Software Requirements Specification

for

Supply Chain Management System

Version 1.0

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Revision History

Name	Date	Reason For Changes	Version

1. Introduction

1.1 Purpose

This document outlines about the shopping website of company A with a delivery management system. This will enable the company to reach customers island-wide and expand the business more efficient manner. The purpose of the software is to provide an integrated shopping platform and delivery management system for Company A, enabling them to efficiently reach customers island-wide. The system facilitates customer orders through an online shopping website, while automating and optimizing the logistics and distribution processes. By selecting suitable train schedules, assigning drivers and assistants based on rosters, and managing deliveries through predefined routes, the software streamlines order fulfillment. This enhances Company A's operational efficiency, ensuring timely deliveries, optimizing resource usage, and ultimately supporting business expansion across the island.

The Software Requirements Specification (SRS) outlines the requirements for the Supply Chain Management System (SCMS) to be developed for Company A, a production company located in Kandy, Sri Lanka. The SCMS is designed to optimize the company's distribution process of products via railways to key cities, with products stored in warehouses near major railway stations. The products will thereafter be dispatched through trucks from these warehouses directly to wholesalers, retailers, and end customers, having an option to choose their preferred route for delivery. The system will manage all aspects of the supply chain, including order management, inventory tracking and the scheduling of deliveries. This SRS will guide the development and implementation of the SCMS to meet Company A’s operational needs and strategic objectives.

1.2 Document Conventions

This document follows standard database design and documentation conventions. Requirements are presented in a structured format, including a requirement identifier, description, and associated attributes. This document is under the IEEE Software Requirement Specification. Using IEEE standard document rules such as Font and text styles, use of table and figures, change history, formatting and page layout, and review and approval. Entity names are capitalized, and relationships are described using primary key (PK) and foreign key (FK) references.

1.3 Intended Audience and Reading Suggestions

This SRS is intended for the following audiences:

- Developers
- Project Managers

- Document writers
- Testers
- Administrators

The rest of this document contains the overall description, external interface requirements, system features, and other non-functional requirements. For a comprehensive understanding, readers are recommended to start with the overview sections and then proceed to sections relevant to their roles and interests. The document is organized to facilitate easy navigation and comprehension of the system's requirements.

1.4 Product Scope

The Supply Chain Management System aims to streamline the distribution of products from Company A's factory in Kandy to customers across the island using a combination of railway and truck transportation. The system aims to enhance the shopping experience for customers and improve business management for the supplier by providing the following features:

- **Order Management**: Handling customer orders, scheduling, and tracking.
- **Railway and Truck Scheduling**: Optimizing transportation by assigning orders to train trips and truck routes based on capacity and routes.
- **Resource Management**: Managing drivers, assistants, trucks, and storage facilities efficiently.
- **Reporting and Analytics**: resource utilization, and operational efficiency through comprehensive reporting features both customers and workers.
- **Customer Interaction**: Facilitating order placement, status tracking, and feedback collection through a user-friendly user interface.

1.5 References

This SRS document refers several resources including,

1. IEEE. IEEE Std 830-1998 IEEE Recommended Practice for Software Requirements Specifications. IEEE Computer Society, 1998.

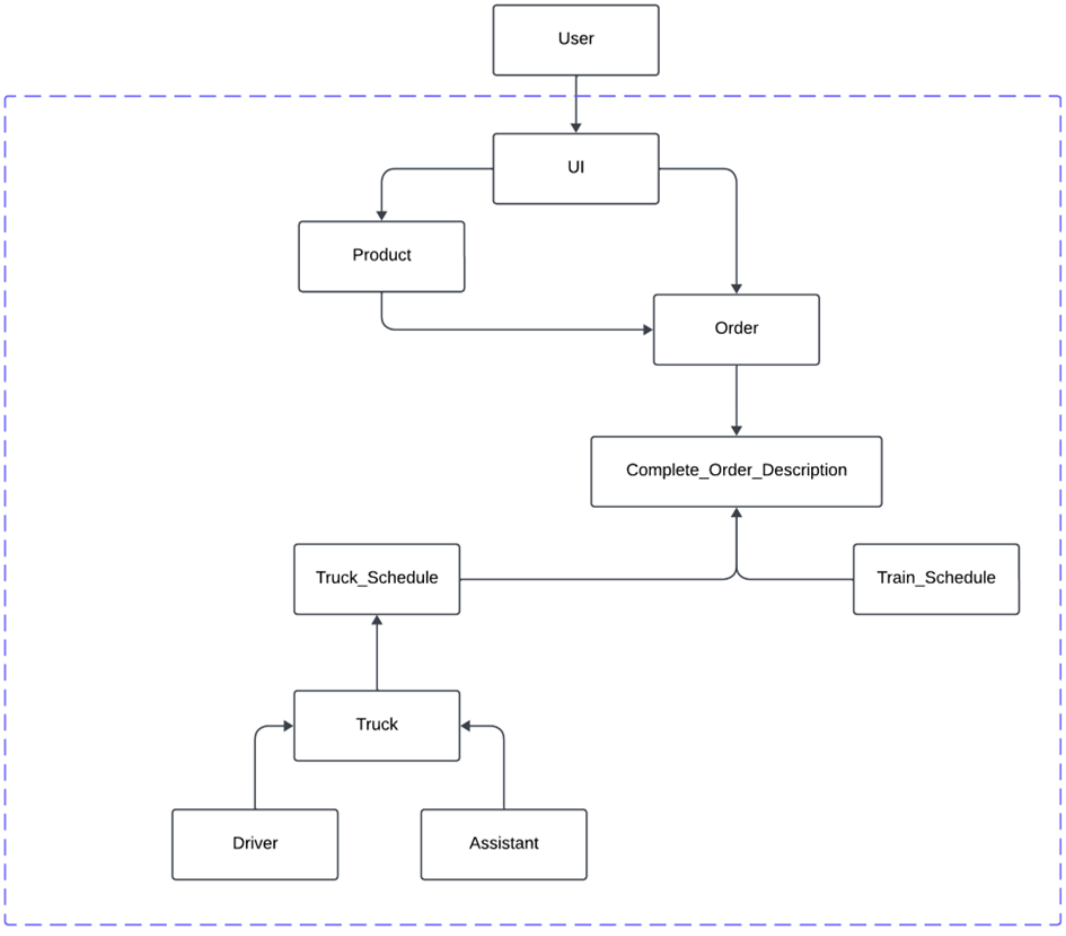
2. How to Write a Software Requirements Specification (SRS Document) - https://www.perforce.com/blog/alm/how-write-software-requirements-specification-sr s-document

2. Overall Description

2.1 Product Perspective

The Supply Chain Management System is a standalone application designed to handle the distribution logistics for Company A. It interacts with the railway department's scheduling system and internal inventory management to ensure efficient order fulfillment. It is designed to be a standalone platform while leveraging its existing infrastructure, including multiple warehouses for product storage and a courier service subsidiary for product delivery.

