Title : Yakadabadu.lk – Scrap Collection & Recycling Management System

Batch : 4.1

Group Number 81

Group Details:

IT Number	Name	E-mail	Contact Number
IT 23202122	P P D R Pathirage	IT23202122@my.sliit.lk	077 051 5121
IT 23140752	Gunawardena A A	IT23140752@my.sliit.lk	071 279 2376
IT 23216778	S A R U Amarasinghe	IT23216778@my.sliit.lk	071 799 5000
IT 23320550	K T A Kularathne	IT23320550@my.slit.lk	071 144 3347
IT 23144408	Fernando W A A T	IT23144408@my.slit.lk	076 206 2013

Activity – 02

IT2080 – Information Technology Project. Year 02 Semester 02

Objective: Identify the requirements of your system

1. Identify the stakeholders in your system and analyze them using an onion diagram.
2. List the Functional Requirements for the direct system users (in the innermost layer of the Onion diagram or main stakeholders).
3. List the related NFRs and analyze them user wise.
4. State the Technical requirements for the system
5. Model the requirements using a use case diagram
6. Write down the use case descriptions for 5 main use cases in the diagram
7. Develop suitable diagrams to show visual presentation of data flow, **the process Flow and Data Connections** to support the above (eg: system diagram, Flow chart, DFD)
8. Create a suitable plan to develop the project as a team.

Question 01 – Answer

Core Layer (Innermost): Collecting Center Owners

- **Role**: Own and manage platform operations, coordinate scrap collection, oversee recycling, and ensure proper material categorization.
- **Responsibilities**: Supervise drivers, monitor quality, and ensure compliance with regulations.

Second Layer: Administrators

- **Role**: Oversee platform functions and user management.
- **Responsibilities**: Maintain the platform, update item categories, manage scrap seller and driver accounts, and generate reports.

Third Layer: Scrap Sellers

- **Role**: Households, businesses, and organizations providing recyclable materials.
- **Responsibilities**: Schedule pickups, categorize materials, and access resale options for reusable items.

Fourth Layer: Drivers

- **Role**: Collect and transport scrap materials.
- **Responsibilities**: Manage timely pickups, provide status updates, and ensure safe transport of materials.

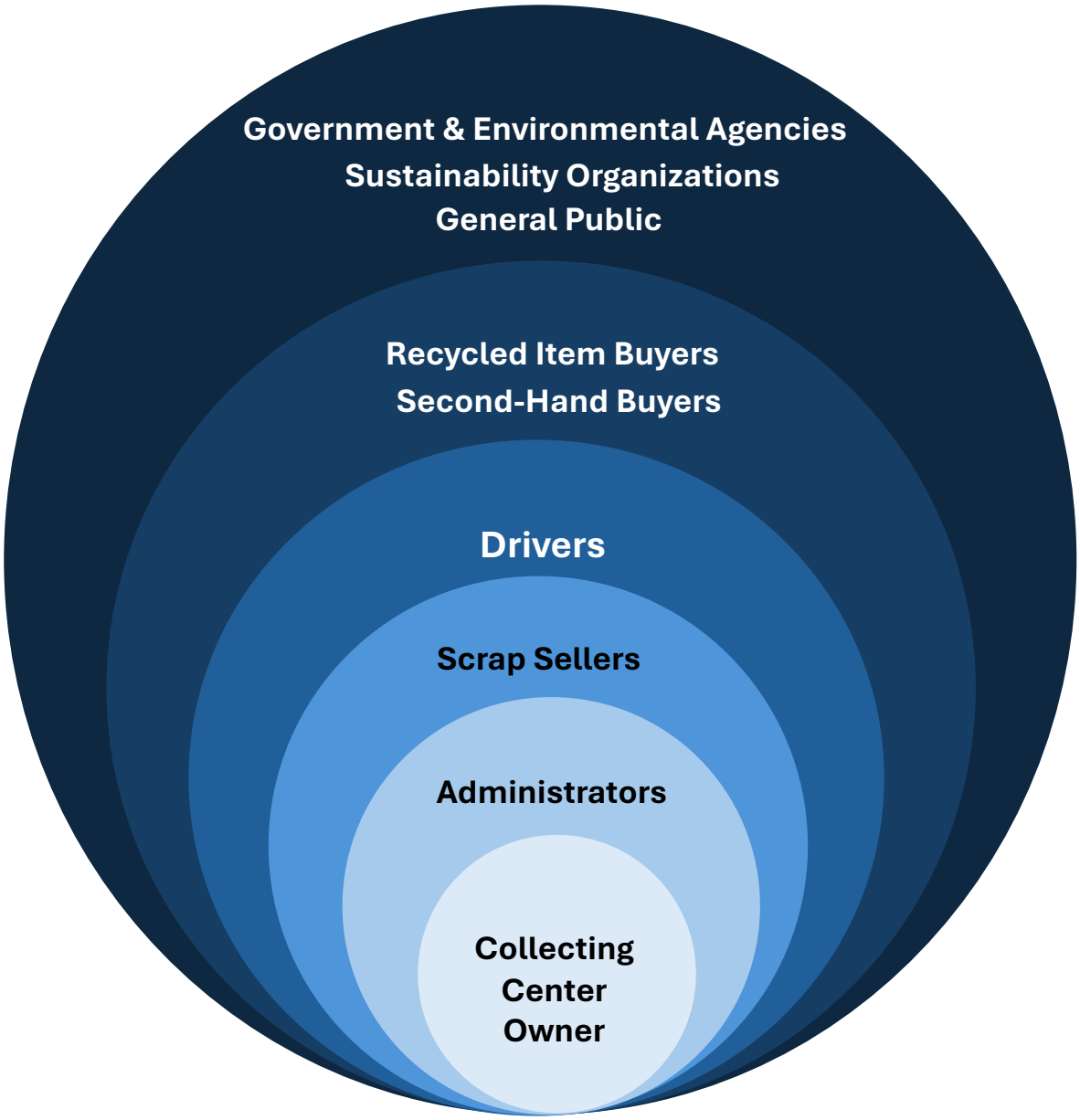
Fifth Layer: Second-Hand Buyers & Recycled Item Buyers

