Name : Muhammad Amin Iqbaal Alam

Potition : System Analyst

- ERP Architecture Design
  1. Components Involved:
     a. System Components
        i. **ERP Modules**

No.	Name	Description
1	Inventory Management	Manages stock levels, raw materials, and finished goods.
2	Production Management	Manages production schedules, work orders, and capacity planning.
3	Financial Management	Handles accounts payable/receivable, general ledger, budgeting, and financial reporting.
4	HR Management	Manages employee records, payroll, benefits, and performance.

        ii. **Relational Database**: Centralized database that stores all ERP data, ensuring consistency and accessibility.
        iii. **Middleware**: Facilitates communication between different ERP modules and the database
        iv. **API Gateway**: Manages external integrations through RESTful APIs, enabling third-party applications to interact with the ERP system.
        v. **User Interface (UI)**: Front-end applications or web interfaces that users interact with to access various ERP functionalities.
     b. Architectural Diagram
        i. At the core, the **Relational Database** serves as the central repository.
        ii. Each ERP module (Inventory, Production, Finance, HR) connects to the database through **Middleware**.
        iii. The **API Gateway** sits on top of the Middleware, enabling communication with external applications (e.g., suppliers, customers).
        iv. **User Interfaces** connect to the ERP modules, allowing users to interact with the system via web or mobile applications.
  2. Data Flow

No.	Name	Description
1	Raw Material Ordering	i. The Inventory Management module checks stock levels. ii. If stock is below the reorder point, it triggers an order through the Procurement system. iii. Financial Management allocates budget and processes payments. iv. Upon receipt, Inventory Management updates stock levels.

2	Production	i. Production Management receives work orders and checks raw material availability in Inventory Management. ii. If sufficient materials are available, production schedules are generated. iii. Production data is sent back to Inventory Management to update material consumption. iv. Finished goods are logged in Inventory Management.
3	Finished Product Sales	i. Sales orders from customers are processed in the Financial Management module. ii. Inventory Management verifies stock levels and triggers shipment. iii. Financial Management handles invoicing and records revenue.

- Algorithm Used in the System

No.	Function	Proposed Algorithm	Considerations
1	Production Scheduling Algorithm	i. **Priority-Based Scheduling Algorithm** • Assigns priorities to orders based on delivery deadlines, material availability, and production capacity. • The algorithm sorts orders by priority and schedules them accordingly, optimizing machine usage and minimizing idle time.	i. The algorithm checks production capacity and availability of raw materials. ii. It adjusts schedules dynamically based on real-time data, ensuring on-time delivery.
2	Inventory Management Algorithm	i. **Economic Order Quantity (EOQ) Algorithm**: • Calculates the optimal order quantity that minimizes the total holding and ordering costs. ii. **Reorder Point (ROP) Calculation**: • ROP = Lead Time Demand + Safety Stock. • Automatically triggers reorder when stock levels fall to the ROP.	i. The algorithm monitors stock levels continuously and updates reorder points based on consumption patterns. ii. It includes a buffer (safety stock) to manage uncertainties in demand and supply.

- Risk Management and Disaster Recovery

No.	Name	Descriptions

1	Risk Identification	i. **Integration Failure Risk**: Failure to integrate ERP modules with existing systems or external applications. ii. **Data Error Risk**: Incorrect data entry or processing, leading to inaccurate reports and decisions. iii. **User Inexperience Risk**: Employees might struggle to adapt to the new system, leading to inefficiencies.
2	Mitigation Strategies	i. **Integration Failure Mitigation** : a. Conduct thorough system compatibility testing. b. Implement a phased integration approach. ii. **Data Error Mitigation** : a. Use data validation techniques. b. Provide comprehensive training on data entry procedures. iii. **User Inexperience Mitigation**: a. Conduct extensive user training sessions. b. Implement a user-friendly interface with guided workflows. iv. **Disaster Recovery Procedures :** a. Implement regular data backups and redundancy. b. Establish a disaster recovery plan, including off-site backups and a failover system.
3	Testing Plan	i. **ERP Testing Phases**: a. Unit Testing: Test individual modules for functionality. b. Integration Testing: Ensure modules work together seamlessly. c. System Testing: Test the entire ERP system in a production-like environment. d. User Acceptance Testing (UAT): Verify the system meets user requirements. ii. **Testing Scenarios**: a. Raw Material Ordering: Simulate low stock levels and verify automatic reorder. b. Production: Test production schedules under different constraints. c. Sales: Process a customer order and verify the complete flow from order to delivery.

- Documentation and Training

No	Document Name	Propose	Contents
1	System Architecture Document	To provide a high-level overview of the ERP system architecture, describing the system components, their	• Introduction to the ERP system. • Detailed architecture diagram. • Description of each component (modules, database, middleware, API gateway, UI).

		interactions, and the technologies used.	• Explanation of data flow and interaction between components. • Technology stack (programming languages, frameworks, databases, etc.).
2	ERP Module Functional Specifications	To define the specific functionalities of each ERP module, outlining what the module is supposed to do and how it should behave.	• Overview of each module (Inventory, Production, Financial, HR). • Functional requirements for each module (e.g., inventory tracking, production scheduling, financial reporting). • Detailed use cases and user stories. • Workflow diagrams for each module's processes. • Validation rules and constraints.
3	Database Schema and Data Dictionary	To describe the structure of the database, including tables, relationships, and the meaning of each data element.	• Database schema diagram (ERD). • List of all tables with descriptions. • Detailed description of each table's columns (data types, constraints, keys). • Relationships between tables (foreign keys, one-to-many, many-to-many). • Data Dictionary: Definitions and descriptions of each data element.
4	API Documentation	To provide a comprehensive guide for developers on how to use the APIs for integrating with the ERP system.	• Overview of the API architecture. • Authentication and authorization mechanisms. • Endpoints for each module (Inventory, Production, Financial, HR). • Request and response formats (e.g., JSON, XML). • Example API calls and responses. • Error codes and handling mechanisms.
5	User Manuals and Training Guides	To provide end-users with instructions on how to use the ERP system effectively.	• Overview of the ERP system and its modules. • Step-by-step guides for common tasks (e.g., creating a purchase order, running a production schedule).

			• Screenshots and annotated diagrams. • Troubleshooting tips and FAQs. • Training materials for different user roles (e.g., admin, manager, employee).
6	Implementation Guides	To outline the steps required to deploy and configure the ERP system in the production environment.	• Pre-implementation checklist. • Installation and configuration procedures. • Database setup and migration instructions. • Integration steps with existing systems. • Testing and validation procedures post-deployment. • Go-live plan and timeline.
7	Disaster Recovery Plan	To ensure that the ERP system can be quickly recovered in case of a failure, minimizing downtime and data loss.	• Risk assessment and potential failure scenarios. • Data backup procedures (frequency, storage locations, encryption). • Failover mechanisms and redundancy planning. • Recovery time objectives (RTO) and recovery point objectives (RPO). • Step-by-step disaster recovery procedures. • Roles and responsibilities during a disaster recovery event.