The primary goal is to provide a user-friendly and efficient online shopping experience for customers, enabling them to explore a curated subset of the product catalog, make purchases, and choose between delivery and in-store pickup options. To achieve this, the system will maintain detailed information about different products, their variants, categories, and custom attributes. It will also manage inventory, handle customer registration and guest browsing, and support various payment methods.



2.2 Product Functions

2.2.1 User Registration and Authentication

- Register new users (wholesalers, retailers, and end customers) and login existing users with valid password credentials.
- Save user data in the database with unique user IDs and roles (wholesaler, retailer, end customer).

2.2.2 Product Management

- Add products to the database and classify them according to their type.
- Store product attributes, including product weight, volume, and train capacity consumption data.

2.2.3 User Interaction

- Add products to a cart and check the bill price including tax and delivery charges.
- Allow guest users to search for products.

2.2.4 Order process

- Place orders: Customers place orders with specified products, delivery dates, and routes.
- Manage order fulfillment: Track whether an order is fulfilled via train or truck, with capacity checks for each shipment.

2.2.5 Delivery Management

- Schedule truck deliveries from the store to customer addresses based on predefined routes
- Assign drivers and assistants to truck schedules according to the driver and assistant rosters.
- Enforce roster constraints: Ensure that drivers and assistants do not exceed working hours and abide by scheduling restrictions.

2.2.6 Reporting and Analytics

- Generate reports for quarterly sales, order trends, and sales categorized by cities and routes.
- Monitor the working hours of drivers and assistants to ensure compliance with work-hour constraints.
- Analyze truck usage based on the hours each truck has been in service.
- Generate customer-order reports to monitor the flow of orders and deliveries.

2.2.7 Train and Truck Scheduling

- Manage train schedules with predefined routes and capacities for each trip, ensuring that orders are allocated efficiently.

- Optimize truck routes to cover delivery areas effectively, ensuring deliveries are completed within the maximum allowed time per route.

2.3 User Classes and Characteristics

2.3.1 Administrator

Characteristics:

- Manages overall system configurations.
- Defines and updates routes for trucks and trains.
- Sets train capacities for each route and transportation trip.
- Monitors system integrity and ensures smooth operations.

Responsibilities:

- Create and modify routes.
- Set product distribution capacities for trains.
- Manage user roles (Logistics Manager, Driver, Assistant, Customer).
- Generate high-level reports on system performance.

2.3.2 Logistics Manager

Characteristics:

- Oversees transportation scheduling and order fulfillment.
- Coordinates between train schedules and truck deliveries.
- Ensures that orders are assigned to transportation modes based on capacity constraints.

Responsibilities*:*

- Schedule train and truck routes.
- Assign orders to available transportation capacity.
- Manage and update train and truck schedules.
- Verify that deliveries are being fulfilled on time.
- Monitor inventory in stores and track the flow of orders.

2.3.3 Driver/Driver Assistant

Characteristics:

- Drivers and their assistants are assigned to deliver orders by truck.
- They follow predefined routes set by the system.

Responsibilities:

- Follow scheduled routes to deliver customer orders.
- Ensure timely and accurate deliveries.
- Abide by work-hour constraints set by the system (e.g., drivers can't work two consecutive shifts).
- Assist in the loading/unloading of goods.

2.3.4 Customer

Characteristics:

- Users who place orders (wholesalers, retailers, or end customers).
- Can browse products and select appropriate delivery routes.

Responsibilities:

- Place orders for products.
- Select delivery routes based on proximity to their delivery address.
- Monitor order status and delivery progress.
- Make payments through the payment system.

2.4 Operating Environment

The operating environment of the supply chain management system consists of,

- Standard web servers.
- Relational database management systems (e.g., MySQL) for storing flight schedules, bookings, and user information.
- Web-based Interface for user access. (Users will access it through web browsers on various devices)

2.4.1 Hardware Platform

Servers: The SCMS will be deployed on cloud-based servers or on-premises servers with the following minimum specifications:

Processor: Quad-core CPU (Intel Xeon or equivalent)
Memory: 64 GB RAM (expandable based on load requirements)
Storage: 2 TB SSD (expandable, with backup and redundancy support)
Network: High-speed Ethernet (1 Gbps or higher)

2.4.2 Software components

Application Framework: The SCMS will be developed using a web-based architecture, likely employing frameworks such as:

- **Backend**: Node.js with Express or Python with Django/Flask
- **Frontend**: React.js or Angular for user interface development
- **APIs**: RESTful APIs for integration with external systems (e.g., Railway Scheduling System, Human Resources System)

2.4.3 Operating system and version

Server-Side:

- **Operating System**: Linux (preferred distributions include Ubuntu 20.04 LTS or CentOS 7/8)
- **Web Server**: Apache HTTP Server 2.4 or Nginx 1.18
- **Database**: PostgreSQL 13 or MySQL 8.0 for data storage and management

2.4.4 Database Management System

The system requires a relational database management system for data storage and retrieval. Compatible DBMS options include:

- MySQL
- Oracle Database

2.5 Design and Implementation Constraints

The design and implementation of the platform must consider various constraints and limitations that may impact the development and deployment of the software. These constraints include:

2.5.1 Hardware and Performance Limitations

The hosting infrastructure's capabilities, particularly the hardware resources (CPU, RAM, storage) available, have an impact on performance. To guarantee optimum performance under variable amounts of user traffic, load balancing, and scalability techniques may be necessary.

2.5.2 Database Technology

Existing organizational preferences or infrastructural restrictions may make it difficult to select a particular database management system (DBMS). Data migration activities may be necessary and complexity may be introduced when switching DBMSs. Also allows it to handle an increasing number of orders, users, and integrations as the company grows.

2.5.3 Parallel Operations

Parallel processing and multi-threading capabilities must be carefully implemented to handle concurrent user requests and maintain system responsiveness during peak usage.

2.5.4 Security Considerations

Authentication, authorization, and encryption protocols should be implemented to safeguard user accounts and transactions.

2.5.5 Programming Language and Frameworks

The choice of programming languages and web development frameworks may be influenced by the development team's expertise and the organization's technology stack.