- **Second-Hand Buyers**:
  - **Role**: Purchase reusable items from the marketplace.
  - **Responsibilities**: Contribute to the circular economy by buying second-hand items.
- **Recycled Item Buyers**:
  - **Role**: Purchase recycled materials for production.
  - **Responsibilities**: Buy processed materials for manufacturing.

Outer Layer: External Stakeholders

- **Role**: Influence or benefit from the platform without direct involvement.
- **Responsibilities** :
  - **Government & Environmental Agencies**: Enforce recycling regulations and monitor environmental impact.
  - **Sustainability Organizations**: Support eco-friendly waste management practices.
  - **General Public**: Benefit from improved recycling and waste management.

Onion Diagram



Question 02 – Answer

Functional Requirements (FRs)

1.User Registration and Login

- Ability to register with personal details (e.g., name, address, contact information).
- User authentication through login (email/username and password).
- Password recovery and reset options.

2.Pickup Scheduling

- Users can schedule scrap collection for a specific date.Time schedule the system.
- Option to select scrap categories for collection (e.g., metal, plastic, paper).
- Ability to modify or cancel scheduled pickups.

3.Tracking Pickup Status

- Users can view the status of their scheduled pickups (pending, completed, cancelled)
- Real-time tracking of pickup status (e.g., driver on route, pickup completed)

4.Recycle Materials Information

- View available information about recyclable materials and their value.
- Option to inquire or get estimates on materials for resale.

5.Resale Options for Reusable Items

- Ability to list reusable items for sale to the system or other users.
- Option to browse reusable materials listed by other users.

6.Notification System

- Users receive notifications about pickup status, resale options, or any system updates.
- Email or SMS notifications for upcoming pickups or changes in status.

7.Profile Management

- Users can view and update their profile (address, contact details)
- View history of scheduled pickups and transactions.

8.Feedback and Rating System

- Users can provide feedback or rate services such as pickup reliability, driver interaction, etc.

9.Reports and Analytics

- Access to basic reports (e.g., how much scrap was collected, recycling statistics, etc.).
- Admins may provide users with insights on how much they have contributed to recycling efforts.

10Access to Scrap Collection and User Details

- Admins and drivers can access daily scrap collection places and user details to ensure efficient collection.

