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**UNIVERSITI TEKNOLOGI MALAYSIA**

**FACULTY OF COMPUTING, UTMJB**

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**PROJECT PHASE 2**

**SECD2613 SYSTEM ANALYSIS AND DESIGN**

**SECTION 05**

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## **1.0 Overview of the Project**

ARS Builders Sdn. Bhd. is a reputable road construction company led by Mr. Sithamparanathan Arunasalam, specializing in the development and maintenance of road infrastructure projects. Currently, the company executes many of its construction projects through predominantly manual processes, which has resulted in significant operational issues. These include frequent human errors due to reliance on paper-based documentation, missed deadlines caused by poor time management, inefficient allocation and utilization of resources, and considerable difficulties in tracking and managing project-related data effectively.

As a consequence of these challenges, the company's overall operational efficiency is hampered, project delivery timelines are often compromised, and costs escalate beyond initial budgets, ultimately leading to decreased client trust and satisfaction. These systemic problems not only hinder the company's ability to grow but also damage its reputation in a competitive industry.

To tackle these inefficiencies and streamline its operations, ARS Builders Sdn. Bhd. is committed to enhancing the planning, coordination, and management of its projects through the implementation of an integrated project management solution. This strategic improvement aims to enable the company to deliver projects on schedule, maintain tighter control over budgets, and foster greater confidence and satisfaction among its clients. A thorough feasibility study has been conducted, which confirms the technical feasibility, economic justification, and operational suitability of the proposed solution for the company's needs.

## 2.0 Problem Statement

Before designing a new system, the problems faced by the current project management practices at ARS Builders Sdn. Bhd. must be first identified. Through interviews and document analysis, several notable operational challenges have emerged, primarily due to the company's continued reliance on manual planning and coordination. These issues have led to inefficiencies, project delays, cost overruns, and dissatisfaction among clients. By identifying these problems, it becomes clear why ARS Builders Sdn. Bhd. requires a more effective solution to improve project execution, resource utilization, and client relationships.

The problem statements are as follows:

- **Unrealistic Time Estimates Cause Missed Deadlines:** Project schedules are often planned with unrealistic timelines, resulting in projects not being completed on time. This frustrates clients and disrupts overall project workflows.
- **Budgets Frequently Exceed Estimates:** Poor planning and unexpected issues cause project costs to go beyond initial budgets, which affects profitability and increases stakeholder concerns.
- **Delays Lead to Client Dissatisfaction:** Repeated project delays have caused clients to lose confidence in the company's ability to deliver on promises, impacting future opportunities.
- **Inadequate Time and Budget Planning:** Management struggles to create accurate schedules and budgets, leading to confusion among staff and poor allocation of resources.
- **Difficulty Managing Unexpected Problems:** When unforeseen issues arise, the company lacks clear processes to respond effectively, resulting in further delays and increased costs.
- **Poor Coordination and Communication:** There is no centralized system to coordinate between personnel, equipment, and resources, leading to scheduling conflicts and inefficient workflows.
- **Lack of Clear Project Progress Tracking:** Without proper monitoring tools, it is challenging for management to gain accurate, real-time insights into project status, hindering oversight and timely decision-making.

### 3.0 Proposed Solutions

To overcome the problems currently faced by ARS Builders Sdn. Bhd., we proposed to make a desktop application that is specifically built to address all of their issues. Rather than relying on companies outside of ARS Builders to create the development and use all the tools and hardware, this desktop application will change the way that construction project delivery is done.

#### **Feasibility Study:**

The aim of this feasibility study is to evaluate the practicality of developing a desktop application for a construction project delivery. The company currently relies heavily on manual methods, which are prone to errors and inefficiencies. This new system seeks to streamline operations and improve scalability.

#### 1. Technical Feasibility

**Technology Stack:** The system can be built using widely available technologies such as:

- Frontend (GUI): Python (Tkinter/PyQt), Java (JavaFX), or [Electron.js](#).
- Backend/Logic: Python, Java, or C#.
- Database: MySQL or SQLite (to be hosted locally).

**Availability of Skills:** All programming/ database technologies outlined to create the system are well documented and used widely by developers, which means that developing in-house or contracting all or part of it is realistic.

**Infrastructure:** The development of the system would need internet access and basic hardware (PC or laptop) for the admin dashboard. No specialized infrastructure is required.

**Conclusion:** Technically Feasible

## 2. Economic Feasibility

### **Estimated Costs:**

- Development Costs: RM 50,000 (one-time)
- On-going Operational Costs: RM 12,000 (annually in maintenance or upgrades)

### **Expected Benefits:**

- Time saved on planning and reporting
- Lower cost overruns because issues can be identified earlier
- Better labour/ equipment utilization
- Improved levels of client satisfaction → improved probabilities of receiving more awards of contract

**Return on Investment (ROI):** As we have operational savings and increased amount of project awards, Investment can be recovered in 3 to 4 years.

**Conclusion:** Economically feasible with positive ROI

## 3. Operational Feasibility

**Ease of Use:** User-friendly interface specifically designed for project manager, engineer, and admin access.

**Training Requirements:** Minimal training needed for staff to use the admin panel.

**Customer Adoption:** Expected to run smoothly with good management support as the technology has been built for internal use.

