A

Project Report

on

“ERP”

Developed at

Vasundhara IT Pvt. Ltd. Pune

Submitted By:

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To

School of Computer Sciences,
Kavayitri Bahinabai Chaudhari North Maharashtra University,
Jalgaon

In the partial fulfillment of the requirement for the award of the degree of Master of Science June 2024

'A' Grade
NAAC Re-accredited
(4th Cycle)

|| अंतरी पेटवू ज्ञानज्योत||

कवयित्री बहिणाबाई चौधरी उत्तर
महाराष्ट्र विद्यापीठ,जळगाव संगणकशास्त्र प्रशाळा

KAVYITRI BAHINABAI CHAUDHARI NORTH MAHARASHTRA UNIVERITY, JALGAON
SCHOOL OF COMPUTER SCIENCES

CERTIFICATE

This is to certify that **Mr. Vishal Rajendra Tejkar**, a final year student of 'Master of Computer Application' from School of Computer Sciences, Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon has successfully completed the project entitled **"ERP"** as a part of six months full time industrial training during academic year 2023-24.

Head

Department of Computer Application,

School of Computer Sciences,

KBCNMU Jalgaon

External Examiner External Examiner

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Chapter 1

Introduction

1.1 Company Profile

About Vasundhara IT Pvt. Ltd.

A custom software services provider based at Pune, Vasundhara is a diverse workplace which enriches business and promotes better understanding between cultures, genders and ethnicity. Backed with extensive experience, we offer solutions in diverse areas of both software and hardware development. Experienced technocrats in the organization have rich experience working with a wide array of platforms, languages and tools in due course of various projects.

Our key differentiators have been the domain knowledge, experience in conceptualizing, exploring technology in designing, developing and packaging hardware and software applications.

We help our clients to find the right solution & solve their problems effectively.

VITPL is an industry player with a diverse clientele. Being ambassadors of diversity, Our representatives make sure that every employee works & interacts as per the code of conduct to keep diversity flowing in from both ways.

OUR MANAGEMENT PROFILE

Mr.Vinay M. Yeolekar (Founder & Managing Director)

Mr.Chetan M. Yeolekar (Co-founder and Managing Director)

IT. PVT. LTD.

Incorporated in 2001, VIPL has successfully implemented web applications for E-labs (Government Project) and also have taken care of Data Monitoring applications for the Public Works Department.

INDUSTRIES

Vasundhara Industries established in 2014, is engaged in the Production & implementation of SCADA systems for Drum Mix Plants, Batch Mix Plants, Compaction Analyzers, Earth Moving Equipment's, Fleet Management & Special Purpose Machines etc.

Vision

To be a globally respective corporation that provides best-of-breed business solution, leveraging technology, delivered by best-in-class people.

1.1.1 Services Offered by Vasundhara IT Pvt. Ltd:

- *Automation*

  Delivering technology blended with SCADA driven functional automations through systems Integration and wireless applications.

- *SPM*

  Our SPM division is a dynamic organization comprising of highly skilled and experienced engineering and management professionals.

- *Software*

  Whether your business is technical or commercial, we offer customized software applications that address most of your business processes.

1.1.2 Clients and Products.

eBilling

eBilling is a paperless solution for organizations to facilitate the efficient collection of bill payments issued to customers. This will increase billing efficiency and reconciliation, and improve customer service.

Our eBill (electronic bill) is an electronic version of a paper bill that you can view online. Implemented in our various solutions for Government projects, it gathers all the relevant contributing data from respective sub-systems of our solution and prepares an Invoice which is shared with client as eBill.

iCARD Helper

I-Card Helper, helps to record and print students and employee ID cards with photo and barcodes, and visitors pass with photo & barcode.

OPAC

OPAC, an Online Public Access Catalogue is an online database of materials held by a library or group of libraries. The product helps locate books and other materials located physically in the library premises.OPAC works on both Intranet and Internet.

Vision

Vision, an admin software application for your school has modules that are tightly integrated for seamless data travel and thus easy to use. The product has student module, fees module, examination module, finance & accounts, and payroll modules.

V-lib

V-Lib, a Library Management Application helps automate all library functions and keep a good track of books and periodicals movement.

Construction ER

The real estate sector fortunes are tied to the growth of economies. Being in a highly capital-intensive industry, you face several challenges in diverse areas of your business: in project planning and execution, project costing, collaborating with preferred suppliers/ sub-contractors, visibility on cash flow, pricing and regulatory compliance. You need to manage project planning, site selection, construction, budget planning, regulatory approvals, and every other aspect of your business smartly.

Construction ERP offers:

- Practical solution for everyday problem
- Comprehensive decision support systems
- Automatic critical alert system
- Seamless flow of information
- Guaranteed ROI
- Dynamic Business Intelligence Report
- Empowered Management
- Real-time integration with project Sites

Clients:

The company's clients include reputed

T&T Infra Pune,

PWD Government of Maharashtra, Nikhil construction,

Ajwani infrastructure Private Limited India,

Raj Infrastructure Private Limited India.

1.2 Introduction to Project

The ERP Software represents a significant advancement in the management of municipal operations, tailored Specifically for the Pune Municipal Corporation (PMC) Government Project. This sophisticated software solution is poised to Revolutionize the management of various municipal functions, offering seamless integration and efficient resource Utilization.

In the face of mounting complexities in municipal services and the imperative for streamlined management, the ERP Software emerges as a pivotal solution. Its design is meticulously crafted to address the multifaceted challenges Encountered by the PMC, providing a centralized platform for orchestrating diverse functions such as finance, human Resources, procurement, asset management, and citizen services.

The genesis of the ERP Software stems from the pressing need to confront the challenges inherent in managing municipal operations. Manual processes, fragmented data systems, and disparate workflows have created inefficiencies, hindering the Corporation's ability to respond adeptly to citizen needs, allocate resources judiciously, and make data-driven decisions.