Question 03 – Answer

Non-Functional Requirements (NFRs)

Performance and Scalability

- Users: The system must be capable of handling a large number of users simultaneously, especially during peak scrap pickup requests, with minimal response times.
- Admins & Drivers: Real-time data access with as minimal delay as possible is required to carry out smooth operations.

Availability and Reliability

- Users: The system must be available 99.9% of the time, with users able to access the service at any given point.
- Admins & Drivers: Continuous provision of functional tools and reports, especially for pickups and scrap sales management.

Security and Data Protection

- Users: Personal and sensitive user information (e.g., contact information) needs to be encrypted and kept secure. Ensure data privacy laws compliance.
- Admins: Role-based access control needs to restrict data access based on user roles (e.g., higher control for admins, users restricted to their own information).
- Drivers: Provide restricted access based on business requirements (i.e., pickup schedules and status).

Usability and User Experience (UX)

- Users: Intuitive design for registration, scheduling pickups, and tracking progress.
- Admins: Simple interface to monitor activity, view analytics, and print reports.
- Drivers: Simple and easy navigation to locate relevant pickup information, with minimal input necessary.

Audit and Logging

- Admins: Logs need to track system activity, including login attempts, data access, and operational changes, to aid in troubleshooting and security audits.
- Users: Transaction history needs to be visible but not modifiable by the user to prevent tampering.

Compliance with Regulatory Requirements

- Users & Admins: Ensure the platform complies with local environmental regulations and data protection policies (e.g., GDPR or CCPA depending on your location).

Data Integrity and Validity

- Users: Real-time data about scheduled pickups and materials should be available, providing users with accurate information.
- Admins: Ensure data is valid to generate reliable reports and informed decisions.

Responsiveness

- Users: The UI must be responsive and fluid on devices (desktop, tablet, phone).
- Admins & Drivers: Updates and real-time data must be immediate, especially in managing pickups and status checks.

Backup and Disaster Recovery

- Users: Backups of data must be done at periodic intervals to prevent user data loss.
- Admins: A disaster recovery system must be in place to recover services quickly and minimize downtime.

Localization and Internationalization

- Users: It should support varied languages so users worldwide can make use of the system in any language of preference.
- Admins & Drivers: The UI will be able to support the language settings of locale, date & time, and currency.

User-Wise Analysis

For Users:

- **Performance & Security:** Give users fast, secure access to services (e.g., registration, scheduling, and tracking).
- **Usability & Availability:** The system should be available 24/7 and easy to use for scheduling and managing their scrap pickups.

For Admins:

- **Performance & Security:** The system should be stable with role-based access control to prevent unauthorized access.
- **Audit & Compliance:** Ensure that logs are maintained properly and that the system is compliant with all relevant regulations.
- **Backup & Recovery:** Admins can restore the system with minimal downtime.

For Drivers:

- **Performance & Usability:** Drivers require quick, simple access to pickup schedules with concise information on the route.
- **Availability & Responsiveness:** Drivers require real-time information and notifications to maximize their pickups.

Question 04 – Answer

Technical Requirements for Yakadabadu.lk

1. System Architecture

- **Architecture:** MERN Stack (MongoDB, Express.js, React.js, Node.js)
- **Design Pattern:** Model-View-Controller (MVC)
- **Hosting:** Cloud-based hosting (e.g., AWS, Firebase, or DigitalOcean)

2. Database Requirements

- **Database:** MongoDB (NoSQL) for scalable data management
- **Data Storage:** Secure storage for user details, scrap transactions, and pickup schedules
- **Backup:** Automated daily backups to prevent data loss

3. Authentication & Security

- **User Authentication:** JWT-based authentication with secure password hashing (bcrypt)
- **Role-based Access Control:** Different access levels for users, admins, and drivers

4. Frontend Requirements

- **Framework:** React.js with Tailwind CSS for UI styling
- **Responsiveness:** Mobile-first design for accessibility across devices
- **APIs:** Integration with Google Maps API for location tracking

5. Backend Requirements

- **Server Framework:** Node.js with Express.js for API development
- **Notification System:** Integration with **EmailJS** for emails and **Twilio** for SMS notifications

6. Performance & Scalability

- **Load Handling:** Optimized API calls, caching with Redis, and database indexing
- **Scalability:** Auto-scaling servers and database sharding if needed