**Conclusion:** Operationally feasible

## **4.0 Information Gathering Process**

In this section, the methods for obtaining information about the current system are outlined. These include structured interviews and document study. The objective is to get a full picture of how the manual system works, what its weaknesses are, and what clients and employees truly need. By collecting real feedback and learning about the workflow, the team ensures that the proposed solutions will address the actual issues the company is facing firsthand.

### **4.1 Method Used**

To gather information, there are various ways that we may conduct to obtain information required to analyse the current system in use by ARS Builders Sdn. Bhd. , that includes interactive methods and unobtrusive methods. For the interactive method, we decided to obtain information by conducting interviews with ARS Builders Sdn. Bhd. representative, meanwhile for unobtrusive methods, we decide to use two methods which are observation and document analysis.

- 1) **Structured Interviews** – Conducted meetings with ARS Builders Sdn. Bhd.'s operations team, management, and IT professionals to better understand the manual workflow and difficulties. The interview was conducted on 24 May 2025 and 31 May 2025 via Webex.
- 2) **Document Analysis** – Internal documentation, budget allocation data, and resources availability were reviewed to identify inefficiencies and redundancies. All these documents were provided by ARS Builders Sdn. Bhd.

## **4.2 Summary from Method Used**

This section summarizes the findings from the information gathering process. It was discovered that the current project management practices at ARS Builders Sdn. Bhd. rely heavily on ad-hoc communication channels, manual paper-based tracking, and fragmented record-keeping. This leads to poor coordination among teams, inefficient use of resources, frequent delays, and inaccurate visibility of project progress. Staff members struggle to stay updated on project statuses, resulting in misunderstandings, missed deadlines, and a general lack of trust from clients. Both employees and management expressed a need for an integrated project management system to centralize information, improve communication, and allow real-time monitoring of project performance.

### **Structured Interviews:**

From the structured interviews with ARS Builders Sdn. Bhd.'s operations team, management, and IT professionals, it was found that the current workflow is unstructured and overly dependent on manual processes. Critical project updates are mostly communicated verbally or through WhatsApp, with no formal mechanism for documenting or tracking these updates. This lack of systematic communication causes repeated mistakes, misaligned schedules, and confusion over task ownership. Interviewees highlighted that coordination between personnel, equipment, and resources often breaks down, especially when unexpected issues arise on-site. Management admitted that poor planning of timeframes and budgets has led to frequent project overruns, client dissatisfaction, and internal frustration. Many staff members expressed that they are unaware of the current status of projects due to the absence of a centralized platform, which affects their ability to prioritize tasks effectively.

### **Document Analysis:**

The analysis of internal documentation, budget allocations, and resource availability data provided by ARS Builders Sdn. Bhd. revealed inefficiencies and redundancies throughout the project lifecycle. Project records are inconsistently maintained in paper files or scattered spreadsheets, making it difficult for management to track spending, resource usage, and project progress accurately. Documents related to budget forecasts and actual costs showed repeated instances of overspending due to poor initial estimations and unforeseen delays. Resource schedules frequently contained double bookings and uncoordinated assignments of manpower



and equipment, resulting in idle periods or clashes in usage. Furthermore, there is no unified reporting mechanism to provide stakeholders with timely insights, limiting oversight and informed decision-making.

## 5.0 Requirement Analysis

This section outlines what the proposed system must accomplish to overcome the existing issues faced by ARS Builders Sdn. Bhd. These requirements are derived from structured interviews, document analysis, and direct observations of the current project management process. The requirements include both **functional** and **non-functional** components. Functional requirements describe the specific operations the system must perform—such as task scheduling, resource allocation, and project tracking—while non-functional requirements define the overall attributes of the system, such as security, scalability, and ease of use. Clearly defining these requirements will allow the development team to build a comprehensive, user-centric solution that optimizes project execution, reduces costs, and restores client confidence.

### 5.1 Current Business Process

ARS Builders Sdn. Bhd. currently relies heavily on manual workflows for managing its construction projects. The absence of an integrated digital solution has led to significant inefficiencies. The following steps summarize the current business processes:

#### Key Processes:

##### 1. Project Planning and Scheduling:

- Project managers manually prepare project schedules using spreadsheets or handwritten plans.
- Time estimates are often made based on experience, without analytical support, resulting in unrealistic timelines.

##### 2. Resource Management:

- Personnel, equipment, and materials are allocated manually.
- Resource availability is tracked on whiteboards or in disjointed files, leading to double bookings or underutilization.

### 3. **Communication and Coordination:**

- Communication is conducted primarily through WhatsApp, phone calls, and emails.
- There is no centralized platform to track decisions, updates, or task assignments.

### 4. **Progress Tracking:**

- Site progress is reported verbally or through occasional reports.
- There is no standardized method to update stakeholders or monitor project KPIs in real time.

### 5. **Budgeting and Cost Tracking:**

- Budget estimates and expenses are recorded in disconnected spreadsheets.
- Actual expenses are reconciled only after project completion, making it difficult to manage budget overruns.

