UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING, UTMJB

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PROJECT PHASE 1

SECD2613 SYSTEM ANALYSIS AND DESIGN

SECTION 05

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Content

1.0 Introduction

This proposal provides an overview for establishing a Project Management System for ARS Builders, a Malaysian road construction company owned by Mr. Sithamparanathan Arunasalam. One of the main challenges ARS Builders faces is related to project management, with issues such as missing deadlines, excess expenditure, inability to track utilisation of equipment and labour resource, and communication breakdowns between teams. All of these issues impact the ability of ARS Builders to provide quality service on time and within budgets to maintain good client relations.

This proposed system overall aims to deal with the issues mentioned above, by developing a centralized digital project management system that is tailored for ARS Builders. Consequently, the new system can assist ARS Builders in its planning, scheduling, budgeting, and compliance tracking, as well as communicating with relevant stakeholders to provide effective support. By developing a new project management system, ARS Builders will be better able to manage multiple construction projects and deliver outcomes that meet the expectations of stakeholders with whom they engage.

2.0 Background Study

ARS Builders is a locally owned and operated road construction company in Malaysia, run by Mr. Sithamparanathan Arunasalam.The company has secured multiple road construction contracts from both government and private entities over the past few years, Yet, even with the scope of their operations, ARS Builders continued to have recurring issues with managing its construction operations effectively. Most issues relate to manual work, lack of coordinated planning, and no central plan for tracking real time, impacting their ability to get projects completed on time and on a confirmed budget.

Manual Planning and Scheduling

At present, ARS Builders currently plans and schedules its project timelines manually using either a spreadsheet or a handwritten paper document. Each phase in the construction project – site preparation, sub-base, base, and top surface is manually documented, and task dependency tracking is not in real time. It becomes very difficult to update scheduled changes in real time, particularly with unplanned site disruptions. They often do not realize there are delays until it is too late to manage them.

Lack of Resource Coordination

Labour, machines, and material have separate logs or WhatsApp messages to exchange information between managers and supervisors on-site. There is no live application to help track when resources are available or how they are deployed, leading to machinery being double booked, miss-timed manpower coordination, or crews waiting for equipment and materials to show up while they sit idle.

Uncertainty in Budget Control

They control finances separately from their planning, often just using simple Excel sheets. Material usage, and labour costs usually have no concrete relation to the project timeline, which creates the difficulty in realising true costs and overruns until the project is completed or close to completion. Most of the unforeseen costs such as interruptions from weather, or overtime labour hours are generally not accounted for in the original budgets and lead to straying from budgets.

Difficulties with Tracking Government Permits

Many building works need various permits from local governing bodies, and currently there are no formal process or systems to apply for and follow-up on permits. Permits are tracked manually at present and once sent, there is no flagging or automated systems for reminding or views of submitted permit requests. This can mean that, even though ARS Builders have taken the necessary steps to collect the required permits for a project, with missed deadlines, forgetting final requirements etc., delay can be caused.

Communication Gaps Between All Stakeholders

ARS Builders' Headquarters communicates with all site teams, clients and governing authorities using all sorts of unsolicited, detached communications - phone calls, messaging apps, emails and briefings; leading to misunderstandings, re-iterated messages, updates forgotten - particularly the many fast paced and time scarcity projects being operated.

Impact on Business Performance

Due to these inefficiencies, ARS builders has experienced a continued decline in customer satisfaction. Project delivery has seen an increased pattern of tardiness, wasted finances, and poor or absent documentation (record keeping), all of which has led to difficulties in conducting post-project audits. Furthermore, it has helped reinforce a negative perception in the industry that ARS cannot deliver complex infrastructure projects. The negative relationship impacts could affect the company's future success for winning contracts and gaining referrals.