2.5.6 Communication Protocols

The software must support secure communication protocols (e.g., HTTPS) to protect data transmitted between the user's browser and the server.

2.5.7 Design and Coding Standards

The development team must adhere to the organization's defined coding standards and design practices or industry best practices.

2.5.8 Maintenance and Support

Considerations for ongoing maintenance, updates, and support must be factored into the design and implementation to ensure the long-term sustainability of the platform.

2.5.9 Reliability

The SCMS must be designed for high availability. Regular backups and disaster recovery plans must be in place.

2.6 User Documentation

The Supply Chain Management System (SCMS) will include comprehensive client documentation to assist users in understanding and effectively utilizing the platform. The user documentation components that will be delivered with the software include:

2.6.1 Contextual guides and online assistance

The application itself will provide direct access to online help resources on the platform. Contextual guides offer support and clarifications pertinent to the user's present task. Pop-up help, FAQs, and tooltips are available for users to quickly find answers to frequently asked queries.

2.6.2 Updates and Release Notes

Release notes that notify users of new features, improvements, and bug corrections are included with software updates. Users will be able to view release notes through the website or application of the platform.

2.6.3 Privacy Statement and Terms of Service

The platform will make its terms of service and privacy policy available to users, including crucial legal and privacy-related details.

2.7 Assumptions and Dependencies

This platform’s development and successful operation are based on certain assumptions and dependencies. These factors could impact the project's requirements and outcomes:

Assumptions:

- **Integration of Third-Party Services:** APIs and service availability notwithstanding, it is presumed that third-party services like payment gateways and railroads will be integrable. Modifications or disruptions to these services may impact their functionality.
- **Availability of Hardware Resources:** The project makes the assumption that the chosen hardware infrastructure will have enough RAM, CPU, and storage to meet the platform's performance needs. To handle rising demand, scalability alternatives must be offered.
- **Database System Compatibility:** The project is predicated on the notion that the selected database management system (DBMS) would remain compliant with the platform's specifications. Information relocation efforts may be necessary in the event of DBMS changes.
- **Store Locations**: The stores near the railway stations are strategically located to minimize delivery times to customers. Each store has sufficient storage capacity to hold the products until they are distributed by trucks and there are sufficient number of trucks available for delivery

- **System Capacity**: The system is assumed to handle all users, including customers, administrative staff, and logistics personnel, without experiencing crashes, lags, or performance degradation. This includes peak usage times, such as during order processing deadlines and report generation periods.

Dependencies:

- **Transportation Availability:** Train timetables, capacity, and any modifications thereto are all subject to precise and timely data feeds from the railway department to the system. The system counts on drivers, driving assistants, and other staff to be consistently available.

- **Third-Party Software**: The availability and dependability of third-party software and services are essential whether they are utilized to manage driver rosters, routes, or analytics. It might be essential to integrate with current databases or transportation management systems.

- **Hardware and Network Infrastructure**: The system's continuous functioning, particularly for real-time tracking and reporting, depends on dependable hardware and network infrastructure.

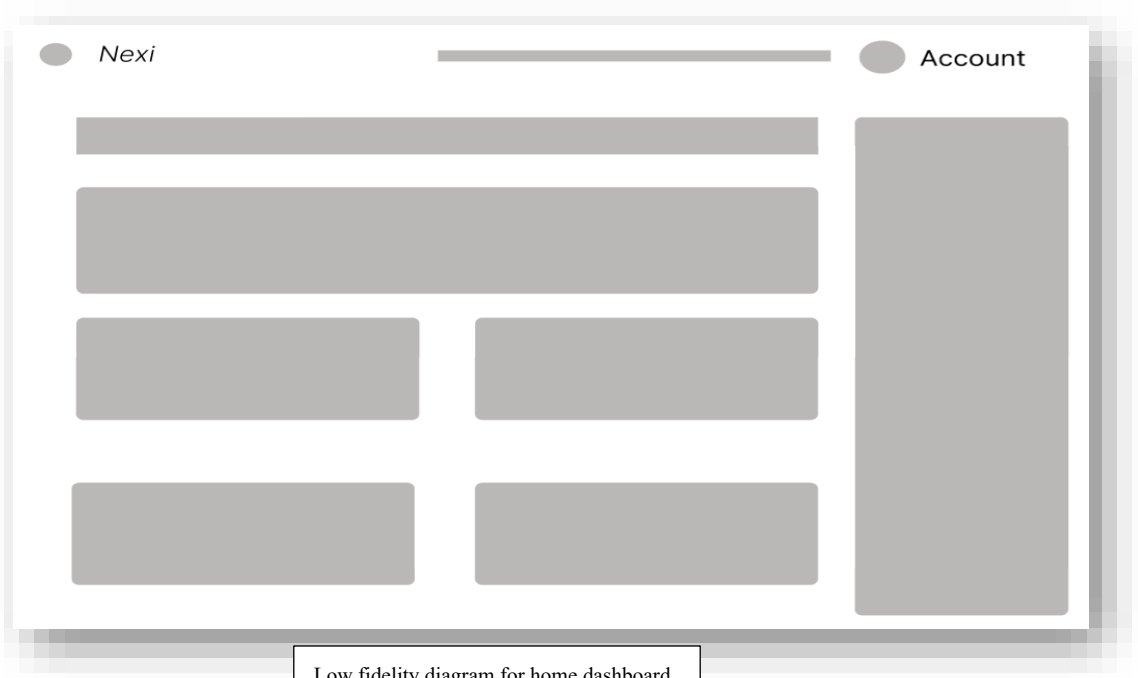
- **External Data Sources**: Outside geolocation data services are necessary to ensure that client addresses and route choices are accurate. Delivery times may be impacted by any changes to the external elements, such as altered road conditions or disruptions in train service.