## **Operational Issues:**

- **High Risk of Human Error:** Manual data entry causes inaccuracies in planning, reporting, and budgeting.
- **Lack of Real-Time Visibility:** Management cannot make timely decisions due to outdated or incomplete information.
- **Poor Coordination:** Resource clashes and task overlaps are common.
- **Client Dissatisfaction:** Delays and miscommunications reduce client trust and repeat business.

## 5.2 Functional Requirement

This section outlines the essential features that the new Integrated Project Management System must possess to address the existing inefficiencies in ARS Builders Sdn. Bhd.'s manual processes. These features support core operations such as project planning, resource scheduling, budgeting, progress tracking, and communication. The system must cater to different user roles (e.g., admin, project manager, site supervisor) and ensure secure, real-time, and centralized access to project-related information.

### → User Registration & Role-Based Access Control

- Allows registration and login for multiple user roles: Admin, Project Manager, Site Supervisor, Finance Officer.
  - Restricts access to modules and data based on user roles.
  - Includes password reset, session control, and login audit logs.
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### → Project Planning & Task Scheduling

- Users can create new projects with detailed scope, start and end dates, milestones, and deliverables.
  - Tasks can be assigned to users, grouped by phase or priority, with deadlines and dependencies.
  - Gantt chart support and visual timeline view for each project.
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### → Resource Allocation & Management

- Centralized system to manage and assign manpower, equipment, and vehicles.

- Prevents double-booking through real-time availability checks.
  - Allows temporary reallocation or substitution in case of conflicts or changes.
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### → **Budgeting & Financial Monitoring**

- Set initial budget estimates by category (labor, materials, equipment, contingency).
  - Track expenses with comparison against actual spending in real time.
  - Generate variance reports and send alerts when nearing budget limits.
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### → **Progress Tracking & Site Updates**

- Site supervisors can submit daily progress updates with attached images or notes.
  - Supports task completion status (e.g., Not Started, In Progress, Completed).
  - Live dashboard for management to monitor project KPIs and milestones.
- 

### → **Document Management System (DMS)**

- Upload and store project-related files (contracts, permits, designs).
  - Supports version control, tagging, and permission-based access.
  - Allows downloading, reviewing, or replacing documents by authorized users.
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### → **Communication & Collaboration Platform**

- Internal chat/messaging system for team discussion within each project.
- Send broadcast announcements or project-wide notices.
- Record conversation history related to task assignments or updates.

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### → Alerts & Notification System

- Automated alerts via email or SMS for deadlines, changes, or approvals.
- Notify team when a task is assigned, delayed, or completed.
- Weekly summary reports sent to project stakeholders.

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### → Reporting & Analytics Module

- Generate reports on project progress, budget usage, and staff performance.
- Custom report builder for clients or internal audits.
- Graphical dashboards to visualize key trends and bottlenecks.

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### → Issue & Risk Management

- Log unexpected problems such as weather delays or equipment failure.
- Assign responsibility, set resolution timelines, and update status.
- Record preventive actions and review closure history.

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### → System Audit Trail

- Maintain logs of all actions taken within the system (e.g., edits, logins, approvals).
  - Helps ensure accountability and compliance with internal procedures.
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## 5.3 Non-functional Requirement

This section outlines the overall qualities and system constraints that the proposed Integrated Project Management System must fulfill. These non-functional requirements ensure that the system performs effectively, remains reliable under varying conditions, and provides a seamless experience for different types of users such as managers, engineers, and administrative staff.

### → Performance

- Support up to 200 users at one time without experiencing significant slowdowns.
  - Page and module load times must be under 3 seconds under standard conditions.
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### → Security

- Include role-based access control for Admin, Project Manager, and Site Supervisor.
  - Use encrypted login credentials and session timeouts
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### → Availability

- The system should be operational with 99% uptime during business hours (8 AM – 6 PM).
  - Offline access should be supported for users at construction sites.
  - System must auto-reconnect and sync when connection is restored.
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### → **Maintainability**

- Use modular and well-documented code for easy maintenance.
  - System updates and bug fixes should not affect user data.
  - Changes should be testable before live deployment.
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### → **Portability**

- The system must be compatible with Windows and macOS.
  - Future expansion to mobile platforms should be possible
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### → **Interoperability**

- System must integrate with external APIs (e.g., weather, permit databases).
  - Export features should support Excel, CSV, and PDF formats.
  - Data sharing with government and clients must be supported
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### → **Compliance**