Need for a Centralized Operation System

Considering all these efficiencies in operations and given the frequency of similar projects ARS regularly undertakes, it is apparent that ARS builders requires a project management system. While there is an opportunity to identify potential system requirements based on stated project tasks during planning and execution, cost estimates and types of resources necessary to perform, performance tracking on project, compliance documentation, and communication with clients and industry stakeholders. A centralized digital system can change, fundamentally, the way that, in an increased activity mode of action and therefore the unintentional applications of inefficiency, directly relates to project awareness, project efficiency and ultimately customer satisfaction.

3.0 Problem Statement

Client Perspective

- Projects are constantly not delivered on time with unrealistic timelines.
- Construction projects are almost continuously over budget.
- The client dissatisfaction has a snowball effect in both new work and existing work, which means it continues to increase because of delays and communication breakdown.

Management Perspective

- Poor management in planning and wasting time to accurately estimate the time and budget on a project basis.
- Delays will happen in the project due to mistakes and unforeseen issues, which makes it challenging in managing delays.
- Poorly coordinated effort of providing labor, machinery, and task completion.
- Poor visibility of what is going on with the project right now.

Impact

- Loss of trust, poor client reputation.
- Decline in the number of client referrals as well as having fewer contracts.
- Further costs are incurred through the cost of resources in the mismanagement of them.
- Lack of productivity among employees created by poor task delegation and clear line of authority.

4.0 Proposed Solutions

4.1 Specialized Desktop-Based Project Management System

In order to streamline the planning and execution, we would propose the creation of a desktop application that is specifically built for ARS Builders. 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.

The standalone system would be an asset and facilitate key tasks such as:

- Project schedules with visual Gantt Charts
- Budgeting and expense tracking
- Labour, equipment and material takeoffs
- Real-time dashboards to monitor project progress
- Track permits and compliance
- Always place alerts for deadlines and other issues with projects
- Produce project reports and internal communications

Example Use Case:

For example, a manager is creating input for a new road project and the application will create a schedule and budget for them automatically, based on previous work. As the project automates, everybody puts input updates in the application which tracks delays and issues automatically which should help produce better decisions, as well as provide the client with improved transparency.

4.2 Feasibility Study

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 infratructure is required.

Conclusion: Technically Feasible

2. Economic Feasiblity

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):

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

4.3 Flexible Scheduling System

Create Gantt chart scheduling drag and drop style scheduling with dependencies and create a trial weather API facilitated with weather data.

Example:

If rain is forecasted, will reschedule pouring concrete, and automatically notify the crew**.**

4.4 Government Approval Tracking

Set up a simple permit tracking add on so you know that the system will integrate with it.

Example:

Manage a simple table to track permit status, submissions, expected approval and notice.

4.5 Project Dashboard

Create a live dashboard in Power BI or Tableau, or create some simple web-based visual dashboards.

Example:

Track percent complete, budget, next tasks to complete and upload daily site photos.

5.0 Objectives

The following is a list of goals to follow after determining the client's needs and presenting a solution:

1. Improve the relationship between realism regarding time and budget estimate
The system will utilize historical data and monitoring tools to help project managers predict, as accurately as possible, how long and how much to budget before and during the implementation phase of the project life cycle. It should give supporting information for project managers to plan and estimate realistically.

2. Reduce delay and improve scheduling
The up to date scheduling tools, as well as monitor deadlines will allow the team to understand potential for delays as well as blockages they may encounter, such as bad weather, delivery of materials, or hold ups getting permits.

3. Improve value of labour and machinery
Has the capability of company executives tracking their resources in a central location will allow for accountability and ensure maximum efficiency. Potentially eliminating over booking or underutilization of workers or equipment, and ensuring all assets are appropriately utilized on multiple projects.

4. Minimize regulatory compliance and documentation time
The system will monitor and advise project managers of any required approvals and documents as identified by the relevant governing authority, minimizing delays caused by incomplete paperwork and expired permits.

5. Utilize project transparency and decisions
The use of a visual dashboard will allow project managers and stakeholders to absorb essential project data such as budget used, schedule progress, issues, and approvals, which will then result in the project team making more informed decisions and next steps quickly.

