |
| 4. Middleware Tools | Use tools like enterprise service buses (ESBs) or APIs for integration. |
| 5. Authentication & Authorization | Ensure secure access control across systems. |
| 6. Centralized IT Support | Create a centralized help desk and training platform. |
| 7. Backup, Recovery & Security | Deploy robust disaster recovery and cyber security protocols. |
| 8. Hardware & Software Standardization | Align all purchases with IT strategy and ERP compatibility. |

#### 2.2 Business processes

#### To understand MED Pharma's business process, let's first understand its manufacturing model.

#### Make-to-order manufacturing is when the production of a certain product is initiated by an order. When an order for a certain commodity is received, the company starts producing, which raises the need for a material planning system.

#### Make-to-stock manufacturing is when a company produces a certain amount of a particular product and stocks it, waiting for customers to place orders. This raises the need for an inventory management system.

### **1. Order Management (Sales & Marketing Department)**

### This is the starting point of MED Pharma’s operations. When a distributor places an order, the system verifies stock availability. If stock exists, the order is forwarded to the warehouse for fulfillment. If not, it triggers the production planning process. The goal is to ensure timely, accurate order handling to satisfy demand and customer expectations

### **2. Production Planning & Scheduling**

### Once an order is confirmed and production is required, the Production Planning Department steps in to create a manufacturing schedule. This department evaluates the availability of raw materials, machine availability, batch size, and labor before generating a production schedule. The aim is to optimize production time, avoid conflicts in machine use, and ensure timely fulfillment of orders. A well-designed schedule supports efficient use of resources and prevents production delays.

### **3. Inventory & Material Management**

This process involves managing all the materials required for production, including raw materials, packaging components, and semi-finished goods. Inventory management ensures that materials are available in the right quantity at the right time. When a production request is raised, the inventory team checks for available materials. If pre-tested materials are in stock, they are issued to production. Otherwise, the procurement process is initiated. This process also includes monitoring stock levels, reordering thresholds, and proper storage of sensitive pharmaceutical materials under controlled conditions.

### **4. Procurement**

### The procurement process involves sourcing and purchasing raw materials, packaging components, and other supplies from approved vendors. When inventory levels are low or items are out of stock, the procurement team generates purchase orders. Procurement must ensure that suppliers meet the company’s quality, regulatory, and cost requirements. The efficiency of this process significantly affects the continuity of production and the cost of operations.

### **5. Production Department**

The manufacturing process involves producing medicines in batches, following strict GMP (Good Manufacturing Practices) guidelines. It includes preparation, mixing, filling, and packaging. Each step is logged and tracked for quality and regulatory compliance. This process is central to MED Pharma’s operations.

### **6. Quality Control (QC)**

### Quality Control is a critical process in pharmaceutical manufacturing. It involves testing raw materials, semi-finished goods, and finished products to ensure they meet predefined quality standards. The QC team performs laboratory tests, inspects packaging, and prepares detailed reports. Only materials that pass QC are approved for production or dispatch. This department ensures the integrity, safety, and efficacy of products, which is essential for regulatory compliance and patient safety.

### **7. Quality Assurance (QA)**

### Beyond testing, QA monitors the entire production workflow to ensure procedures are followed correctly. This process includes reviewing production and test records, approving deviations if any, and releasing final products for dispatch only after all validations are complete.

### **8.** Dispatch and Distribution

This process involves preparing and shipping products to customers or distributors. Orders are packed, invoices are generated, and delivery logistics are coordinated. The goal is efficient, timely, and traceable delivery of medicines under controlled conditions.

### **9.** Financial Transaction Management

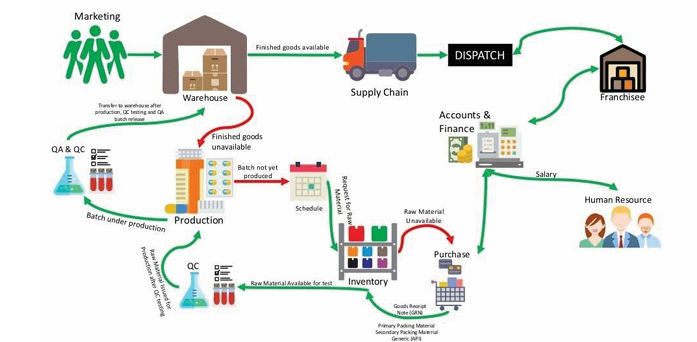
This includes all monetary processes such as handling payments from customers, managing supplier invoices, processing salaries, and tracking operational costs. It supports profitability, legal compliance, and financial planning.