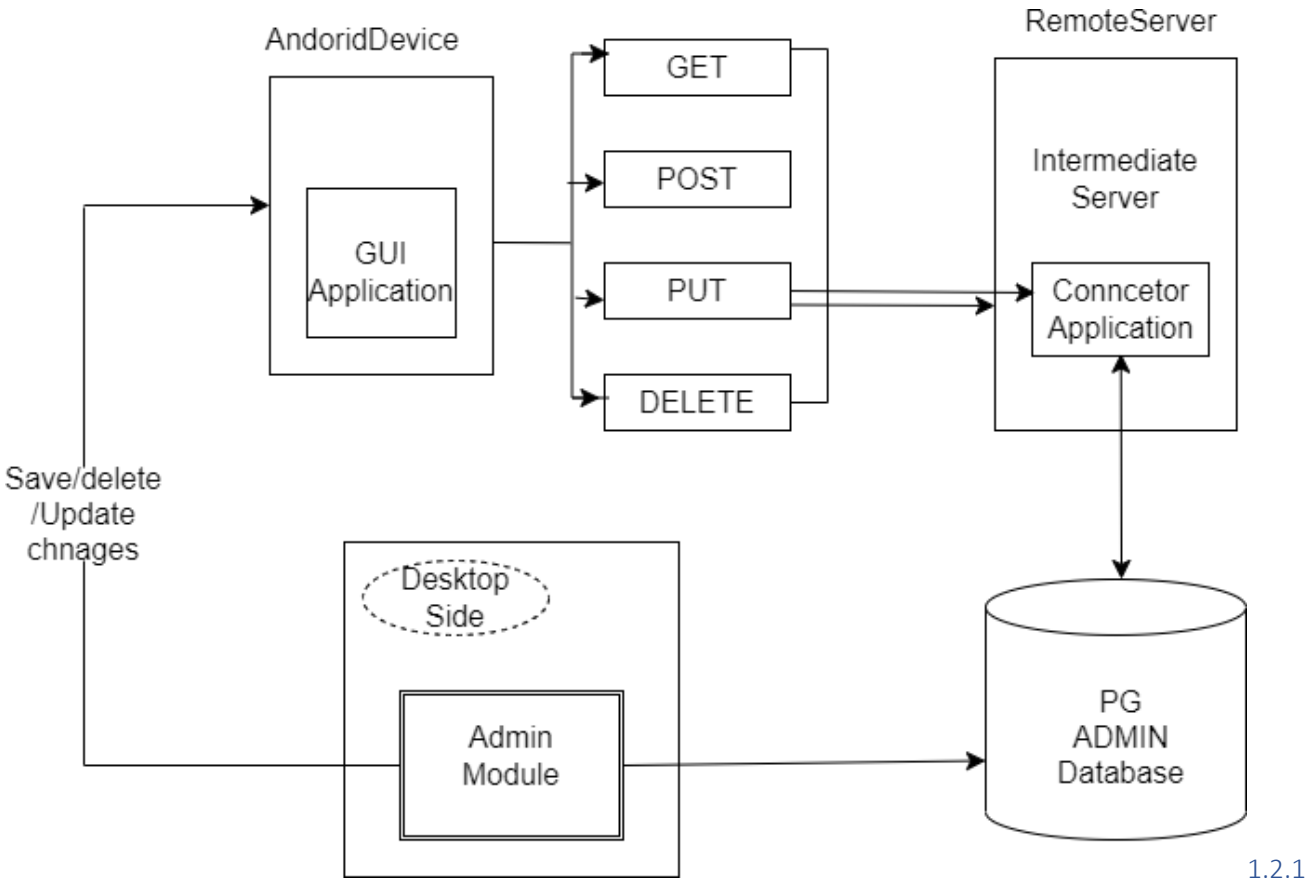
The ERP Software is envisioned as a transformative tool to surmount these obstacles. By offering a unified platform that integrates various functions, promises to enhance operational efficiency, fortify data integrity, and empower Decision-makers with timely insights.

At its core, the ERP Software endeavors to modernize and optimize municipal operations, positioning the Pune Municipal Corporation at the vanguard of efficient governance. Through this initiative, PMC seeks to streamline workflows, enhance service delivery, and ensure transparent, accountable governance practices.

The scope of the ERP project encompasses a comprehensive overhaul of existing systems, spanning identification of key functional areas for integration, selection and customization of an appropriate ERP solution, system configuration, user training, and post-implementation evaluation.

In adopting ERP Software, PMC aims for operational excellence, citizen satisfaction, and modernized administration. In embracing the ERP Software.

Architecture Diagram:



1.2.1

1.2.1 Need and Motivation

In the modern business landscape, organizations face a myriad of challenges in managing their operations efficiently and Effectively. These challenges often stem from disparate systems, manual processes, and fragmented data sources that Result in inefficiencies, errors, and missed opportunities. Recognizing the need for a unified solution to streamline their Operations and drive growth, organizations turn to Enterprise Resource Planning (ERP) systems.

At the heart of the decision to implement an ERP system lies the imperative to streamline business processes. Organizations grapple with the complexities of managing various functions such as finance, human resources, procurement, inventory management, and customer relationship management. These functions often operate in silos, leading to redundancy and inefficiency. By consolidating these functions into a single, integrated platform, an ERP system eliminates silos and streamlines processes, enabling organizations to operate more efficiently and effectively

1.2.2 Problem definition

The ERP implementation project aims to address challenges inherent in modernizing organizational processes through ERP adoption. Key issues include fragmented systems, inadequate data management, resistance to change, scalability concerns, and resource constraints. The project seeks to overcome these hurdles by conducting a comprehensive needs assessment, engaging stakeholders, implementing robust change management strategies, optimizing data migration and integration, customizing the ERP solution, and providing extensive training and support to employees.

Fragmented Systems:

Current organizational processes rely on disparate systems and workflows across departments, leading to inefficiencies and data silos. This fragmentation makes it difficult to obtain a comprehensive view of operations and hinders effective decision-making.

Inadequate Data Management:

Manual data entry processes are prevalent, resulting in errors and inconsistencies. This complicates data migration and integration efforts when transitioning to an ERP system. Legacy data formats and poor data quality further hinder effective utilization of the ERP system.

Inaccurate or incomplete data undermines the reliability of reports and analytics generated by the ERP system, reducing its value as a decision-making tool. It also increases the time and effort required for data cleansing and validation.

Resistance to Change:

Employees may resist adopting new technologies and processes due to fear of job displacement, increased workload, or unfamiliarity with the new system. Resistance may be particularly strong among long-tenured staff who are accustomed to existing procedures.

Lack of user acceptance impedes successful implementation and utilization of the ERP system. It can lead to decreased productivity, morale issues, and a reluctance to fully engage with the system, limiting its effectiveness.

1.2.3 Limitation of exiting System

One limitation could be the difficulty in customizing the ERP system to meet unique business requirements. If the system lacks flexibility or has limited customization options, it may not fully align with the specific needs and processes of your organization. This limitation could result in inefficient workflows, manual workarounds, or the need for additional third-party solutions to fill gaps.

1.2.4 Objective and Scope

The following are the major objective of the application.

Enhance Operational Efficiency:

The primary objective of the ERP project is to enhance operational efficiency by automating manual processes, reducing redundant tasks, and streamlining workflows across departments. This objective aims to improve productivity, reduce costs, and enable the organization to respond more effectively to changing business demand

Modules and Functionalities:

The scope of the ERP project includes the implementation of core modules such as finance, human resources, inventory management, procurement, sales, and customer relationship management, based on the organization's requirements. Additionally, customization and configuration of the ERP system will be undertaken to align with the organization's unique business processes and requirements.

Modules "ERP" System Spring Boot

There are two types of actors in the application one is ADMIN who can manage all the Information and the other one will be the User/Contractor who can view Information. Let's see all the details step by step.

ADMIN

- Admin can ADD/VIEW/DELETE/UPDATE Information of Enquiry/Follow-up.
- Admin can ADD/VIEW/DELETE/UPDATE Information of Quotation
- Admin can ADD/VIEW/DELETE/UPDATE Information of Sales Order.
- Admin can ADD/VIEW/DELETE/UPDATE Information of Proforma Invoice.
- Admin can ADD/VIEW/DELETE/UPDATE Information of Payment Receipt.
- Admin can ADD/VIEW/DELETE/UPDATE Information of Tax Invoice, Delivery Challan.

- Admin can ADD/UPDATE user information.
- Admin should be able to see all record of users.

USER

- Users can VIEW Work Orders.
- Users can VIEW Product.
- Users can VIEW Enquiry/Follow-up.
- Users can VIEW Sales Order.
- User can VIEW Payment Receipt.
- Users can view their own Profile.
- The purpose of the SCADA App for Pune Municipal Corporation Government Project
- Streamline operations and improve efficiency within the municipal corporation.

1. Enable real-time monitoring and control of critical infrastructure and processes.
2. Enhance work order management, ensuring timely and efficient completion of tasks.
3. Optimize resource allocation, reducing costs and improving productivity.
4. Facilitate data-driven decision making and enhance service delivery to citizens.