7. Reporting & Analytics

- **Report Generation:** Exportable reports in CSV/PDF formats

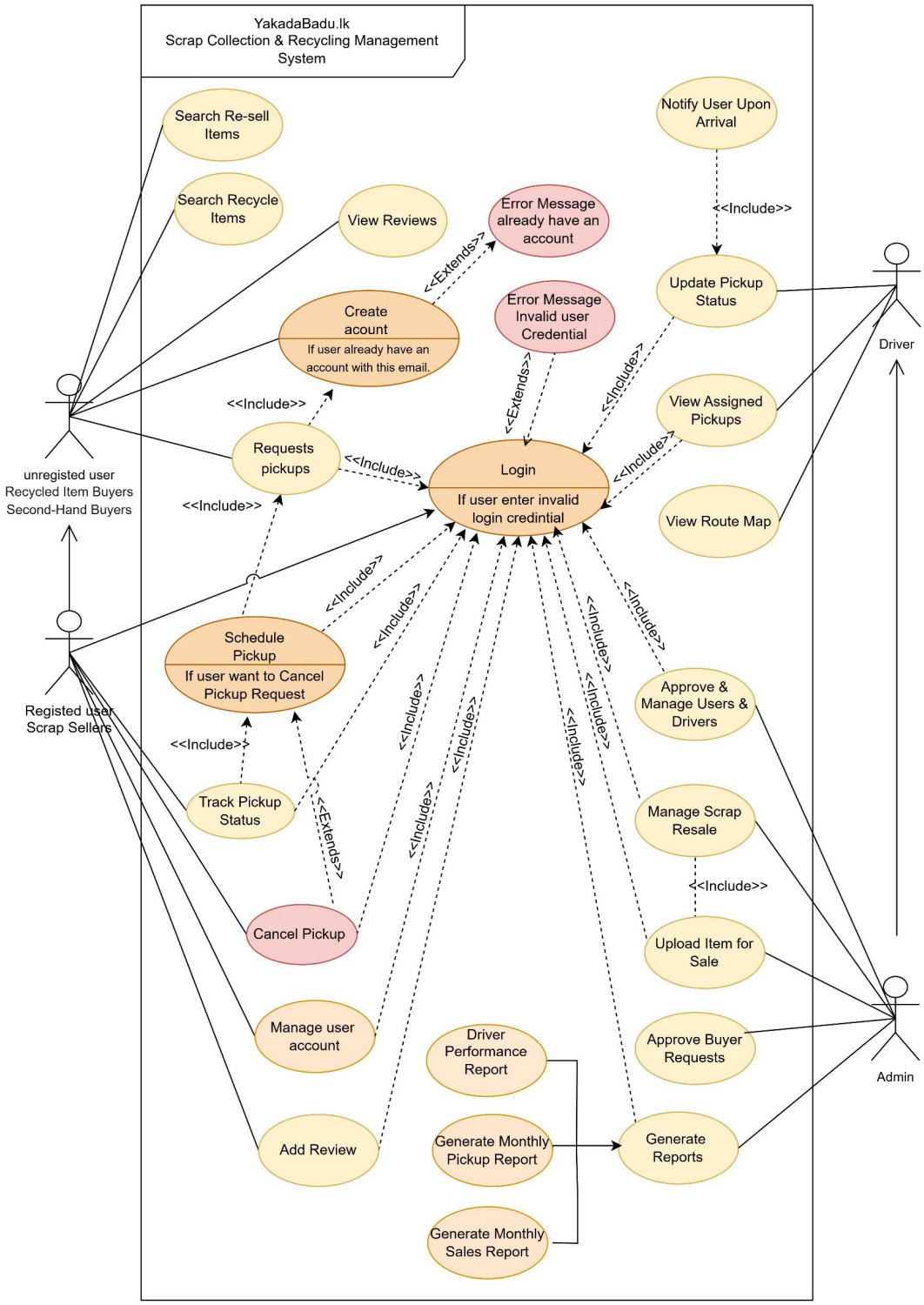
8. DevOps & Deployment

- **Version Control:** GitHub for source code management

10. Compliance & Data Protection

- **Regulatory Compliance:** Adherence to local waste management and privacy laws
- **GDPR Compliance:** User data privacy protection and opt-out options