6. Promote communication among stakeholders
The system will enable easy sharing of updates, status reports, and changes that promote communications among teams, clients, or third-party authorities while minimizing miscommunication and delays.

6.0 Scope of the Project

The proposed system includes the following functions:

Core Modules

- Project planning and task scheduling.
- Labour, equipment, and materials resource tracking.
- Management of budget and cost estimates.
- Daily/hourly project reporting and tracking.
- Documentation and tracking for compliance (existing or new permits).
- Risk and issues tracking tools.
- Communications tools for stakeholders.
- Alerts for deadlines and updates.
- Data visualization dashboards to assist data-driven decision-making.

Users

- Administrators (of ARS Builders management)
- Government & Private Clients (can view project status)
- Project Managers (responsible for Planning and monitoring)
- Site Engineers (responsible for reporting and managing resources)

7.0 Project Planning

7.1 Human Resource

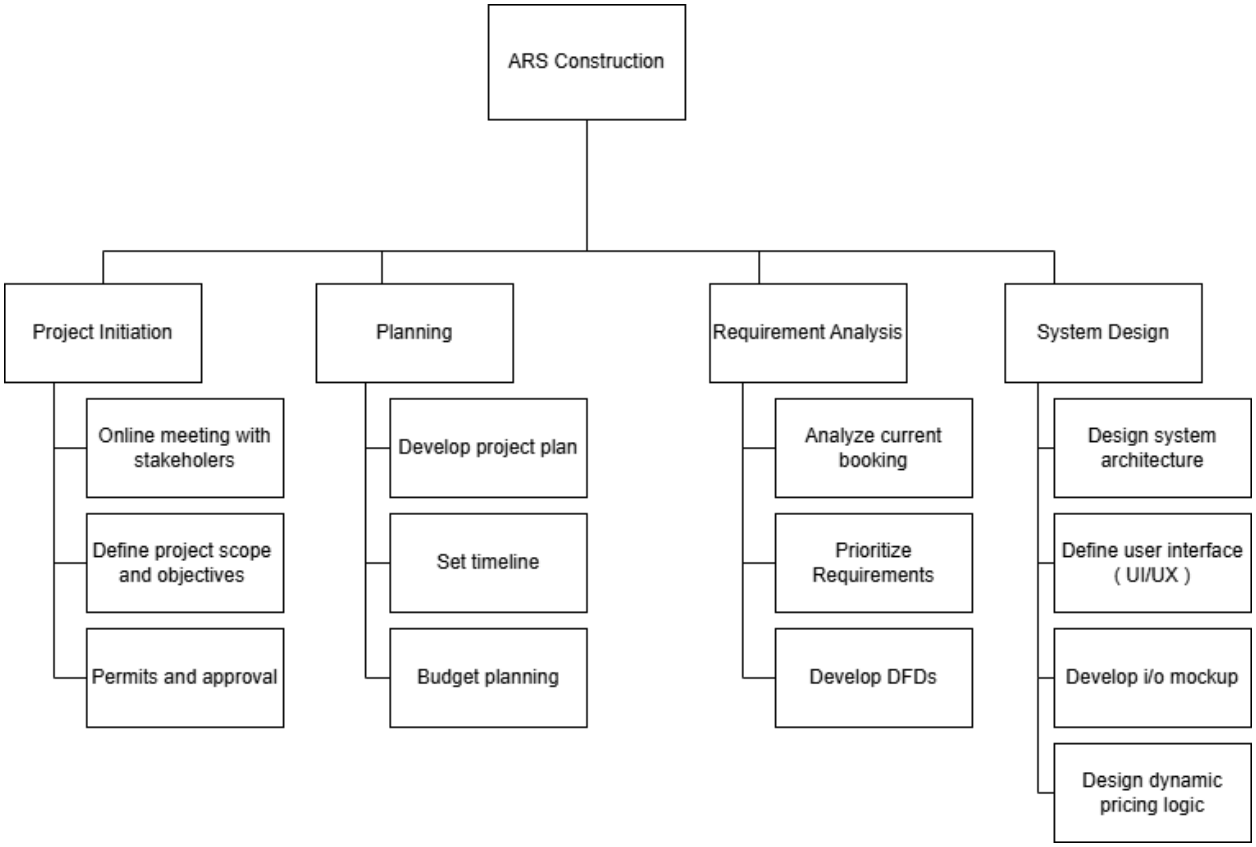
To ensure that the project can be conducted efficiently, we have identified each member's responsibilities and position in the project. This may ensure that the project can be done well and achieve the objectives and requirements of the client.