Chapter 2
System Analysis

2.1 System Requirement Analysis:

2.1 System Requirement Analysis for ERP Project (Spring Boot Application)

2.1.1 Pre-Analysis:

Pre-analysis in system requirement analysis for an ERP project involves gathering initial information, defining project scope, identifying stakeholders, assessing technical environment, and conducting risk assessment. It sets the stage for comprehensive requirement analysis by providing context, understanding project goals, and identifying potential challenges and constraints.

2.1.2 Situation Analysis:

Situation analysis involves evaluating the current state of the organization, including its processes, technology, data, and compliance status. It helps identify key challenges, opportunities, and stakeholders' needs, providing a foundation for the ERP project's requirements and objectives. Additionally, situation analysis serves to uncover inefficiencies, bottlenecks, and areas for improvement within the organization.

2.1.3 Stakeholder Analysis:

ERP project aims to streamline and integrate business processes across departments using a Spring Boot application. It involves analyzing system requirements, including functionalities like user management, inventory, sales, finance, and HR. Key considerations include scalability, security, and compliance, with a technology stack comprising Spring Boot for the backend, along with suitable frontend and database.

2.1.4 Problem Analysis:

Problem analysis involves identifying and understanding the underlying issues, challenges, and pain points that the ERP project aims to address. This step is crucial for uncovering the root causes of inefficiencies or shortcomings in the current system and informing the design of effective solutions. It may involve analyzing workflow bottlenecks, data inconsistencies, legacy system limitations, or user frustrations to develop a clear understanding of the problems that need to be solved.

2.1.5 Needs Analysis:

Needs analysis in the context of an ERP project involves identifying the specific requirements and objectives of the organization that the ERP system must fulfill. This includes understanding the functional needs of different departments, as well as non-functional requirements such as scalability, security, and regulatory compliance. Needs analysis helps ensure that the ERP solution is aligned with the organization's goals and priorities, ultimately delivering value and driving business success.

2.1.6 SWOT Analysis:

SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis is conducted to assess the internal and external factors that may impact the success of the ERP project. It involves evaluating the application's potential strengths and weaknesses, identifying opportunities for innovation or improvement, and recognizing any external threats or challenges that may affect the project's implementation or sustainability.

For the ERP Spring Boot Application, some initial requirements include:

Minimum Device Requirements: The application should be compatible with devices running on various operating systems, ensuring accessibility across different platforms.

Real-time Monitoring: The ERP system should provide real-time monitoring and control capabilities for various business processes, enabling users to access live data, track performance metrics, and respond to events

Data Management: The application should support efficient data collection, storage, and analysis, enabling users to input, store, retrieve, and analyze data seamlessly. This includes features such as database management, data validation, and data visualization tools.

User Interface: The ERP system should have an intuitive and user-friendly interface, ensuring ease of navigation, data entry, and information retrieval. Customization options for interface elements and user preferences should also be available.

Security: Robust security measures should be implemented to protect sensitive data and ensure system integrity. This includes features such as user authentication, role-based access control, data encryption, and audit trails to track user activities.

Integration: The application should support seamless integration with other systems and third-party services, enabling data exchange, interoperability, and workflow automation. This includes integration with existing ERP systems, CRM software, accounting platforms, and external APIs.

These initial requirements lay the groundwork for further development and customization of the ERP Spring Boot application, ensuring that it meets the specific needs and objectives of your organization.

2.2 Scope of Proposed System:

Considering needs of farmers and drawbacks of existing system proposed system is developed, which has several features.

The aim of proposed system is to develop a system of improved facilities. The proposed system can overcome all the limitations of the existing system. The system provides proper security and reduces the manual work.

It has the following advantages listed

- Enhanced data security.
- Improved data accuracy.
- Better control over accounting processes.
- Reduction in paper-based data entry.
- Increased efficiency and better service delivery.
- User-friendly and interactive interface.

2.3 Tools/Platform, Hardware and Software Requirement specifications:

2.3 Technical Specification :

Name Of Component	Specifications
Operating System	Windows 10 64 Bit, Eclipse IDE
Browser	Google chrome, Mozilla Firefox
Ram	4GB or More
Name Of Component	**Specifications**
Operating System	Windows 10 64 Bit, Eclipse IDE
Browser	Google chrome, Mozilla Firefox
Ram	4GB or More
Hard disk Space	NA
Internet Speed	Mbps

Chapter 3
Feasibility Study

3. Feasibility Study:

3.1 Introduction

The introduction sets the stage for the feasibility study by providing context and outlining the study's objectives. It introduces the ERP Spring Boot project, highlighting its importance and relevance to the organization. Additionally, it outlines the structure of the feasibility study report, indicating the sections that will be covered to assess the project's feasibility thoroughly.

3.2 Economic Feasibility

This is a very important aspect to be considered while developing a project. We decided the technology based on minimum possible cost factor.

- All hardware and software cost has to be borne by the organization.
- Overall, we have estimated that the benefits farmers are going to receive from the proposed system will surely overcome the initial costs and the later on running cost for system.

3.3. Technical Feasibility

This involves evaluating the technical requirements and constraints of developing the ERP system using Spring Boot. Factors such as the availability of necessary technology, expertise, and compatibility with existing systems will be analyzed to ensure the project's technical feasibility.

3.4 Operational Feasibility

Operational feasibility examines the practicality and effectiveness of implementing the ERP system within the organization. This includes evaluating factors such as user acceptance, organizational readiness, and potential impacts on existing workflows to ensure smooth integration and adoption of the new system.

By conducting a comprehensive feasibility study, we aim to identify potential risks, challenges, and opportunities associated with the ERP Spring Boot project. This will enable stakeholders to make informed Decisions regarding project initiation and resource allocation, ultimately maximizing the likelihood of project Success.

Chapter 4
Proposed System

4.1 Proposed System

The proposed ERP system aims to streamline and integrate business processes across departments using a comprehensive and user-friendly web application. It will address the limitations of existing ERP solutions by providing enhanced functionalities for resource management, financial tracking, HR management, and customer relationship management.

Integrated Business Modules: The system will include modules for inventory management, sales, finance, human resources, and customer relationship management, allowing seamless integration and data flow between different departments.

Real-time Data Analysis: With its real-time monitoring and analytics capabilities, the ERP system will provide stakeholders with valuable insights into business performance, enabling informed decision-making and proactive management.

Work Order Management: The system will facilitate efficient work order management, enabling users to create, assign, track, and complete tasks within defined timelines. This will enhance project visibility and coordination across teams.

4.2 User Privilege

The ERP system will implement a role-based access control model to ensure appropriate user privileges and data security. User privileges will be assigned based on the roles and responsibilities of individuals within the organization. Here are the user privileges that can be defined within the system:

Administrator:

- Full access to all system features and functionalities.
- User management: Ability to create, modify, and delete user accounts.
- Role management: Ability to assign roles and privileges to other users.
- System configuration: Ability to configure system settings and preferences.

Project Manager:

- Access to project-specific data and functionalities:
- Work order management: Ability to create, assign, and track work orders.
- Resource management: Ability to manage resources such as materials, equipment, and personnel.
- Financial management: Ability to manage project budgets, expenses, and financial transactions.
- Reporting: Ability to generate reports on project progress, budget status, and resource utilization.