Question 05 – Answer



View This

Question 06 – Answer

Number	1	
Use Case ID	IT23140752_1	
Name	Search Resell Items	
Summary	Unregistered users search for available resell items on the platform	
Priority	5	
Pre-Condition	The user must be on the homepage of the platform	
Post-Condition	The user can see search results	
Primary Actor(s)	Unregistered User	
Trigger	The user navigates to the “Resell Items” page and uses the search function	
Main Scenario	Step	
	1	User visits the homepage
	2	Navigates to “Resell Items” section
	3	System displays list of available items
	4	User enters search criteria
	5	System displays filtered list of available items based on the searched input
	6	To review the item(s), user needs to register to the system
Extensions	4a	If the user enters an invalid search term, system displays a message saying, “No items found.”
Open Issues	Issue 1	Can unregistered users add items to resell?
	Issue 2	Can unregistered users schedule pickups to sell their scrap materials?

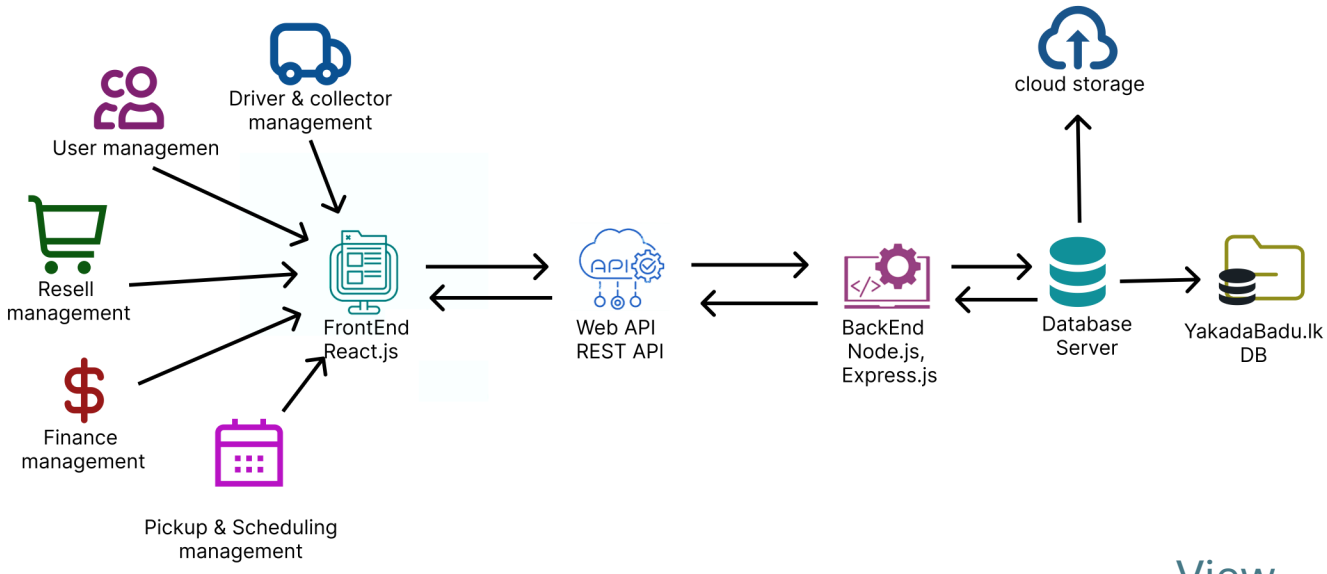
Number	2	
Use Case ID	IT23140752_2	
Name	Upload items for sale	
Summary	Admin uploads items for resale	
Priority	5	
Pre-Condition	Admin must login to the system	
Post-Condition	The newly added item must appear in the “Resell Items” page for users to view.	
Primary Actor(s)	Admin	
Trigger	Admin accesses the “Manage Items” section and decides to add a new item	
Main Scenario	Step	
	1	The admin login to the system by entering the valid username and password
	2	The admin will be directed to the admin dashboard
	3	The admin navigates to “Manage Items”
	4	The admin must click on “Add Item” button
	5	System prompts the admin to input item details
	6	Enter details of item and click “Submit”
	7	System adds the item to the platform’s listing
Extensions	1a	If the entered username or password is incorrect, ask to re-enter the username and password
	1b	If an incorrect username or password is entered more than 3 times repeatedly, do not allow to enter username or password for 15 minutes
	6a	If the user has not completed any of the required fields, send an error message and user is not permitted to click “Submit” button
	7a	If an error occurred while adding an item, prompt an error message
Open Issues	Issue 1	What kind of verification should be in place for the uploaded item details?
	Issue 2	System must be able to add restrictions such as image size