Name	Position	Responsibility
Dr Iqbal	Advisor	Provides guidance and strategic input throughout each phase to ensure the project outcome is accurate and aligned with objectives.
VIKASH RAJ A/L KATHIRASAN	Project Manager	Oversees every aspect of the project, from start to finish. Creates a clear task plan, sets key milestones, ensures the team knows their roles, and keeps communication flowing smoothly with clients. Keeps everything on track and ensures the project runs smoothly.
DASHITA A/P GAUTHAMAN	Quality Assurance	Make sure the service is top-notch, reliable, and performs well. Tests everything from how it works and feels to its compatibility, speed, and security, ensuring it meets the highest standards.
MOHAMMAD YAZID BIN MOHD KHAIRUDDIN	Front-End Web Developer	Develops engaging, user-friendly web interfaces by transforming UI/UX designs into responsive, interactive web pages using HTML, CSS, and JavaScript. Ensures smooth performance, troubleshoots issues, and optimizes for speed and usability.

GAN YAO TONG	UI/UX Designer	Creates wireframes, mockups, and prototypes to bring ideas to life. Chooses colors, fonts, and layouts that not only look great but also improve the user experience and align with the brand, often using tools like Figma.
MUHAMMAD ARIF BIN MUHAMAD SUHAIMI	Back-End Web Developer	A back-end developer builds and maintains server-side logic, databases, and APIs that power applications. They ensure data processing, security, and smooth communication between the front end and servers.
MUHAMMAD ANAS BIN HAMDAN	UI/UX Designer	Creates wireframes, mockups, and prototypes to bring ideas to life. Chooses colors, fonts, and layouts that not only look great but also improve the user experience and align with the brand, often using tools like Figma

7.2 Work Breakdown Structure (WBS)

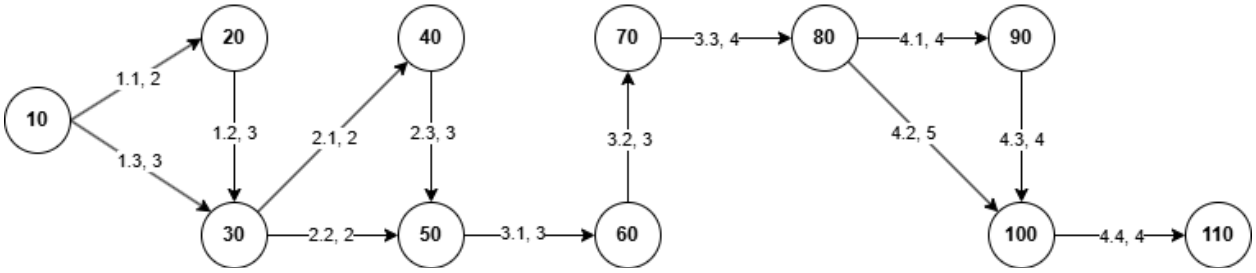
To identify the work to be done throughout the project, a work breakdown structure has been created to ensure that the required work in this project is identified.