3. External Interface Requirements

3.1 User Interfaces

3.1.1 Home Dashboard

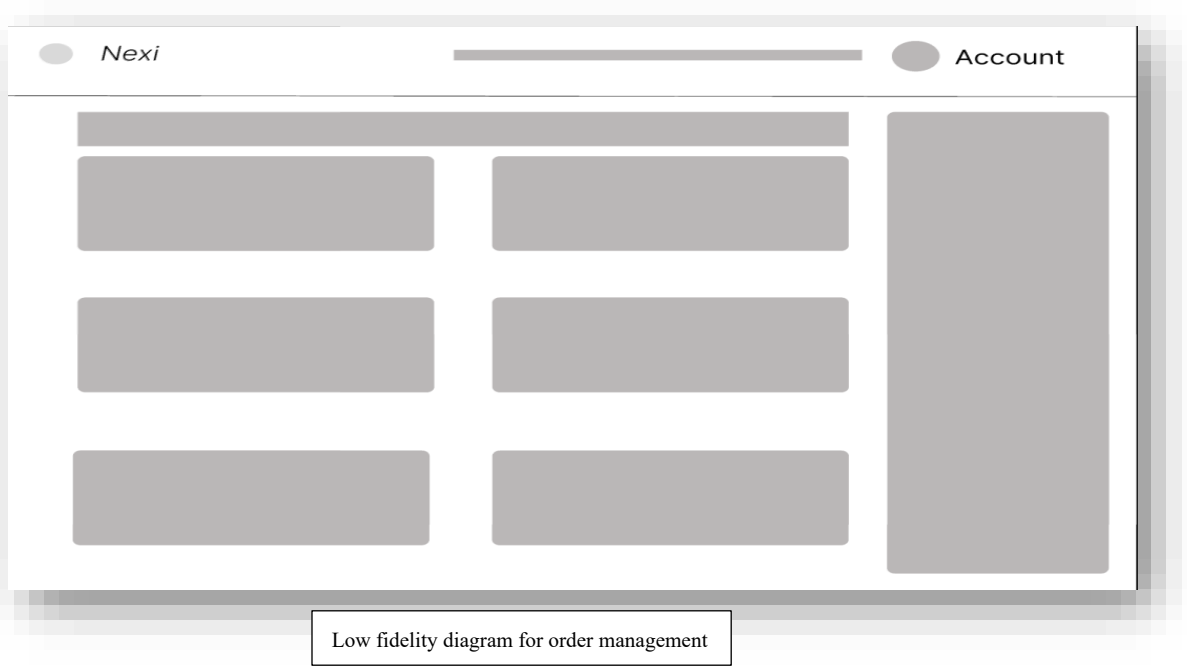
- The purpose of this interface is to provide an overview of key metrics and quick access to main functionalities.
- Components:
    - Navigation Menu: Links to Orders, Schedules, Reports, and Settings.
    - Summary Widgets: Display key metrics such as total orders, upcoming deliveries, and recent sales.
    - Notifications Panel: Display system alerts and updates.
- Use charts and graphs for visual representation of data.
- This interface is accessible to relevant workers in the company.
- Screen Layout Constraints: Ensure a responsive design that adapts to various screen sizes. (e.g. tablets, desktops, mobile phones)
- Standard Buttons & Functions: “Search”, “My Account”, “Help”, and “Total orders”.
- error message display standards: Use the snack bar of the browser to display error messages.



Low fidelity diagram for home dashboard

3.1.2 Order Management Interface

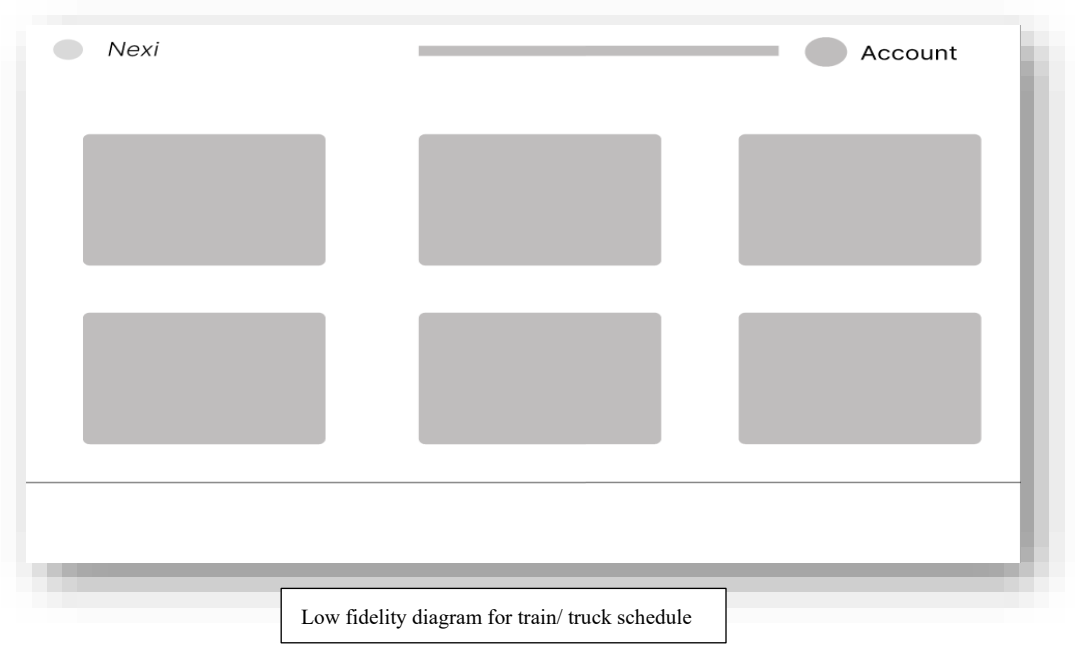
- Purpose of this interface is to allow users to create, view, and manage customer orders.
- Components:
    - Order Form: Input fields for customer details, product selection, delivery date, and route.
    - Order List: Table view of all orders with filters for status, date, and customer.
    - Order Details: Detailed view of individual orders including history and status updates.
- Use form validation to ensure data accuracy. Use clear action buttons for creating, editing, and deleting orders.
- This interface is specially for the manager of the company.
- Screen Layout Constraints : Ensure a responsive design that adapts to various screen sizes . (e.g. tablets, desktops , mobile phones)
- GUI Standards : Consistent layout for admin tasks.
- Standard Buttons & Functions : Include common buttons to manage orders.(e.g. “View” , “Edit” ,”Delete”, “Help”)
- Error message display standards : Use the snack bar of the browser to display error messages.



Low fidelity diagram for order management

3.1.3 Scheduling Interface

- The purpose of this interface is to manage train and truck schedules including capacity allocation and route assignments.
- Components:
    - Train Schedule: Table view for displaying train trips, capacities, and assigned orders.
    - Truck Schedule: Table view showing truck assignments, routes, and driver/assistant assignments.
- Provide visual feedback for capacity limits and scheduling conflicts. Ensure intuitive navigation for schedule management.
- Drivers can view and manage truck schedules and route assignments using this interface.
- Screen Layout Constraints: Ensure a responsive design that adapts to various screen sizes. (e.g. tablets, desktops , mobile phones).
- Standard Buttons & Functions: Includes options for “View train Trips “, “View truck Trips “, and “Capacities”.
- Error message display standards: Use the snack bar of the browser to display error messages.



