

DIGITAL ASSIGNMENT - 1

Project Documentation - 1



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Project Title:

Intelligent Delivery Logistics System

Overview:

Zepto's ultra-fast delivery system revolves around its unique "dark store" model, which is transforming the grocery delivery landscape. Dark stores are small warehouses located just 2-3 kilometers from customers, strategically positioned in high-demand neighborhoods. Unlike traditional retail outlets, dark stores are not open to the public but act as fulfillment centers where items are stocked and packed for delivery. This proximity ensures that orders can be processed and dispatched swiftly, meeting Zepto's ambitious promise of delivering groceries in under 10 minutes.

When a customer places an order through Zepto's app or website, the system immediately identifies the nearest dark store with the required items in stock. These warehouses are meticulously organized to allow packers to locate and pack items in less than 60 seconds. Zepto's AI technology not only tracks inventory in real-time but also maintains product assortment, ensuring that customers always have access to a variety of goods, including fresh produce, dairy, and everyday essentials.

Once the order is packed, Zepto's AI logistics system locates the nearest available delivery partner. By considering real-time location data and the partner's availability status, the system assigns the task to ensure minimal delays. This seamless coordination between dark stores and delivery personnel is the backbone of Zepto's promise of rapid delivery, even during peak demand hours.

The final piece of the puzzle lies in Zepto's route optimization. The AI maps out the fastest delivery route, taking into account factors like traffic patterns, road conditions, and weather. By bypassing congestion and avoiding unnecessary detours, delivery personnel can reach customers' doorsteps quickly and efficiently. This cutting-edge technology not only saves time but also enhances the overall customer experience.

Project Focus

This project explores the AI logistics framework employed by Zepto to enhance its delivery efficiency. The focus is on the system's ability to identify the nearest dark store with the required items in stock and to assign an available delivery partner who can fulfill the order within a stringent time frame. Additionally, the project will delve into how the AI logistics system determines optimal delivery routes to ensure timely deliveries. When a customer places an order through the Zepto app, the system utilizes advanced algorithms to assess various factors, including customer location, item availability, and real-time traffic conditions.

Functional Requirements:

1. Customer Order Placement:

- Users must be able to place orders via a user-friendly mobile application.
- The app should allow customers to browse items and check real-time availability.

2. Dark Store Identification:

- The system must automatically identify the nearest dark store based on the customer's GPS location.
- It should check inventory levels in real-time to ensure that ordered items are in stock.

3. Delivery Partner Assignment:

- The logistics system should identify available delivery partners based on proximity to the dark store and their current status (available or busy).
- Notifications should be sent to delivery partners about new assignments.

4. Route Optimization:

- The AI must calculate the best route for delivery partners using real-time traffic data and historical traffic patterns.
- The system should provide turn-by-turn navigation to delivery partners.

5. Order Tracking:

- Customers should be able to track their orders in real-time from dispatch to delivery.
- Notifications about order status changes (e.g., dispatched, out for delivery) should be sent to customers.

Non-Functional Requirements:

1. Performance:

- The system should process orders and assign dark stores within seconds.
- Delivery routes must be calculated in real-time to ensure timely deliveries within 10-15 minutes.

2. Scalability:

- The architecture must support scaling as demand increases or as new dark stores are added.
- It should handle multiple simultaneous orders without degradation in performance.

3. Reliability:

- The system must ensure high availability with minimal downtime.
- Data integrity must be maintained across all transactions.

4. Security:

- Customer data and payment information must be securely handled and encrypted.
- Access controls should be implemented to protect sensitive information.

5. User Experience:

- The mobile application must have an intuitive interface for easy navigation.
- Response times for user actions (e.g., placing an order) should be minimal.

Process Model:

The **Agile Development Model** is deemed most appropriate for this project due to several key factors:

1. Flexibility and Adaptability:

- The quick commerce environment is dynamic, with changing customer preferences and market conditions. Agile allows for iterative development, enabling teams to adapt features based on user feedback and evolving requirements.

2. Incremental Delivery:

- Agile promotes delivering functional increments of the software at regular intervals. This approach ensures that core functionalities—such as order placement, dark store identification, and route optimization—can be developed, tested, and deployed progressively.

3. Collaboration and Communication:

- Agile emphasizes collaboration among cross-functional teams, including developers, data scientists, and business analysts. This fosters better communication and understanding of requirements, leading to more effective solutions tailored to user needs.

4. Continuous Improvement:

- Through regular sprint reviews and retrospectives, Agile encourages continuous improvement of processes and products based on actual performance metrics and user feedback.

5. Rapid Prototyping:

- The ability to quickly prototype features allows for testing ideas in real-world scenarios before full-scale implementation, reducing risks associated with development.

In summary, by employing an Agile approach, this project can effectively address the complexities of developing AI logistics for Zepto's dark store model while ensuring responsiveness to market demands and user needs.