7.3 PERT Chart

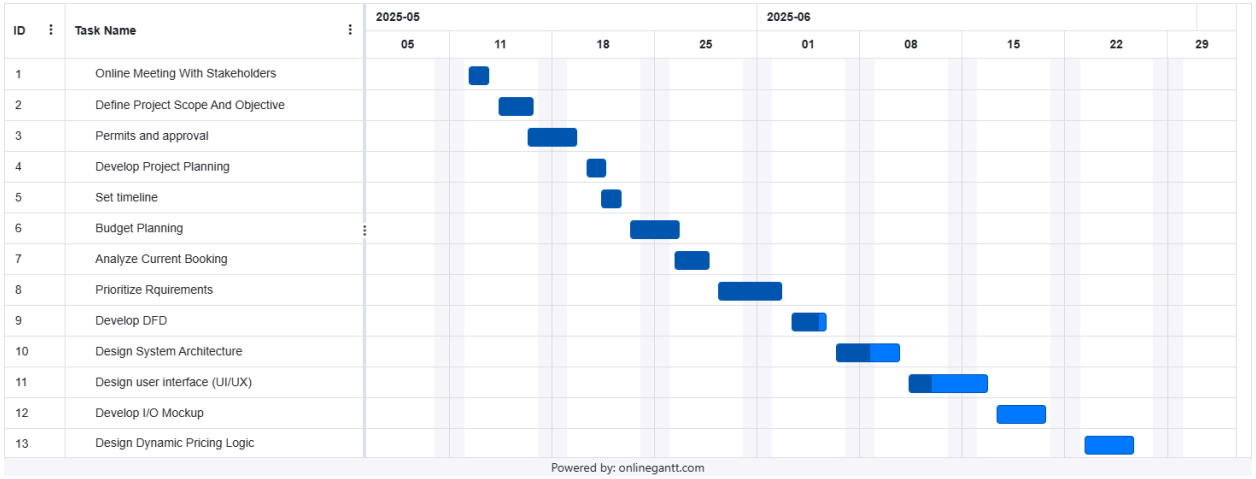
This pert chart is about to visualise the flow of the work for this project. Through this, we can identify the shortest time required to complete the project.

ARS Construction		
Activity	**Duration (days)**	**Predecessor**
1.0 Project initiation		
1.1 Online meeting with stakeholders	**2**	**-**
1.2 Define project scope and objectives	**3**	**1.1**
1.3 Permits and approval	**3**	**-**
2.0 Planning		
2.1 Develop project plan	**2**	**1.2, 1.3**
2.2 Set timeline	**2**	**1.2, 1.3**
2.3 Budget Planning	**3**	**2.1**
3.0 Requirement Analysis		
3.1 Analyze current bookings	**3**	**2.2, 2.3**
3.2 Prioritize requirements	**3**	**3.1**
3.3 Develop DFD	**4**	**3.2**
4.0 System design		
4.1 Design system architecture	**4**	**3.3**
4.2 Design user interface	**5**	**3.3**
4.3 Design I/O mockup	**4**	**4.1**
4.4 Design dynamic pricing logic	**4**	**4.2, 4.3**



7.4 Gantt Chart

This gantt chart is created to distribute task between periods of the project. This chart show which week and which task should be completed to ensure the project completed without delay.



8.0 Benefit and Overall Summary of Proposed System

The possible Project Management System provides ARS Builders with significant advantages by replacing out-of-date manual processes with a central digital solution. Project scheduling will become easier, delay times will minimize, and clients will appreciate better time and budget management through project tracking tools like Gantt charts and budget tracking, available with real-time information. The management of resources becomes better as the Project Management System prevents double-booking of labour and equipment, with automatic item alerts. Communication tools available enable all parties on a project to stay updated. The Project Management System has capabilities for automated permit tracking which reduces or eliminates violations for not adhering to project site regulations. All of the information can be consolidated on dashboards that allow management to analyze project status information quickly which provides them the ability to make improved decision-making quickly. ARS Builders can benefit from better efficiencies, reduced costs, improved client satisfaction, and support for completing construction projects on time and on-budget.