Low fidelity diagram for train/ truck schedule

3.1.4 Reporting Interface

- Purpose of this interface is to generate and view various reports related to sales, working hours, and order statistics.
- Components:
    - Report Selection: Navigation menu to choose report type (e.g., Quarterly Sales, Items with Most Orders).
    - Report Display: Table view of report data with options for exporting and filtering.
    - Report Filters: Options to specify date ranges, cities, routes, etc.
- Ensure reports are presented in a readable format. Provide export options (e.g., CSV, PDF) and filtering capabilities.
- The manager of the company can take various kinds of reports. Using those reports He/she can make decisions.
- Screen Layout Constraints: Ensure a responsive design that adapts to various screen sizes. (e.g. tablets, desktops , mobile phones)
- error message display standards: Use the snack bar of the browser to display error messages.
- Standard Buttons & Functions: Include options for “Get report” , “SaveAs”, ”Help”.

Low fidelity diagram for reporting interface

3.1.5 User Management Interface (Admin)

- Purpose of this interface is manage user accounts, roles, and permissions.
- Components:
    - User List: Table view of all users with options for adding, editing, and deleting accounts.
    - Role Assignment: Interface for assigning roles and permissions to users.
- Use clear action buttons for user management and ensure data security.
- Screen Layout Constraints: Ensure a responsive design that adapts to various screen sizes. (e.g. tablets, desktops, mobile phones)
- GUI Standards: Use clear and efficient layout for admin tasks.
- Error message display standards: Use the snack bar of the browser to display error messages
- Standard Buttons and functions: Include Options for adding/editing orders, processing orders, managing inventory and generating reports.

Law fidelity diagram for admin

3.1.6 Customer Order Interface

- Purpose of this interface is allow customers to place and track orders.
- Components:
    - Order Placement: Form for entering order details, selecting delivery routes, and specifying delivery dates.
    - Categorize order : Option to categorize orders (e.g. electric, mobile phones , furniture , etc.)
    - Search : search the order that customer need to buy.
    - Cart : If a customer would like to save a certain order, they can add that order to the cart.
    - Order Tracking: Interface for viewing the status of placed orders.
- Use simple and intuitive order placement process. Provide real-time updates on order status.
- After searching for a specific order, if that order is out of stock, blur the picture and name of the order.
- Screen Layout Constraints : Ensure a responsive design that adapts to various screen sizes . (e.g. tablets, desktops , mobile phones).
- Error message display standards : Use the snackbar of the browser to display error messages
- Standard buttons and functions : Include options for “ Add to carts “ , “ Search orders “ , “Categorize orders” , “Select the Language” , “Help and Support” , “Place order” , “Track Order”.

Low fidelity diagram for customer order interface

3.1.7 User Registration Interface

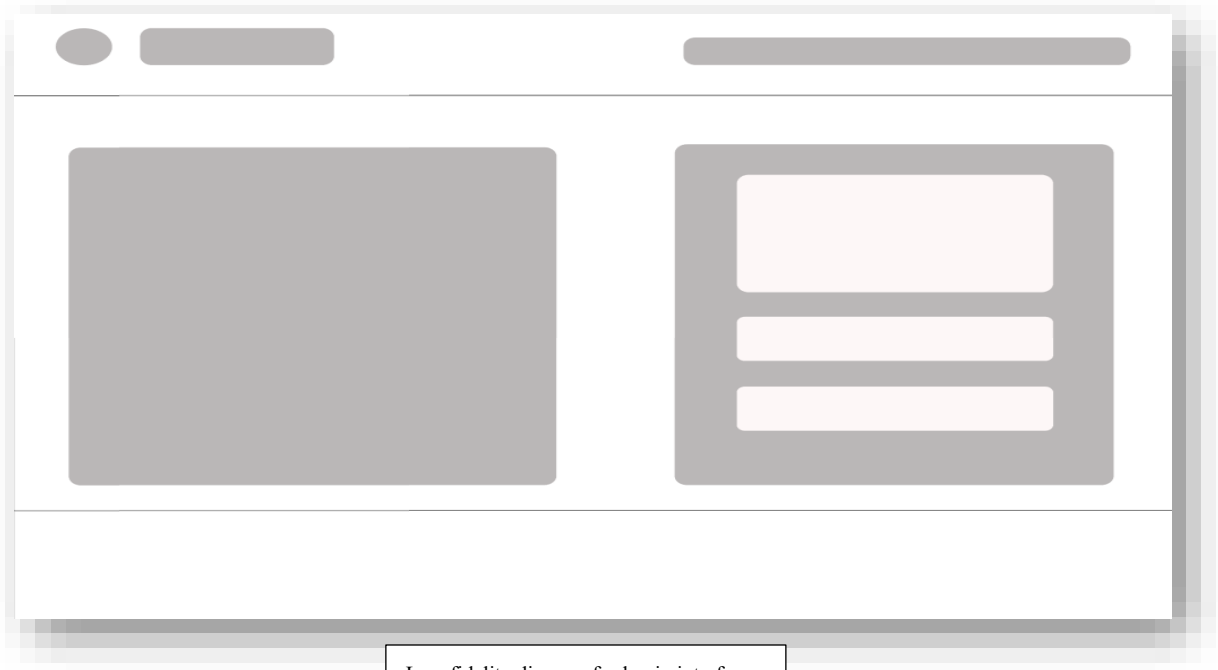
- Purpose of this interface is to allow new users to create an account in the system by providing necessary information.
- Components:
    - Registration Form: Input fields for the following information:
        - Full Name
        - Email Address (which will also serve as the username)
        - Password (with password strength indicator)
        - Confirm Password
        - Optional fields such as Phone Number, Address, etc.
    - Security Measures:
        - CAPTCHA verification to prevent automated registrations.
        - Password requirements (e.g., minimum length, inclusion of numbers and special characters).
    - Action Buttons:
        - Register: To submit the registration form.
        - Clear: To reset the form fields.
    - Error Messages:
        - Display validation errors next to each field (e.g., “Email already in use,” “Passwords do not match”).
    - Confirmation:

- Upon successful registration, a confirmation message is displayed, and a verification email is sent.