Supervisor:

- Limited access to project data and functionalities.
- Work order tracking: Ability to view work order status and progress.
- Resource monitoring: Ability to monitor resource utilization and availability.
- Communication: Ability to communicate with project teams and stakeholders.

Technician:

- Limited access to specific project data and functionalities.
- Task execution: Ability to perform assigned tasks and update task status.
- Equipment monitoring: Ability to monitor equipment status and performance.
- Reporting: Ability to report issues, incidents, and maintenance needs.

Viewer:

- Read-only access to project data.
- View project-related information, such as work orders, resources, and financial data.
- Access reports and dashboards for informational purposes.

These user privileges can be customized and adjusted based on the specific requirements and workflows of the ERP system. It is essential to ensure that each user is granted the appropriate privileges to perform their assigned tasks while maintaining data security and integrity throughout the system.

4.3 Objective of System

The objective of the ERP system is to streamline and optimize business processes by providing a centralized platform for managing and integrating various organizational functions. The system aims to achieve the following objectives:

Efficiency: Improve operational efficiency by automating routine tasks, reducing manual effort, and eliminating redundancies in data entry and processing.

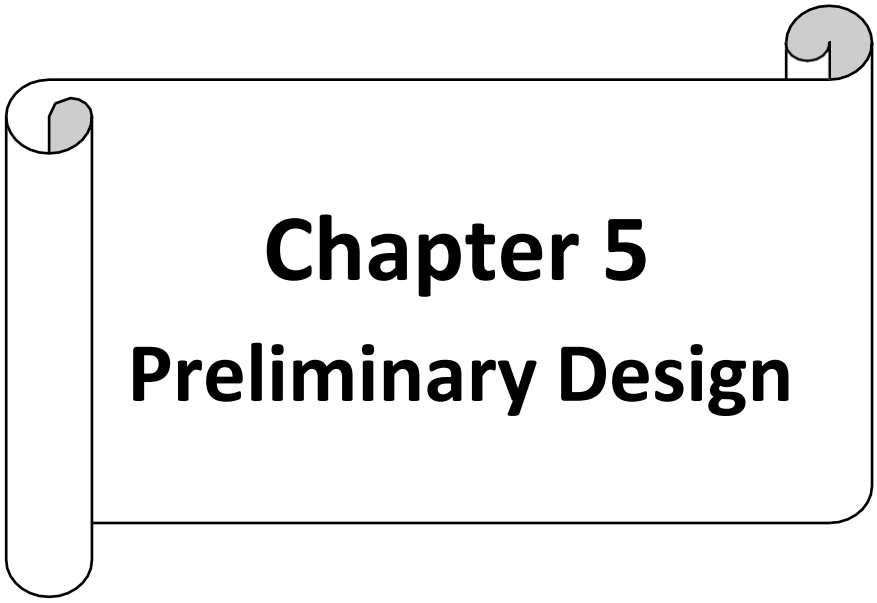
Integration: Integrate disparate systems and departments within the organization to facilitate seamless data flow and collaboration across functions.

Visibility: Enhance visibility into business operations by providing real-time access to relevant data, metrics, and insights for informed decision-making.

Resource Optimization: Optimize resource allocation, including human resources, materials, and finances, to maximize productivity and minimize costs.

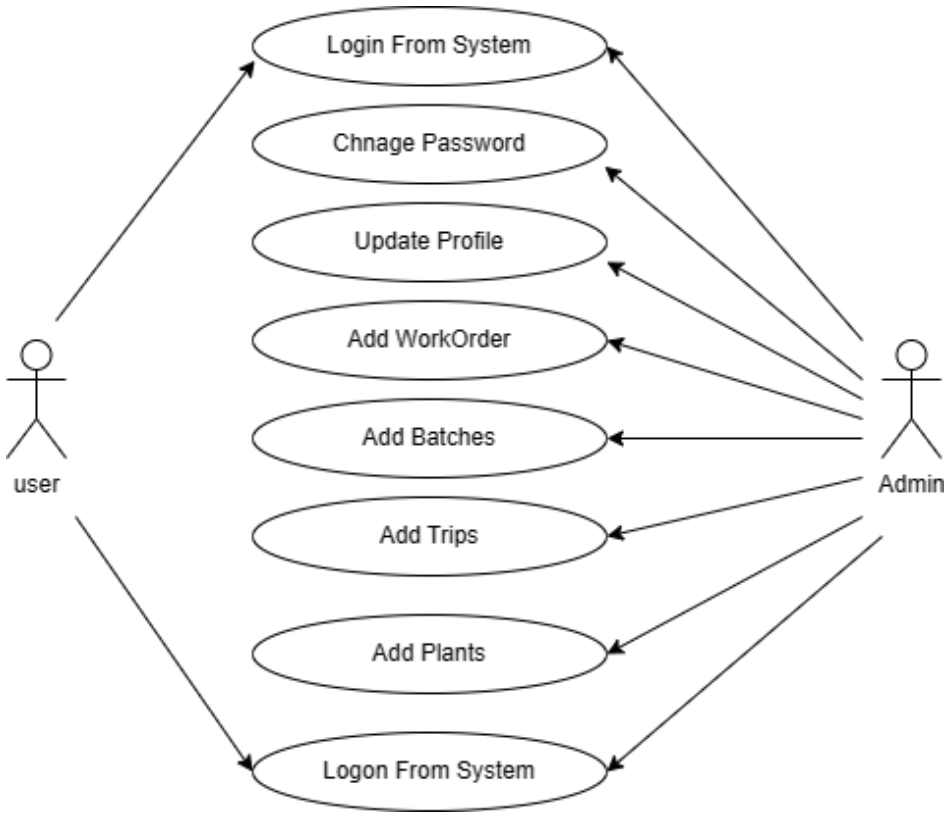
Standardization: Standardize business processes and workflows to ensure consistency, compliance with regulations and adherence to best practices.

Overall, the objective of the ERP system is to transform the organization's operations, enhance competitiveness, and drive sustainable growth by leveraging technology to optimize business processes and improve organizational performance.



Chapter 5
Preliminary Design

5.1 Use Case Diagram: Use case diagram shows the static view of the system. It includes number of use cases and actors participating in the system