### **10. Human Resources management**

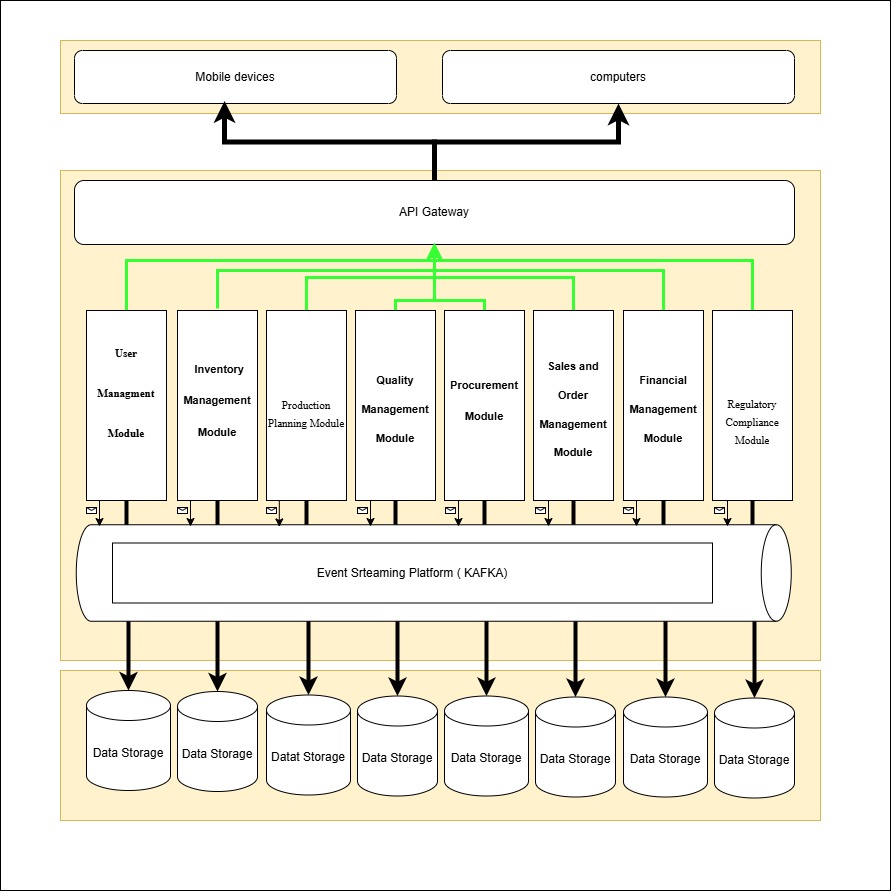
### This process covers the recruitment, onboarding, training, attendance tracking, performance evaluation, and payroll management of employees

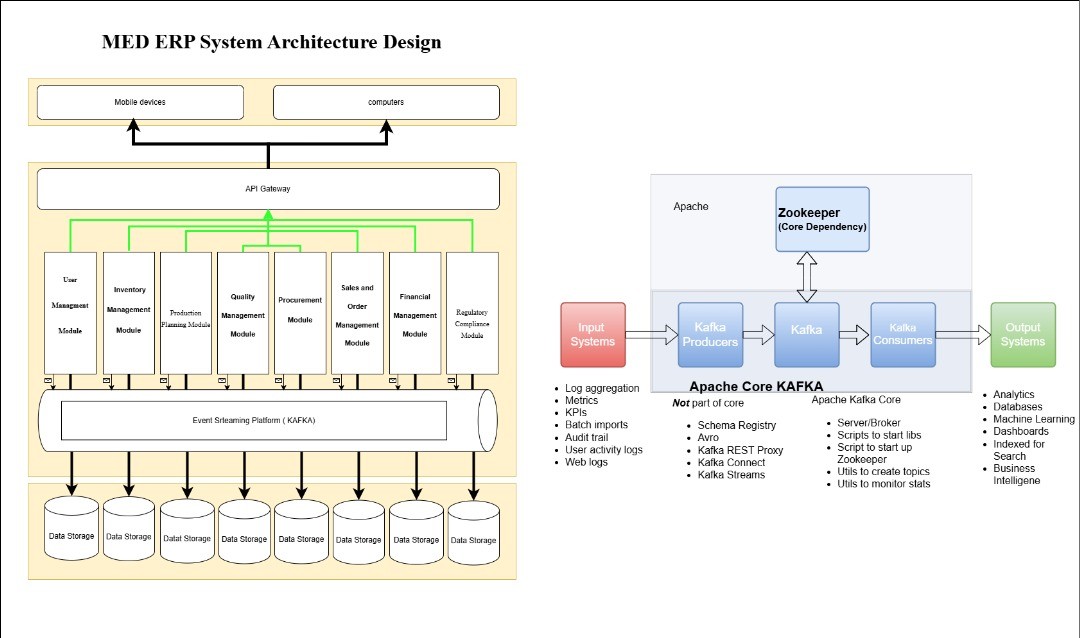
### **11.** Regulatory Compliance and Documentation

### This process ensures that all operational activities comply with local and international pharmaceutical laws. It involves maintaining batch records, QC reports, audit logs, and certifications, all of which are vital for inspections and audits.



2.3 General architecture

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