Low fidelity diagram for user registration interface

3.1.8 Login Interface

- Purpose of this interface is allow existing users to access the system by entering their credentials.
- Components:
  - Login Form: Input fields for:
    - Email/Username
    - Password
  - Security Measures:
    - CAPTCHA verification (optional, but recommended for enhanced security).
    - Option to enable "Remember Me" functionality for persistent sessions.
  - Action Buttons:
    - Login: To submit the credentials and access the system.
    - Clear: To reset the form fields.
  - Additional Links:
    - Forgot Password: Link to a password recovery interface.
    - Register: Link to the user registration interface.
  - Error Messages:
    - Display errors such as “Invalid username or password” at the top of the form or next to the respective fields.



Low fidelity diagram for log in interface

3.2 Hardware Interfaces

Web Server:

- Hosts the web application, processes logic, and handles communication between the client and database.
- Must have sufficient memory and processing power to handle processors.

Database Server:

- Stores and manages all data related to the supply chain operations, including orders, schedules, user information, and reports.
- Use MYSQL for managing and storing the data.

Client Devices:

- Desktop Computers and Laptops: Used by administrators, managers, and other staff for accessing the system via a web browser that support HTML5 , CSS3 and Java script.
- Tablets and Smartphones: Used by drivers and assistants for accessing schedules, routes, and order details in the field via a web browser that support HTML5 , CSS3 and java script.
- Customers can access to the website using any device mentioned in above via modern web browser that support HTML5, CSS3 and java script.

3.3 Software Interfaces

3.3.1 Database Interface

- Database Type: Relational Database Management System (RDBMS)
- Database Name: SCMS_DB
- Connection: The application will interact with the database using SQL queries through an ORM (Object-Relational Mapping) layer, such as Sequelize for Node.js.
- Data Flow:
    - Incoming: Customer orders, Train schedules, Truck routes, Driver/Assistant rosters, Inventory data.
    - Outgoing: Sales reports, Driver/Assistant working hours, Order delivery status, Inventory levels, Customer order history.
- Services Needed:
    - Data Storage: For all operational data, including customer orders, inventory, schedules, and logs.
    - Data Retrieval: For generating reports, tracking orders, and monitoring resource utilization.

3.3.2 Web Server Interface

- Web Server: Nginx 1.20.x (or similar)
- Connection: Acts as a reverse proxy to manage incoming HTTP/HTTPS requests and forward them to the backend Node.js application.
- Data Flow:
    - Incoming: HTTP requests from users (e.g., placing orders, viewing reports).
    - Outgoing: HTTP responses with web pages, data in JSON format, reports.
- Services Needed:
    - Load Balancing: To distribute traffic among multiple instances of the application.
    - SSL/TLS: For securing data transmission.

3.3.3 APIs and External Services

- Payment Gateway: Stripe API v2023.x (or similar) for handling online payments.
    - Data Flow:
        - Incoming: Payment details, transaction requests.
        - Outgoing: Payment confirmation, transaction status.
- Railway Department API: For real-time train schedule updates and capacity management.
    - Data Flow:

        - Incoming: Train schedules, capacity data.
        - Outgoing: Order assignment to trains.
- Mapping and Routing Service: Google Maps API or OpenStreetMap for route optimization.
    - Data Flow:
        - Incoming: Location data, route requests.
        - Outgoing: Optimized routes, distance calculations.

3.3.4 Libraries and Frameworks

- Front-end: React 18.x for the user interface, Bootstrap 5 for responsive design.
    - Data Flow:
        - Incoming: User inputs for order placement, report generation.
        - Outgoing: Rendered UI components, form submissions.
- Back-end: Node.js 18.x with Express.js for server-side logic and API management.
    - Data Flow:
        - Incoming: HTTP requests from the front-end or other services.
        - Outgoing: JSON responses with processed data, status updates.

3.4 Communications Interfaces

3.4.1 Web Browser Interface

- Protocol: HTTPS for secure communication.
- Standards: HTML5, CSS3, JavaScript, AJAX.
- Compatibility: Modern browsers like Chrome, Firefox, Safari, Edge.

3.4.2 Network Server Communication

- Protocol: RESTful APIs over HTTPS.
- Message Format: JSON.
- Synchronization: ACID transactions for data consistency.
- Data Transfer: Optimized and compressed for efficiency.

3.4.3 Email Notifications

- Protocol: SMTP with TLS encryption.
- Triggers: Automated for order updates, delivery status, etc.
- Format: HTML for professional appearance.

3.4.4 Communication Security

- Encryption: HTTPS with TLS 1.2+ for all data exchanges.

- Authentication: OAuth2 or JWT for secure access.
- Firewall: Protection against unauthorized access.

3.4.5 Communication Standards

- FTP/SFTP: For secure bulk data transfers.
- APIs: REST standards with OpenAPI/Swagger documentation.

3.4.6 Synchronization Mechanisms

- Real-Time Updates: WebSocket or SSE for live data.
- Database Sync: Locking and transaction management for consistency.

4. System Features

4.1 Order Management

4.1.1 Description and Priority

This feature allows customers to place orders and monitor their orders.
Priority: High

4.1.2 Stimulus/Response Sequences

User Action	System Response
Customer adds an item to the cart.	If the item is available, the system updates the cart including the item. If not, display “Out of Stock.”
Customer proceeds to checkout.	The system requests payment details and delivery information and confirms the order after validation.

4.1.3 Functional Requirements

REQ-01: The system shall allow customers to add products to the cart and specify the quantity.

REQ-02: The system shall check the product availability.

REQ-03: The system shall inform the customer if the product is not available.

REQ-04: The system shall verify the payment and then complete the order.

REQ-05: The system shall save customer details, delivery details, ordered items with quantities and cost.

REQ-06: After completing an order, the system should empty the cart and update the inventory count.

4.2 Inventory Management

4.2.1 Description and Priority

This feature allows the company to manage inventory levels and track product usage.

Priority: High

4.2.2 Stimulus/Response Sequences

System or User Action	System Response
Administrator updates inventory levels.	The system updates the inventory counts.
Customer places an order.	The system updates the inventory counts and the order list.
Inventory reaches a predefined low level.	The system notifies the administrators to restock.

4.2.3 Functional Requirements

REQ-07: The system shall maintain a current stock count for every inventory item.

REQ-08: The system shall allow administrators to manually update the inventory count.

REQ-09: The system shall automatically update the inventory count when an order is placed successfully.

REQ-10: The system shall notify the administrators when inventory levels fall below a specified level.

4.3 Transport Management

4.3.1 Description and Priority

This feature manages the distribution of products in the main factory to various customers island-wide using railway systems and trucks.