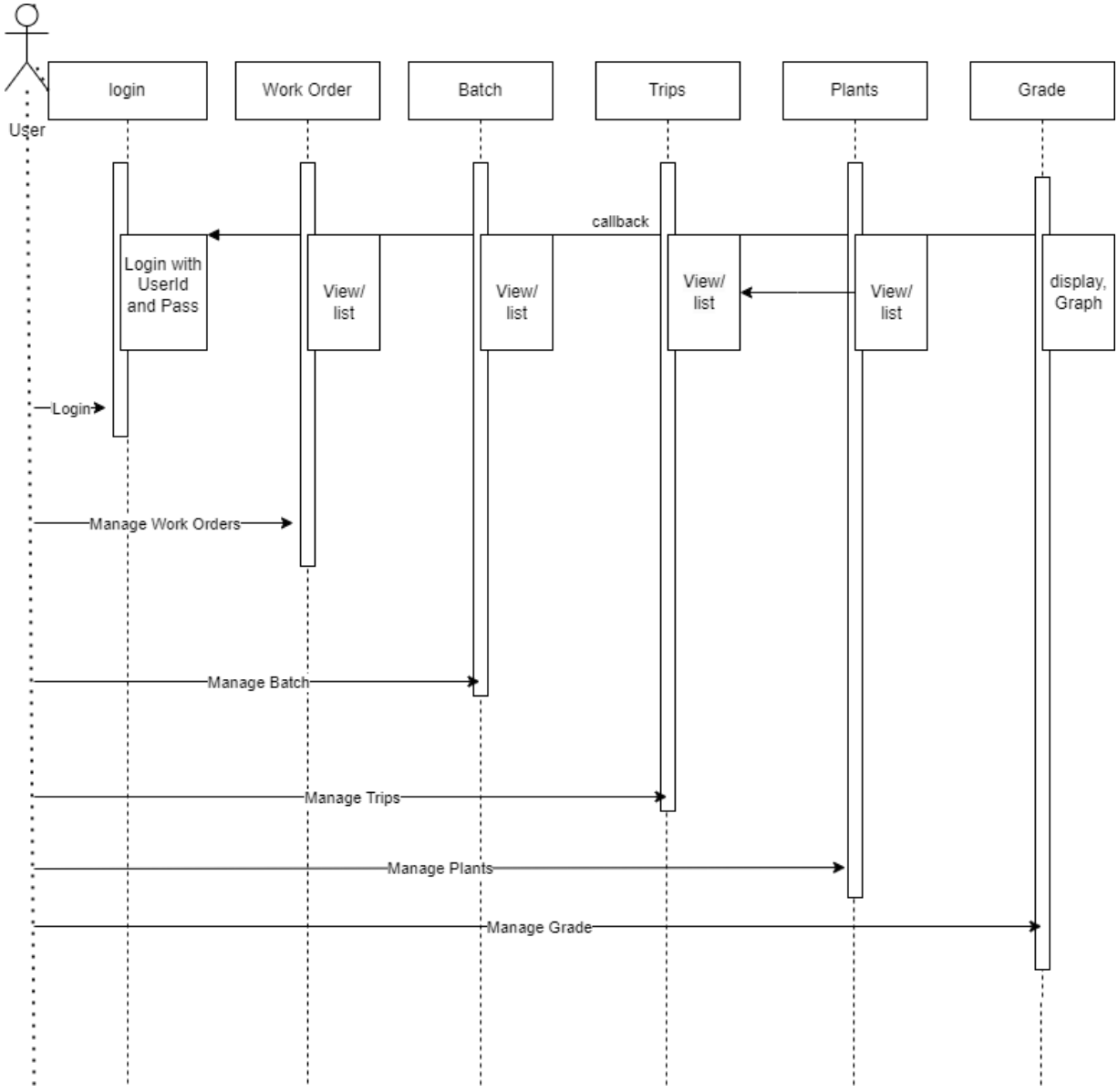


Use Case Diagram of SCADA

5.2 Sequence Diagram

A sequence diagram is a Unified Modeling Language (UML) diagram that illustrates the sequence of messages between objects in an interaction. A sequence diagram consists of a group of objects that are represented by lifelines, and the messages that they exchange over time during the interaction.

Sequence Diagram for Login

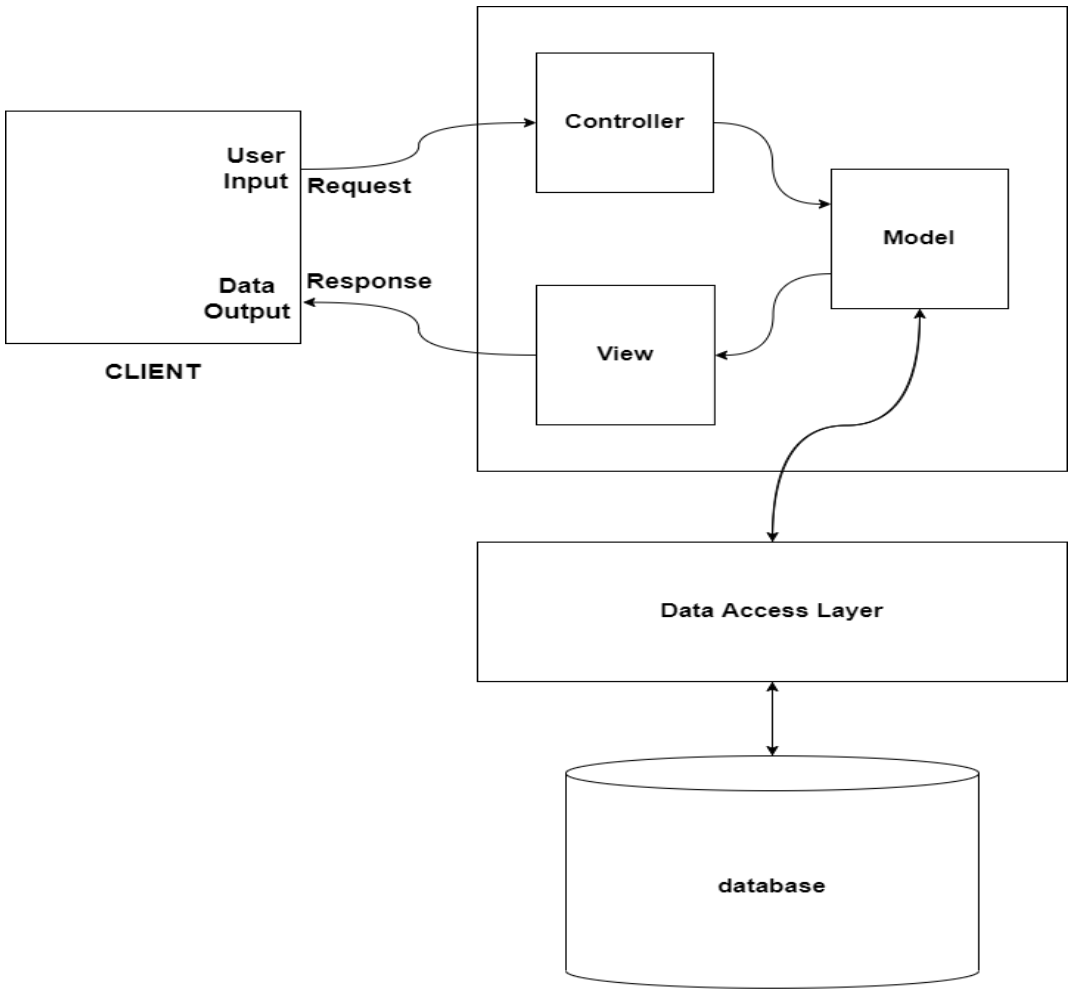


5.3 Data Flow Diagram

Data flow diagram is the basic building blocks that define the flow of data in a system to the particular destination and difference in the flow when any transformation happens. It makes whole procedure like a good document and makes simpler and easy to understand for both programmers and non-programmers by dividing into the sub process.

The data flow diagram serves two purposes.