Number	3	
Use Case ID	IT23140752_3	
Name	View assigned pickups	
Summary	The driver views the assigned pickup tasks, including locations and details	
Priority	4	
Pre-Condition	Driver must be logged into the system	
Post-Condition	The driver has an updated list of pickups and can proceed with collection	
Primary Actor(s)	Driver	
Trigger	The driver logs into their dashboard and accesses the "Assigned Pickups" section	
Main Scenario	Step	
	1	The driver login to the system by entering the valid username and password
	2	Driver will be directed to the Driver dashboard
	3	Navigates to “Assigned Pickups”
	4	System displays upcoming pickups
	5	Driver views a list of scheduled pickups with details
	6	Driver proceeds with the pickups and marks the status
Extension	1a	If the entered username or password is incorrect, ask to re-enter the username and password
	1b	If an incorrect username or password is entered more than 3 times repeatedly, do not allow to enter username or password for 15 minutes
	5a	If the driver selects a pickup, the system may show map details or route suggestions
	6a	If the driver encounters an issue (e.g., invalid address), they can mark the pickup as problematic
Open Issues	Issue 1	Should there be a feature for drivers to reschedule or decline a pickup?

Number	4	
Use Case ID	IT 23320550_1	
Name	Search Recycle Items	
Summary	Unregistered users search for available recyclable items on the platform.	
Priority	4	
Pre-Condition	The user must be on the homepage of the platform.	
Post-Condition	The user can see search results.	
Primary Actor(s)	Unregistered User	
Trigger	The user navigates to the "Recycle Items" page and uses the search function.	
Main Scenario	Step	
	1	User visits the homepage.
	2	Navigates to the “Recycle Items” section.
	3	System displays a list of available recyclable items.
	4	User enters search criteria.
	5	System displays a filtered list of available items based on the search input.
	6	To review item details, the user needs to register to the system.
Extension	4a	If the user enters an invalid search term, the system displays a message saying, "No items found."
	4b	If no items match the search criteria, the system suggests related items based on similar keywords.
	5a	If the system is experiencing high traffic, the search results may take longer to load, and a loading indicator is displayed.
	6a	If the user tries to view an item without registering, the system prompts them to sign up or log in.
Open Issues	1	Can unregistered users add items for recycling?