4.3.2 Stimulus/Response Sequences

System or User Action	System Response
Customer places an order.	The system schedules the order for railway transportation based on available capacity and delivery dates.
Customer selects a delivery route.	The system schedules chosen route as the delivery route
Orders exceed the allocated train capacity.	The system reschedules excess orders for the next available train trip
Train arrives at the destination city.	The system transfers the products to the nearby store.
Truck is scheduled to deliver orders from the store.	The system assigns a driver and an assistant to the truck and schedules deliveries based on predefined routes.
Driver updates the delivery status.	The system changes the order status to complete.

4.3.3 Functional Requirements

REQ-11: The system shall allocate and schedule orders for railway transportation based on the capacity negotiated with the railway department.

REQ-12: The system shall reschedule orders to the next available train trip if they exceed the allocated capacity.

REQ-13: The system shall manage the transfer of goods from the train to the store and subsequently schedule truck deliveries.

REQ-14: The system shall allow customers to select their delivery route during order placement and ensure that orders are scheduled accordingly.

REQ-15: The system shall enforce driver and driver assistant scheduling based on their respective rosters, ensuring compliance with the constraints.

REQ-16: The system shall track and update the status of deliveries in real-time, notifying customers as their orders progress.

4.4 User Registration

4.4.1 Description and Priority

This feature allows new users to create an account and existing users to manage their profiles.

Priority: High

4.4.2 Stimulus/Response Sequences

User Action	System Response
User attempts to register.	The system presents a registration form.
User submits the registration form.	The system validates the information and creates a new user account.
User attempts to log in.	The system verifies the credentials and grants access.
User updates their profile information.	The system updates the user profiles with the changes.

4.4.3 Functional Requirements

REQ-17: System shall allow customers to register by providing mandatory details such as a username, email, password and contact details etc.

REQ-18: System shall validate user information during registration to ensure uniqueness.

REQ-19: System shall authenticate user credential correctly.

REQ-20: System shall allow users to update their profile information.

4.5 Monitoring and Analytics Reporting System

4.5.1 Description and Priority

This feature provides detailed insights into various aspects of supply chain operations, such as sales, inventory, and logistics, supporting the administrators' decision-making processes.

Priority: Medium

4.5.2 Stimulus/Response Sequences

User Action	System Response
Administrator requests a quarterly sales report	The system generates and displays the quarterly sales report for the specified year.
Administrator requests a report of items with most orders	The system generates and displays the list of the most ordered items.
Administrator requests a sales report categorized according to main cities and routes.	The system generates and displays the sales report, organized by the main cities and predefined routes.
Administrator requests a report on working hours of drivers and driver assistants	The system calculates and displays the total working hours per driver and assistant within a specific period
Customer requests a customer order report	The system generates and displays a report of customer orders

4.5.3 Functional Requirements

REQ-21: The system shall generate a quarterly sales report for a given year, providing total sales figures categorized by product and customer type.

REQ-22: The system shall provide a report listing items with the most orders over a specified time period.

REQ-23: The system shall generate a sales report categorized by main cities and routes to show distribution patterns and sales performance across different regions.

REQ-24: The system shall track and generate a report on the working hours of drivers and driver assistants, ensuring compliance with work hour limits.

REQ-25: The system shall generate a customer order report with all orders placed, including customer details, products ordered, total cost, and delivery status.

REQ-26: The system shall allow administrators to filter and customize reports based on time periods, product categories, routes, and customer types.

REQ-27: The system shall provide an option to export reports in common formats (e.g., PDF, Excel) for further analysis and record-keeping.

4.6 Product Management

4.6.1 Description and Priority

This feature allows administrators to manage the listed products by adding, deleting and updating them.

Priority: Low

4.6.2 Stimulus/Response Sequences

User Action	System Response
Administrator adds a new product	The system presents a registration form.

Administrator updates and submits the product details	The system validates the information and creates a new user account.
Administrator deletes a product	The system verifies the credentials and grants access.

4.6.3 Functional Requirements

REQ-28: The system shall allow administrators to add, update and delete products from the catalog.

REQ-29: The system shall present a form to enter and modify product details.

REQ-30: The system shall validate all product information.

REQ-31: The system shall verify administrator credentials for deletion requests.

4.7 Store Management

4.7.1 Description and Priority

This feature allows administrators to create and manage stores as well as appoint managers, drivers, assistants and allocate trucks.

Priority: Low

4.7.2 Stimulus/Response Sequences

User Action	System Response
Administrator creates a new store and assigns a manager.	The system adds the new branch records to the. database.
Administrator appoints new staff members (drivers, assistants, etc.)	The system records staff members' details.
Administrator assigns new trucks to the store.	The system logs the truck details into the database.

4.7.3 Functional Requirements

REQ-01: The system shall support the creation of branches with distinct identifiers.

REQ-02: The system shall allow branch managers to allocate roles and responsibilities to employees within their branch.

REQ-03: The system shall generate reports on branch performance and transportation activities.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

5.1.1 User Interface Loading:

- The user interface should load fully within 2 seconds to ensure a smooth user experience.

5.1.2 Database Query Time:

- Searching for and retrieving information from the database should take no longer than 2 seconds.

5.1.3 System Response Time:

- The system should respond to user actions within 2 seconds.

5.1.4 Concurrent User Support:

- System should handle 100 concurrent users effectively.

5.1.5 Real-Time Tracking:

- Real-time updates for order tracking should be delivered within 10 seconds to provide accurate and timely information to customers and staff.

5.1.6 Handling Capacity:

- The system should efficiently manage up to 800 items without performance issues.

5.2 Safety Requirements

5.2.1 Delivery Safety:

Ensure that all truck drivers follow predefined routes and schedules to minimize risks and maintain the safety of deliveries.

5.2.2 Order Integrity:

Ensure no orders are lost or duplicated during the scheduling and processing stages, protecting data accuracy and reliability.

5.3 Security Requirements

5.3.1 Secure Login:

Implement strong passwords (e.g., minimum of 8 characters, including letters and numbers) to prevent unauthorized access.

5.3.2 Data Security:

Ensure all data, especially customer and order information, is transmitted over secure HTTPS connections.

5.3.3 Role-Based Access:

Only administrators can modify user permissions and access levels to ensure secure management of the system.

5.3.4 Data encryption:

All sensitive data, like customer information and order details, should be encrypted during transfer and while it is at rest to prevent access by unauthorized entities.

5.4 Software Quality Attributes

5.4.1 System Uptime:

The system should achieve an uptime of 99.9%, ensuring high availability and reliability for users.