1. To provide an indication of how data are transforming as the moves through the system.



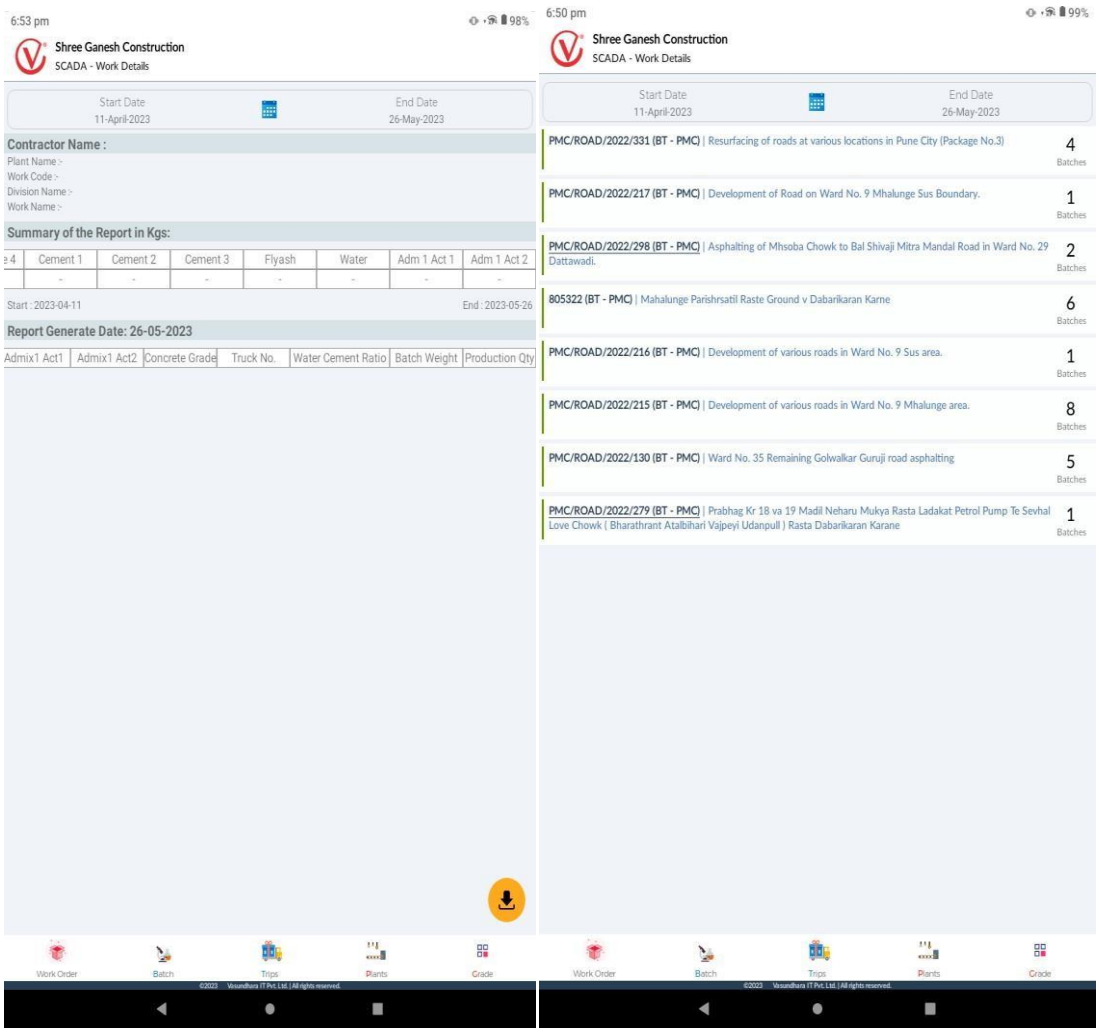
Data flow diagram of SCADA

Chapter 6
Detailed Design

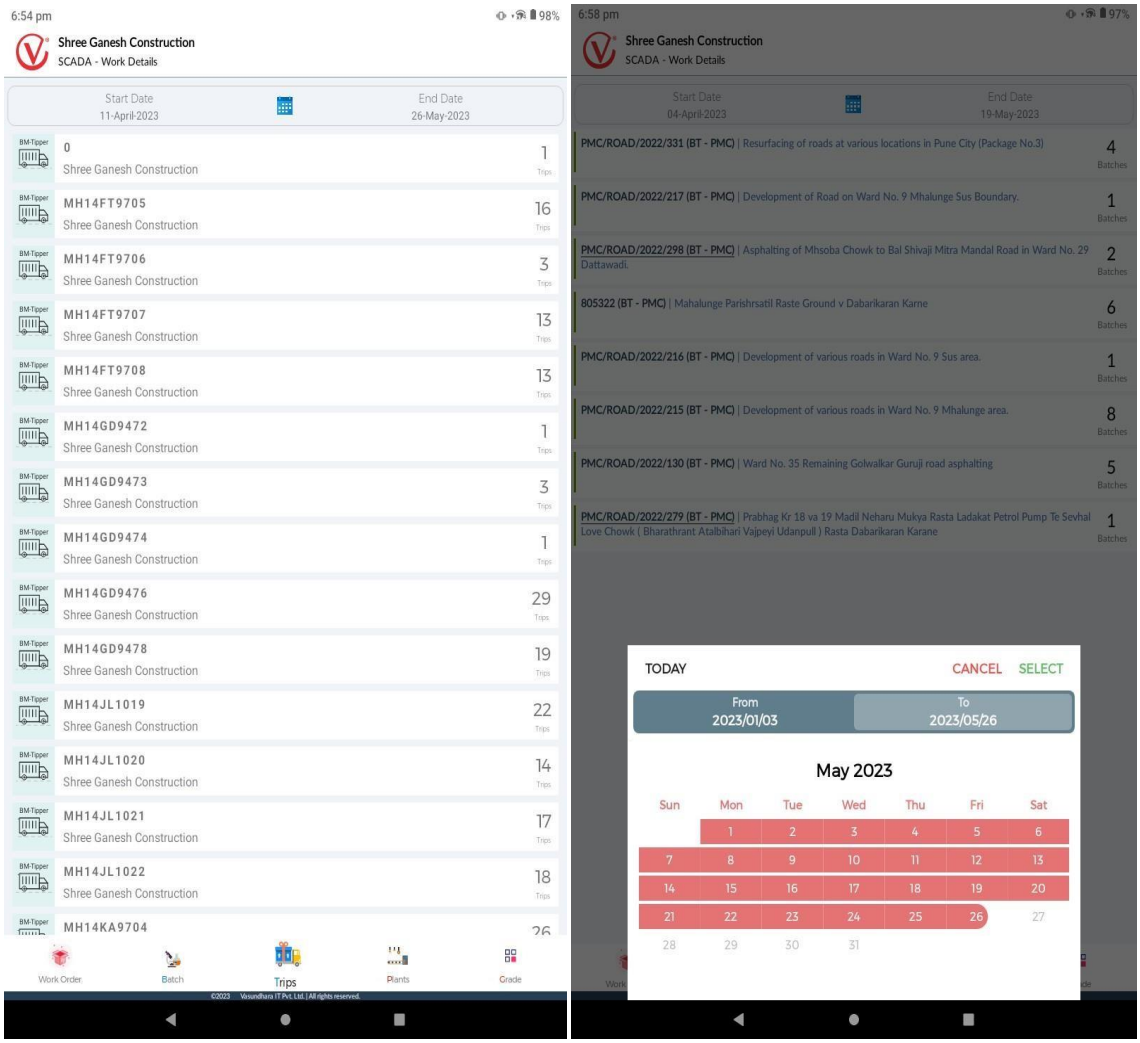
6.1 Screen Shots of Project:

The project has two parts, an android application and an admin panel **Android**

Application:



Screen shot of Batch Screen



Screen shot of Trips Screen

6.2 Database Design

Database design is the organization of data according to a database model. The designer determines what data must be stored and how the data elements interrelate. With this information, they can begin to fit the data to the database model.[1]Database management system

This process is one which is generally considered part of requirements analysis, and requires skill on the part of the database designer to elicit the needed information from those with the domain knowledge. This is because those with the necessary domain knowledge frequently cannot express clearly what their system requirements

for the database are as they are unaccustomed to thinking in terms of the discrete data elements which must be stored. Data to be stored can be determined by Requirement Specification.