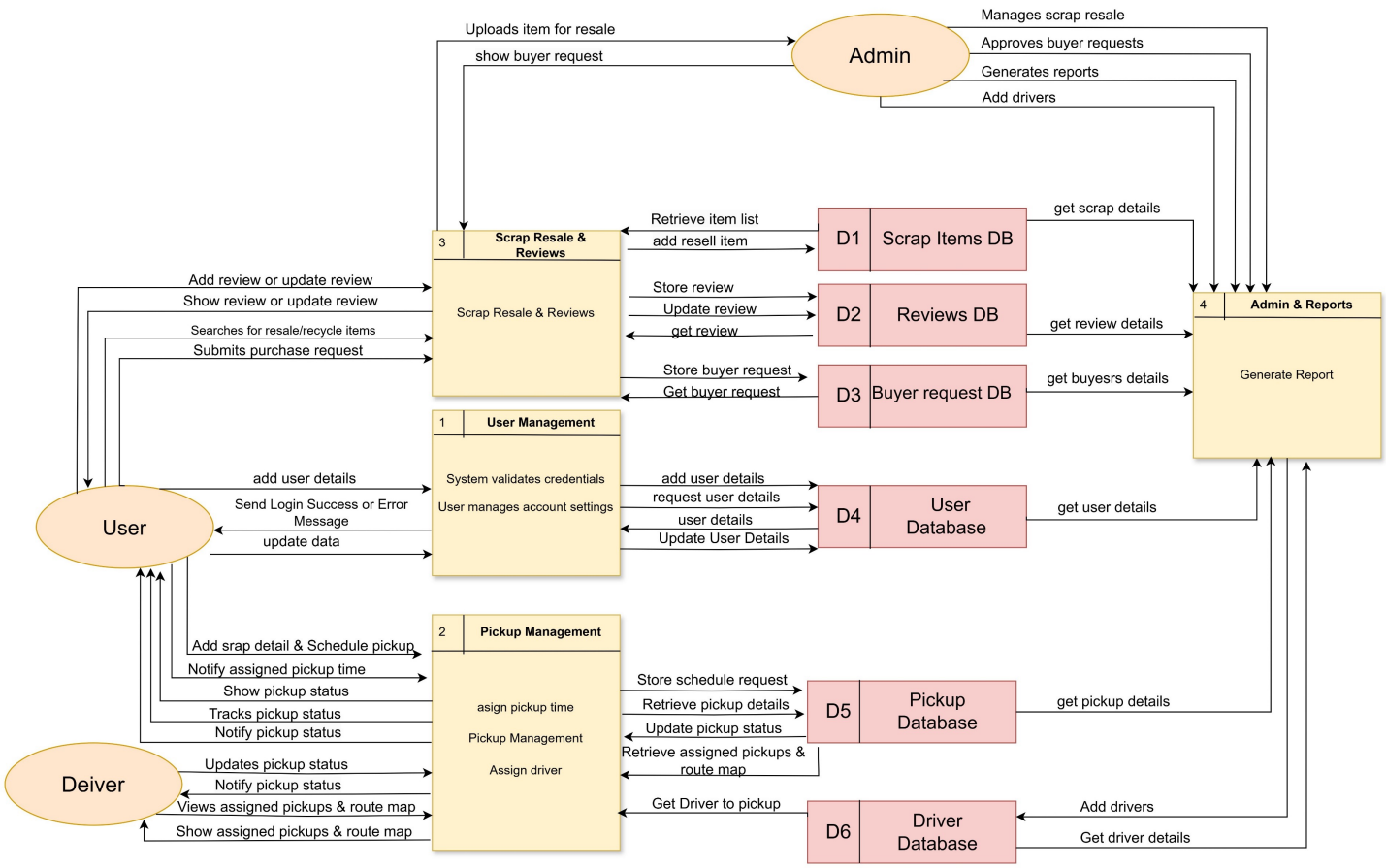
Number	5	
Use Case ID	IT 23320550_2	
Name	View Route Map	
Summary	The driver views the route map to navigate to assigned pickup locations.	
Priority	3	
Pre-Condition	The driver must be logged into the system and have assigned pickups.	
Post-Condition	The driver can see the optimized route map with pickup locations.	
Primary Actor(s)	Driver	
Trigger	The driver navigates to the "Route Map" section to check pickup locations.	
Main Scenario	Step	
	1	Driver logs into the system.
	2	Navigates to the "View Route Map" section.
	3	System fetches assigned pickups for the driver.
	4	System displays a map with pickup locations and an optimized route.
	5	Driver can zoom in/out, view pickup details, and check estimated arrival times.
	6	Driver follows the route to complete pickups.
Extension	3a	If the driver has no assigned pickups, the system displays a message: "No pickups assigned at the moment."
	4a	If GPS location services are disabled, the system prompts the driver to enable them.
	4b	If the system cannot retrieve location data, it displays an error message: "Unable to load map. Please check your internet connection."
	6a	If the driver reaches a pickup location, they can mark it as "Completed," and the system updates the status.
Open Issues	1	Should the system provide voice navigation for drivers?
	2	Can drivers manually mark a pickup as completed if GPS tracking fails?