5.4.2 Maintainability:

The system should be developed using modern technologies like React.js and SQL, ensuring ease of updates, bug fixes, and maintenance.

5.4.3 Usability:

The system should provide a user-friendly interface. For that the system will support intuitive navigation with well-organized menus, a fast responsive page loading, and a simple checkout process.

5.4.4 Robustness:

The system should be strong enough to handle unexpected errors or wrong inputs without crashing, ensuring it runs smoothly and reliably.

5.4.5 Scalability:

The system should be scalable to accommodate future growth, handling increased loads and user demands without performance degradation.

5.5 Business Rules

5.5.1 Order Deadline Compliance:

The system shall enforce the rule that customers can't schedule deliveries less than 7 days from the order date.

5.5.2 Weekly Work Hours:

The system shall track and enforce the maximum weekly work hours for drivers (40 hours) and driver assistants (60 hours).

5.5.3 Capacity Management:

The system should monitor and enforce train capacity(1000kg) limits for each trip.

5.5.4 Driver/Assistant Assignment:

The system shall ensure that a driver is not assigned to 2 consecutive truck schedules and driver assistant is not assigned to more than 2 consecutive truck schedules.

6. Other Requirements

1. Business requirements
    - These requirements focus on a broader view of achieving business goals and fulfilling various stakeholder needs.
2. Interface requirements
    - These requirements focus on creating user-friendly interface, and responsive buttons, specify the APIs needed for the system.
3. Legal and Regulatory requirements

- These address the legal aspects of the system such as compliance with industry standards.

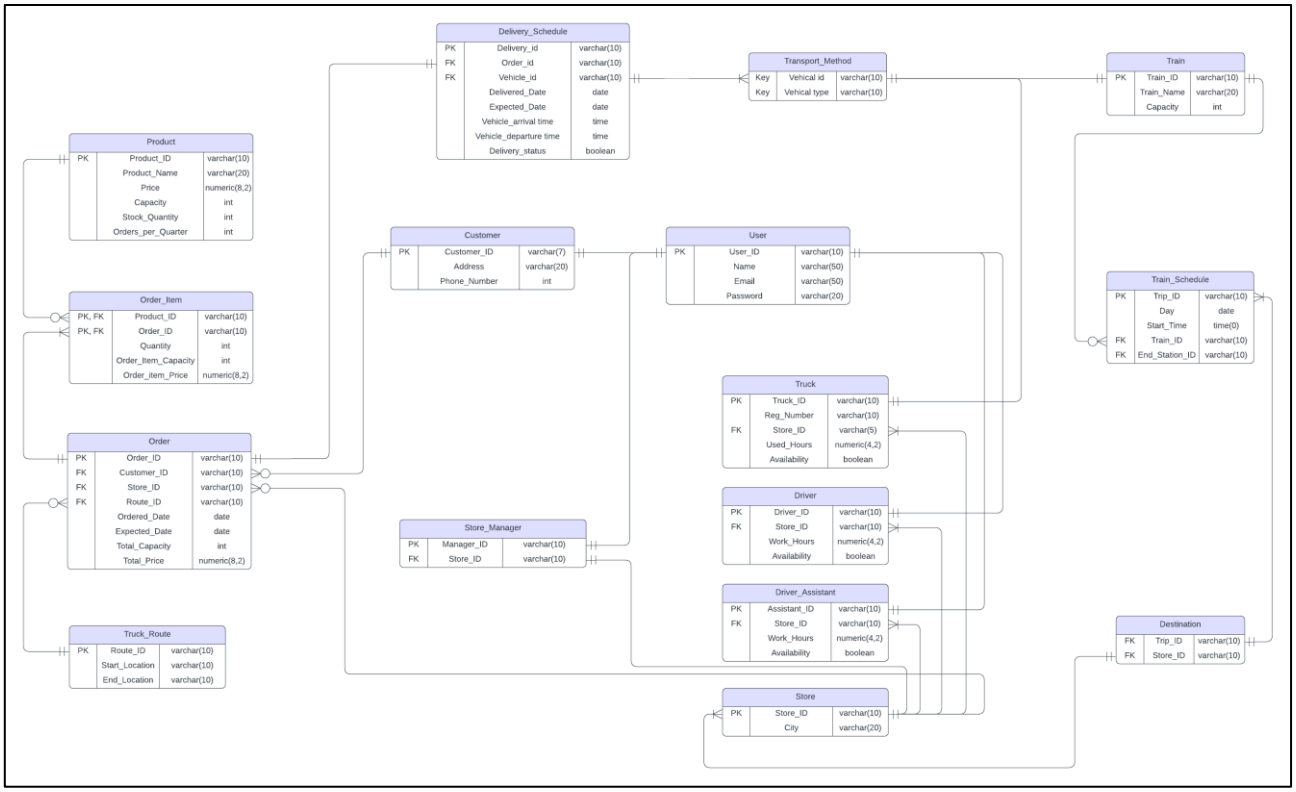
4. Train allocation requirements
    - These focus on checking the train conditions before loading the goods and how they give service to the store like giving more accurate information about usable space.

Appendix A: Glossary

- **Administrative:** The person or group who manages the system configurations, routes, driver and assistant allocations, paying salaries according to work hours, etc.
- **Train schedule:** Time table that includes train arrival times to a particular station in various days. The system extends the time table with the train capacity for company use.
- **ACID Properties:** Stands for Atomicity, Consistency, Isolation and Durability ensuring reliable transactions in the database system.
- **Order Fulfilment:** The complete process from order placement to deliver goods to the customer.
- **PDF:** Portable Document Format
- **CSV:** Comma-Separated Values
- **HTTP:** Hypertext Transfer Protocol
- **JSON:** JavaScript Object Notation
- **RDBMS:** Relational Database Management System
- **SEMS:** Supply Chain Execution Management System

Appendix B: Analysis Models

We use this ER diagram for building the database.



Appendix C: To Be Determined List

1. UI design frameworks
   - We will use react framework for UI design and it is yet to be determined.

2. Security loopholes
   - We should ensure the payments are encrypted throughout the path that deducting money from
   - the customer account and depositing to the admin account

3. Analyze users' expectations via reviews and update
   - Users' expectations are the most important thing for a successful software design. So it is yet to be determined and updated according to them.

4. Creating a user manual
   - We should launch a user manual for the software users and any other stakeholders who are interested in this. It is also important because some tiny things in the software will be hidden if users don't know how to use them and get the service from them.

Appendix D: Team Members

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