Once the relationships and dependencies amongst the various pieces of information have been determined, it is possible to arrange the data into a logical structure which can then be mapped into the storage objects supported by the database management system. In the case of relational databases, the storage objects are tables which store data in rows and columns. In an Object database the storage objects correspond directly to the objects used by the Object-oriented programming language used to write the applications that will manage and access the data. The relationships may be defined as attributes of the object classes involved or as methods that operate on the object classes.

The way this mapping is generally performed is such that each set of related data which depends upon a single object, whether real or abstract, is placed in a table. Relationships between these dependent objects is then stored as links between the various objects.

Each table may represent an implementation of either a logical object or a relationship joining one or more instances of one or more logical objects. Relationships between tables may then be stored as links connecting child tables with parents. Since complex logical relationships are themselves tables, they will probably have links to more than one parent.

Batch Table

COLUMN_NAME	DATA_TYPE	IS_NULLABLE
work_id	Numeric(11)(PK)	NO
comp_hireachycle_id	Numeric	NO
work_code	bigint	NO
work_name	Char var(255)	NO
work_starred_on_Date	Date	NO
work_ended_on_date	Date	NO
rec_status	Numeric(1)	NO
Created_date	Numeric(5)	NO
Created_on_	timestamp_without_timezome	NO

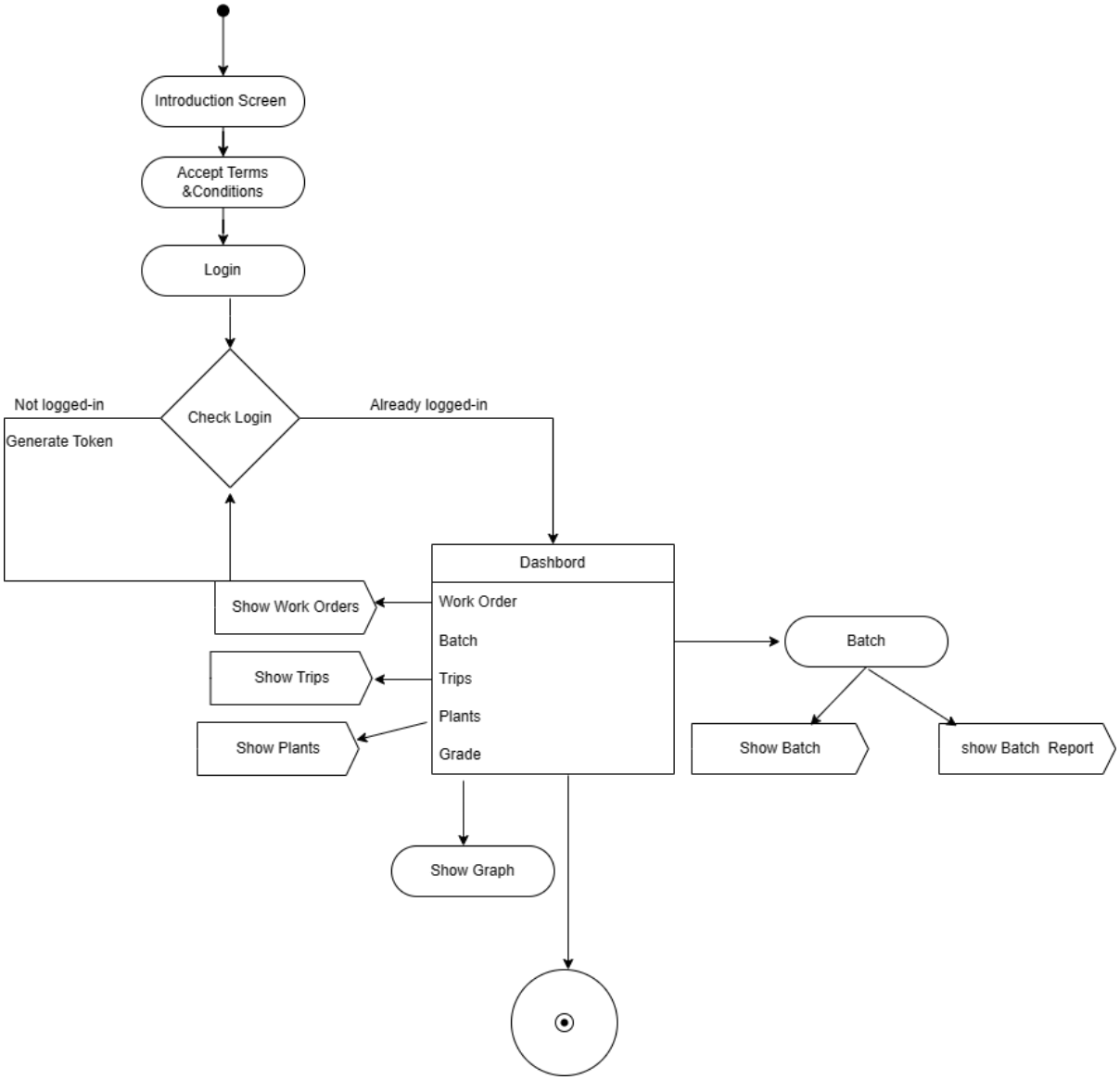
Trips Table

COLUMN_NAME	DATA_TYPE	IS_NULLABLE
Vehicle_id	numeric(5) PK	NO
Con_id	numeric(5)	NO
Plant_id	numeric(7)	NO
Int_id	numeric(30)	NO
Dev_sim_no	Character varying(20)	NO
Dev_imei_no	Character varying(20)	NO
Dev_inastall_on	date	NO