- Follow Malaysian standards for construction, reporting, and digital data.
  - Allow documentation workflows to support audits and permit checks
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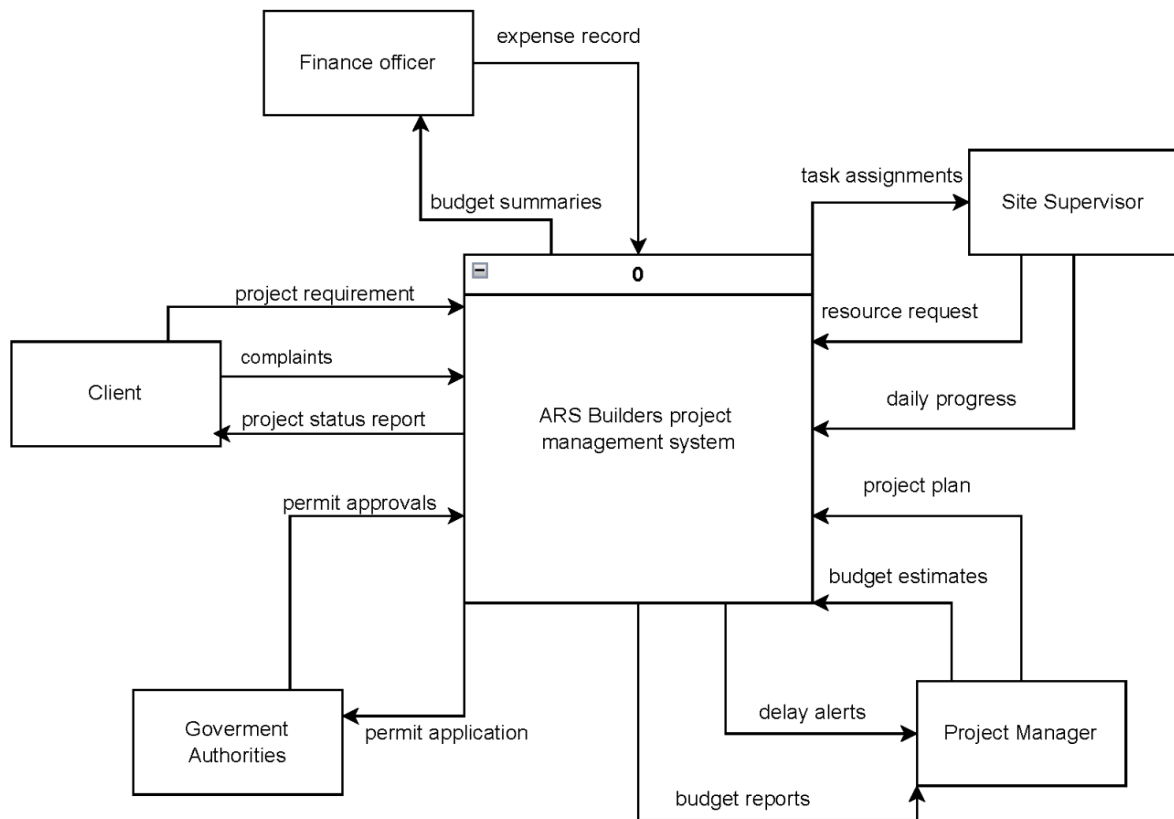
### → **Usability**

- Minimal training should be required for staff members.
- The layout should allow for easy navigation and task execution.