Question 07 – Answer
System Diagram



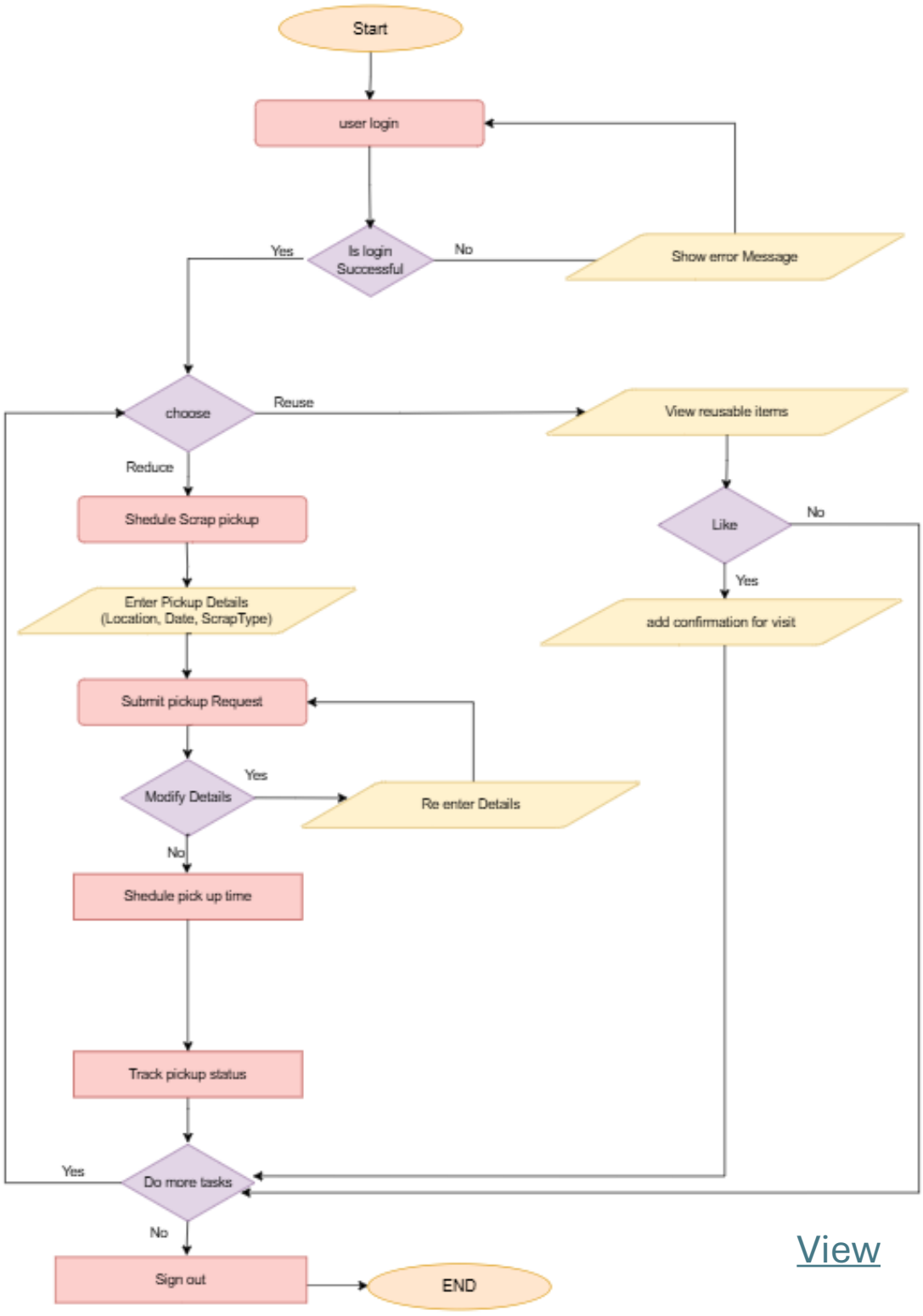
View

DFD level 1



View

User level flowchart



View

Question 08 – Answer

Development Phases & Timeline

Week 1-2: Planning & Research

- Finalize project scope and requirements.
- Identify features (User registration, scrap item listing, buyer-seller matching, etc.)
- Set up Trello/Jira for task management.

Week 3-4: UI/UX & Database Design

- Design wireframes and prototypes in Figma.
- Create the database schema (MongoDB collections for users, scrap items, transactions).
- Finalize API endpoints for CRUD operations.

Week 5-7: Backend & Frontend Development

- Develop authentication (JWT) and user roles (admin, seller, buyer).
- Implement backend routes and controllers for CRUD operations.
- Build frontend pages with React (Home, Profile, Listings, Orders).
- Integrate API with React frontend.

Week 8-9: Testing & Bug Fixing

- Unit testing for backend APIs.
- UI testing for responsiveness.
- Security testing (input validation, authentication).

Week 10: Deployment & Finalization

- Deploy backend to **Render/Heroku** and frontend to **Vercel/Netlify**.
- Connect domain (yakadabadu.lk).
- Present project and submit final documentation.