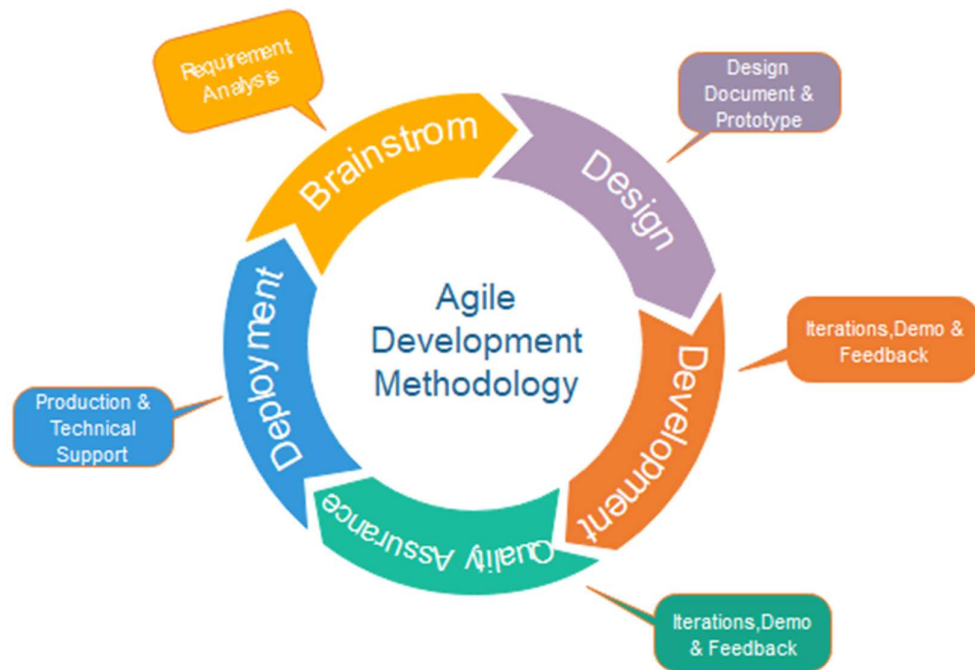


Fig. Agile Model

Work Breakdown Structure (WBS):

A work breakdown structure (WBS) is a visual, hierarchical and deliverable-oriented deconstruction of a project. It organizes the project into manageable sections, ensuring clarity and efficiency in execution. Below is a detailed WBS that outlines the major phases, sub-projects, and tasks involved in the project.

Level 1: Project Title

- AI Logistics System for Ultra-Fast Delivery Optimization

Level 2: Phases

1. Requirement Analysis
2. System Design
3. Implementation
4. Testing and Validation
5. Deployment and Maintenance

Level 3: Tasks within Each Phase

1. Requirement Analysis
 - 1.1 Identify functional requirements (e.g., dark store selection, delivery personnel assignment).
 - 1.2 Identify non-functional requirements (e.g., performance, scalability).
 - 1.3 Conduct stakeholder interviews (e.g., managers, delivery personnel).
 - 1.4 Define user stories for customers, delivery personnel, and dark store managers.
 - 1.5 Document requirements specification.
2. System Design
 - 2.1 Architecture design for the AI logistics system.
 - 2.2 Database schema design for inventory and personnel tracking.
 - 2.3 Algorithm design for dark store selection.
 - 2.4 Algorithm design for delivery personnel assignment.
 - 2.5 Route optimization algorithm design.
 - 2.6 API design for integration with third-party services (e.g., maps, notifications).

- 2.7 Design user interfaces for customers, delivery personnel, and administrators.

3. Implementation

- 3.1 Develop dark store inventory tracking module.
- 3.2 Implement delivery personnel tracking and assignment module.
- 3.3 Develop route optimization module using real-time traffic data.
- 3.4 Integrate mapping and notification APIs.
- 3.5 Build user interfaces (web/app) for customers, delivery personnel, and administrators.
- 3.6 Implement order tracking and notification systems.

4. Testing and Validation

- 4.1 Unit testing for each module (inventory, assignment, routing).
- 4.2 Integration testing for modules working together.
- 4.3 Performance testing for high-order volumes and traffic conditions.
- 4.4 User acceptance testing (UAT) with real-world scenarios.
- 4.5 Bug fixing and optimization based on test results.

5. Deployment and Maintenance

- 5.1 Deploy system on production servers.
- 5.2 Configure and test APIs for third-party integration.
- 5.3 Monitor system performance post-deployment.
- 5.4 Regularly update inventory, personnel, and routing algorithms.
- 5.5 Provide user support and gather feedback for improvements.

Level 4: Sub-Tasks for Key Activities

1. within 1.1 Identify functional requirements:

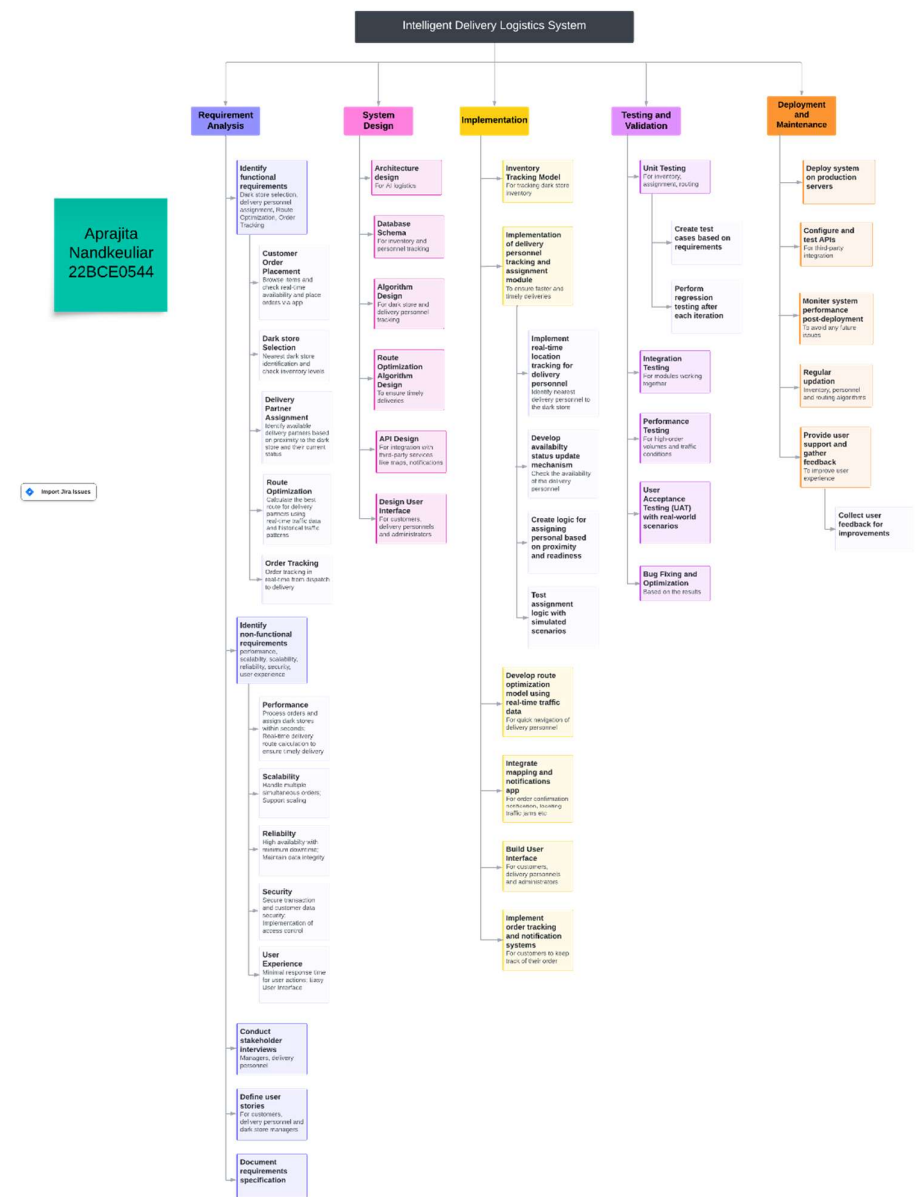
- 1.1.1 Customer Order Placement - to allow customers to browse items and check real-time availability and place orders via app
- 1.1.2 Dark store Selection-to identify nearest dark store and check inventory levels

- 1.1.3 Delivery Partner Assignment-to identify available delivery partners based on proximity to the dark store and their current status
 - 1.1.4 Route Optimization- to calculate the best route for delivery partners using real-time traffic data and historical traffic patterns
 - 1.1.5 Order Tracking- Order tracking for customer in real-time from dispatch to delivery
2. within 1.2 Identify non-functional requirements:
- 1.2.1 Performance- Process orders and assign dark stores within seconds; Real-time delivery route calculation to ensure timely delivery
 - 1.2.2 Scalability- Handle multiple simultaneous orders; Support scaling
 - 1.2.3 Reliability- High availability with minimum downtime; Maintain data integrity
 - 1.2.4 Security- Secure transaction and customer data security; Implementation of access control
 - 1.2.5 User Experience- Minimal response time for user actions; Easy User Interface
3. within 3.2 Implement Delivery Personnel Tracking and Assignment Module:
- 3.2.1 Implement real-time location tracking for delivery personnel- to identify nearest delivery personnel to the dark store
 - 3.2.2 Develop availability status update mechanism- Check the availability of the delivery personnel
 - 3.2.3 Create logic for assigning personnel based on proximity and readiness
 - 3.2.4 Test assignment logic with simulated scenarios
4. within 4.1 Unit Testing:
- 4.1.1 Create test cases based on requirements
 - 4.1.2 Perform regression testing after each iteration
5. within 5.5 Provide user support and gather feedback:
- 5.5.1 Collect user feedback for improvements-to improve user experience

Conclusion

This WBS provides a structured approach to managing the AI logistics optimization project for Zepto, breaking down complex tasks into manageable components while ensuring all aspects of the project are addressed systematically. By following this WBS, the project team can maintain focus on deliverables, allocate resources effectively, and track progress throughout the project lifecycle.

Link: https://lucid.app/lucidspark/05ab2538-cdb1-4c33-94a6-c50e308c8683/edit?viewport_loc=-1520%2C161%2C5805%2C2986%2C0_0&invitationId=inv_0dfc9e1d-3793-4b98-a519-993ee4da9719



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