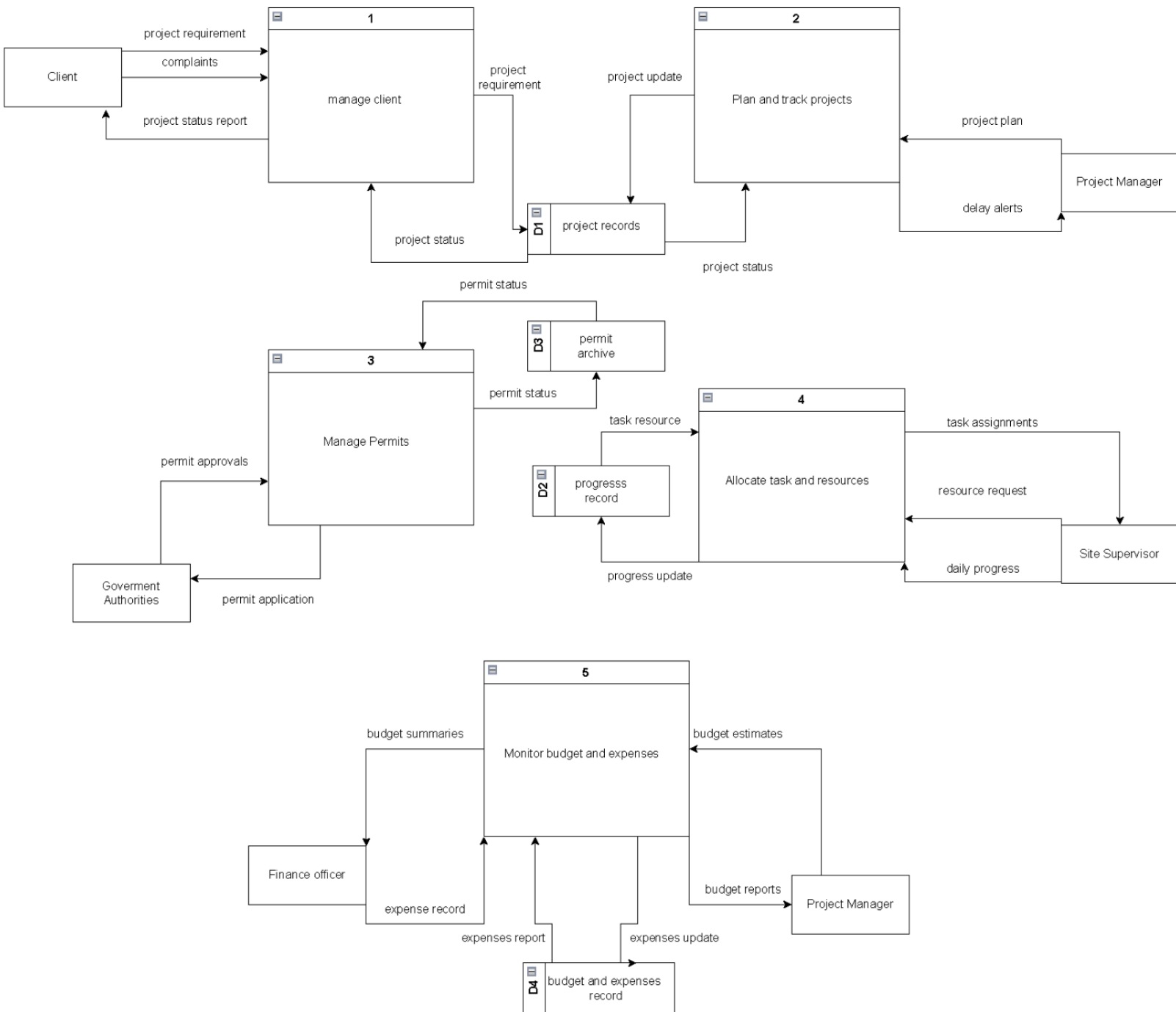


## 5.4 Logical DFD AS-IS system

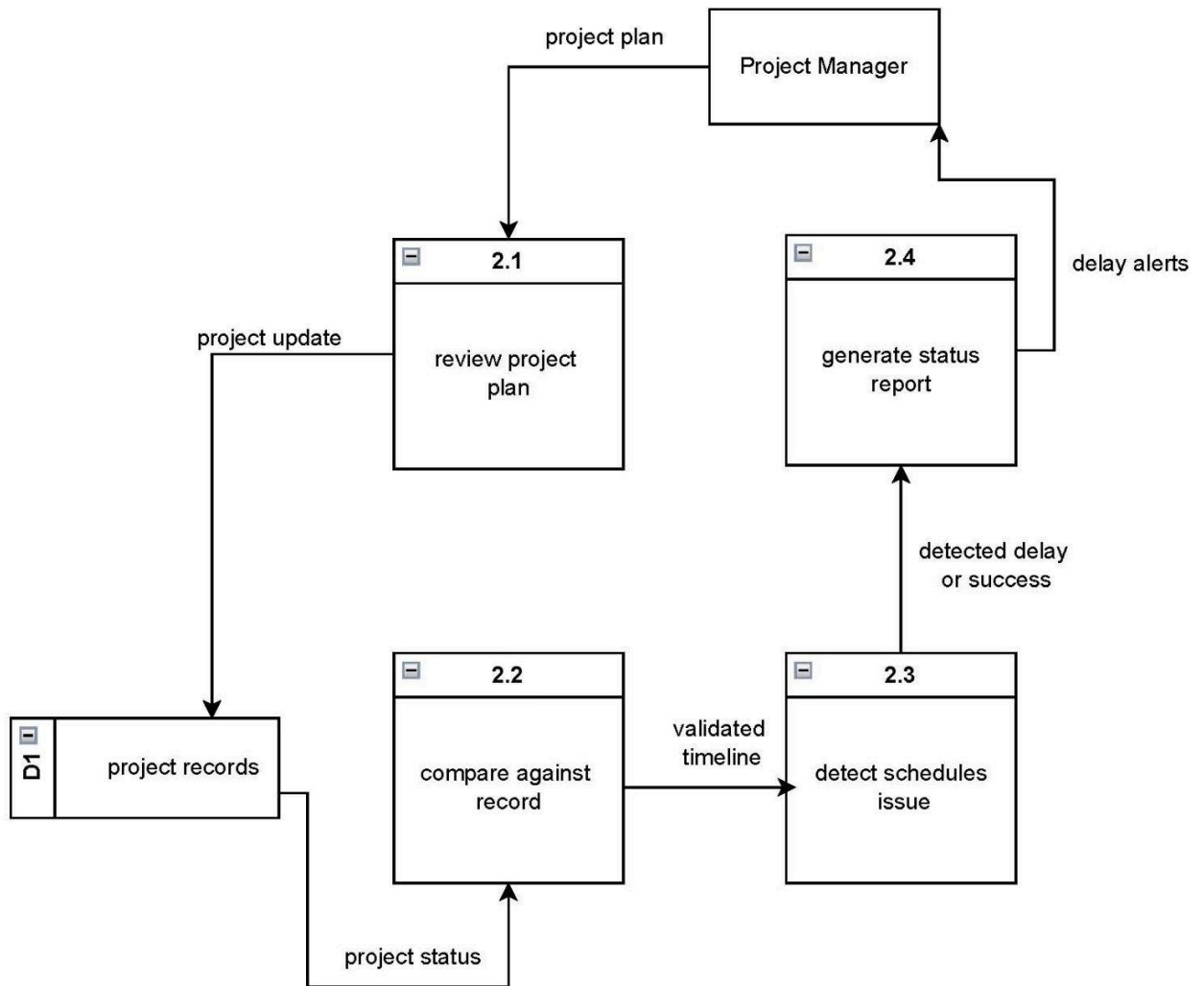
Context Diagram



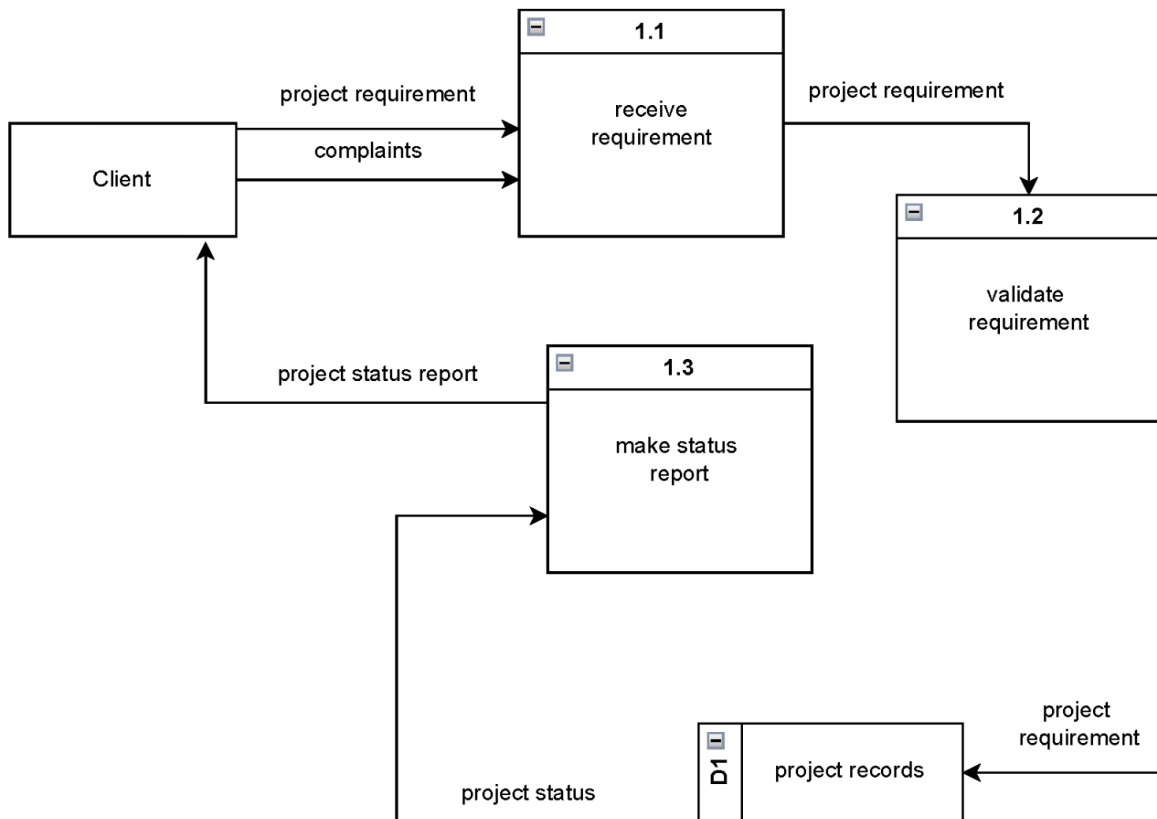
## Level 0 DFD



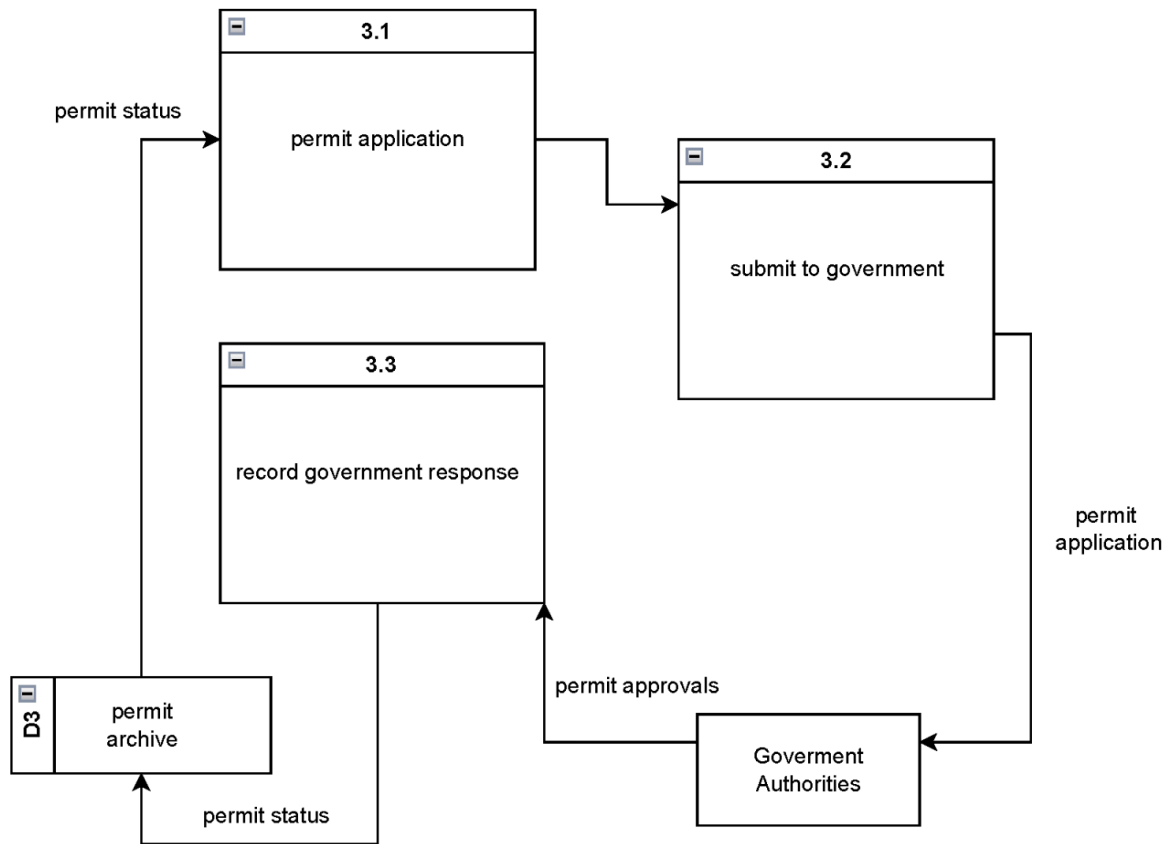
## Child Diagram of Process 2



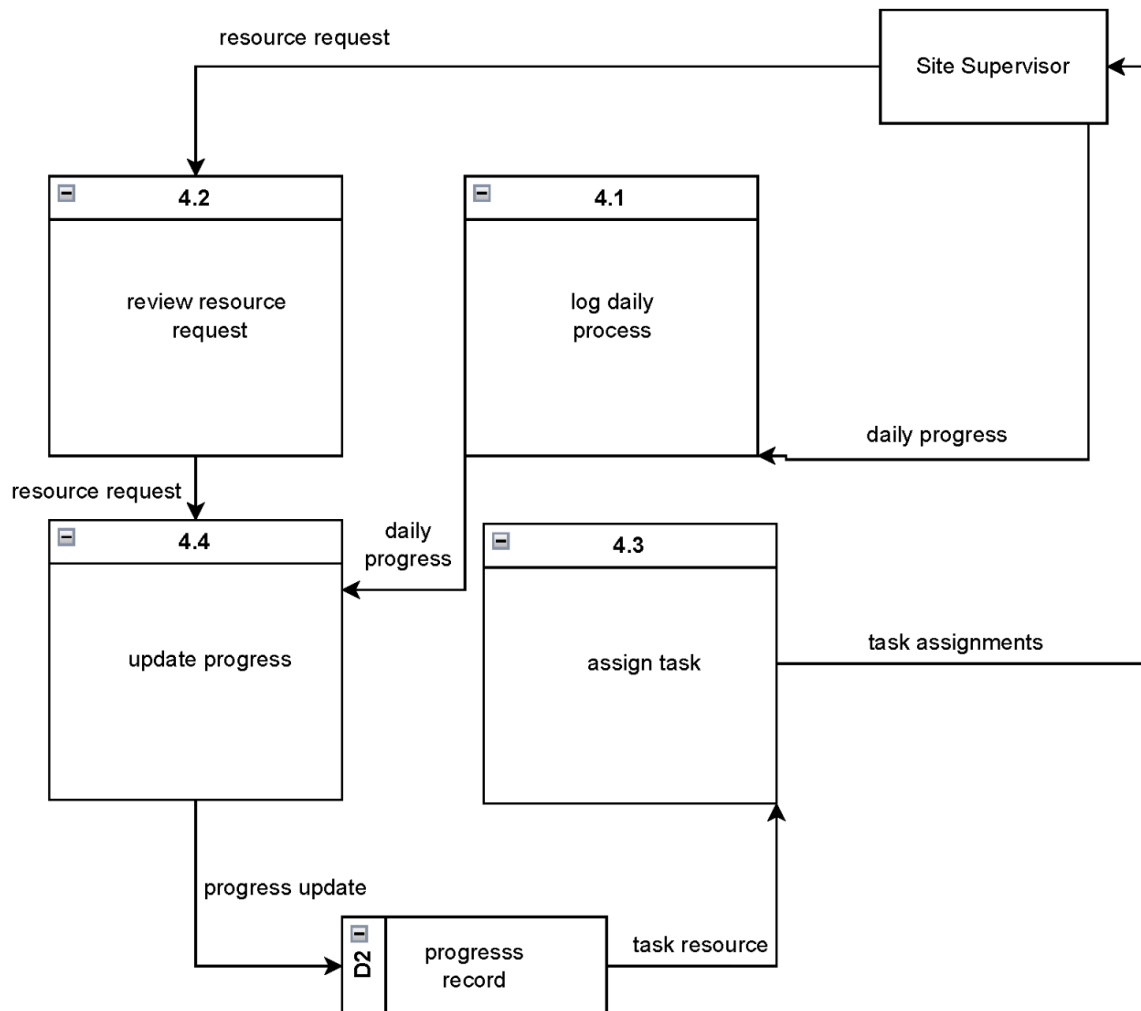
### Child Diagram of Process 1



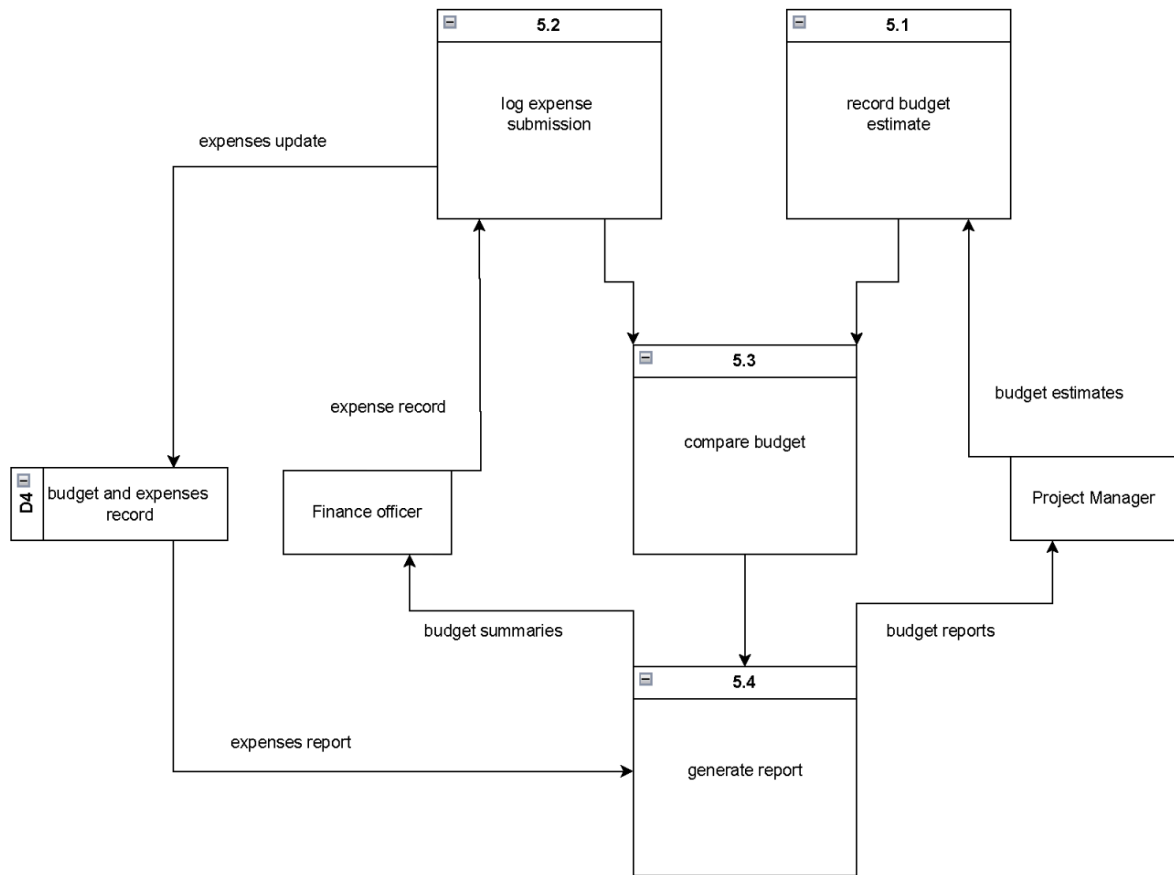
### Child Diagram of Process 3



### Child Diagram of Process 4



## Child Diagram of Process 5



## 6.0 Summary of Requirement Analysis Process

After conducting the requirement analysis process, it is found that there are many manual processes in the workflow of ARS Builders Sdn. Bhd. road construction projects. This inefficient way of handling the projects has lead to numerous issues that has been addressed above. From the requirement analysis process, we have also identified a few processes that can be computerised to increase workflow efficiency and improve project management. Those processes are as follows:

**Project Scheduling and Timeline Tracking:** Automating the creation, monitoring, and adjustment of project schedules to ensure tasks are completed on time and dependencies are managed effectively.

**Budget Monitoring and Reporting:** Digitizing budget planning and expenditure tracking to compare estimated and actual costs, allowing for early detection of overruns.

**Resource Allocation Management:** Tracking and assigning manpower, equipment, and materials in real time, reducing double-bookings and idle periods.

Hence, from the gatherings from the requirement analysis process, a useful and intuitive road construction system can be designed and developed by fulfilling the requirements that have been analysed.