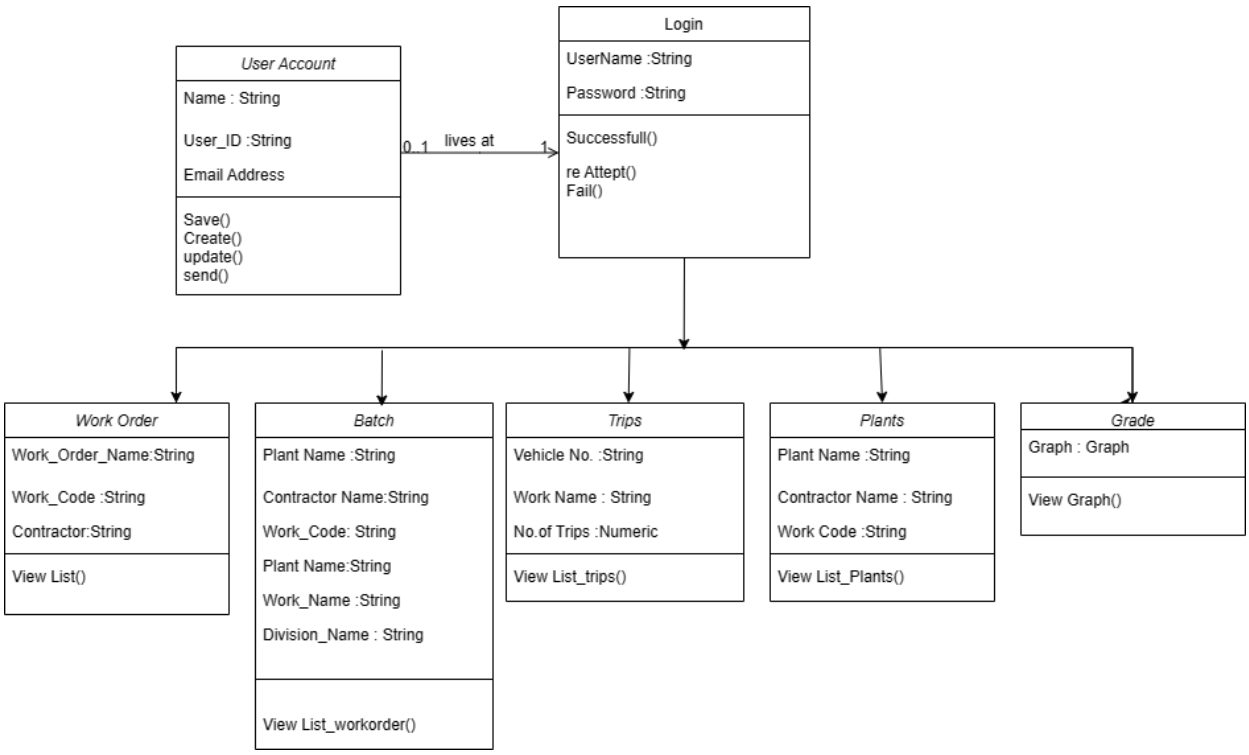
Vehicles Table

COLUMN_NAME	DATA_TYPE	IS_NULLABLE
Vehicle_id	numeric(5) PK	NO
Vehicle_name	Character varying(50)	NO
Vehicle_no	Character varying(15)	NO
Vehicle_type	numeric(2)	NO

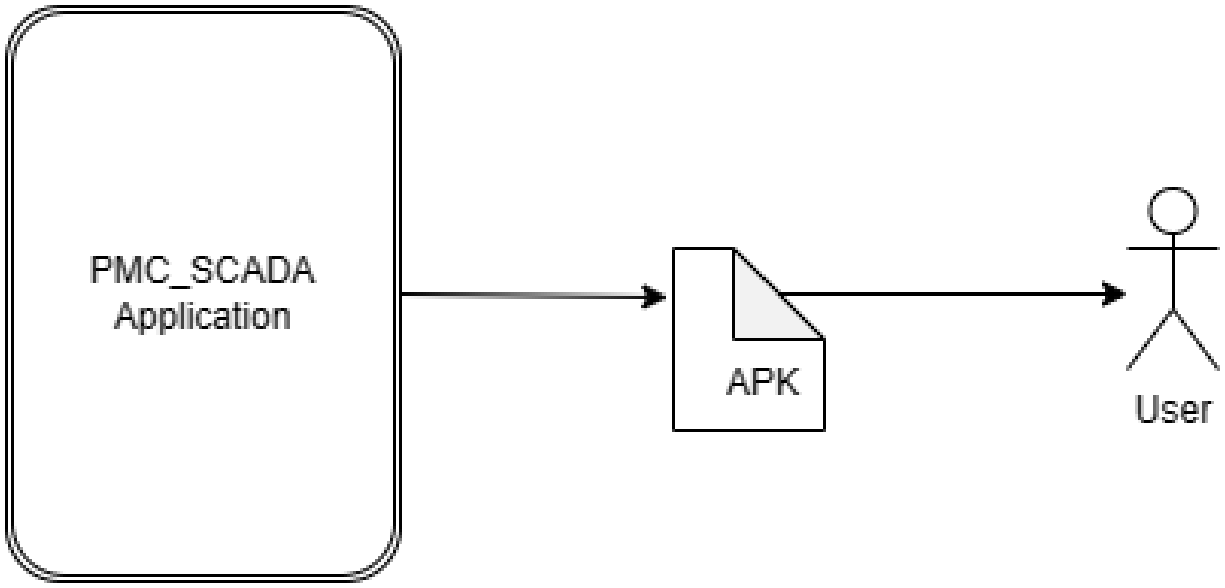
6.3 Activity diagram

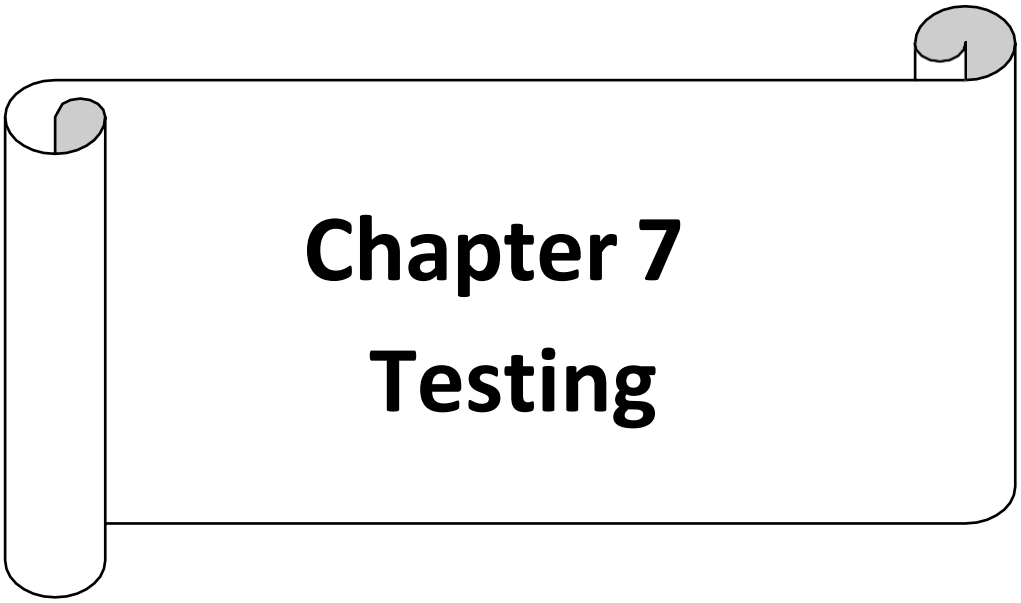


6.4 Class diagram



6.5 Deployment diagram





Chapter 7
Testing

7.1 Introduction

Testing is an integral part of the development lifecycle of any software project, including ERP Systems developed using Spring Boot. The purpose of testing in the context of an ERP Spring Boot Project is to ensure the reliability, functionality, performance, and security of the software application. Testing serves as a fundamental pillar in the development journey of any software application, and its significance amplifies when considering Enterprise resource planning (ERP) systems developed using the Spring Boot framework. Within the realm of ERP solutions, which cater to the intricate needs of modern enterprises, testing assumes a critical role in ensuring the reliability, functionality, and security of the software.

Person who is not involved in project development performs black box testing its aim is to:

- Demonstrate that the software functions are operational.
- Data input is properly accepted
- Required output is produced ➢Incorrect or missing functions ➢External errors.
- Performance testing
- Initializations and termination error

7.2 Unit testing

Unit testing in a Spring Boot application is an essential practice aimed at verifying the correctness of individual units of code, typically at the method level, in isolation from the rest of the system. The primary goal of unit testing is to ensure that each component behaves as expected under various conditions and edge cases. In the context of our ERP project developed using Spring Boot, unit testing plays a crucial role in maintaining the quality and reliability of the application. By writing comprehensive unit tests, we can identify and address defects early in the development lifecycle, reducing the likelihood of bugs reaching production.

7.3 Integration testing

Integration testing in our Spring Boot ERP project verifies how different modules interact, ensuring seamless operation. Using Spring Boot's testing capabilities, we validate components like controllers, services, and repositories, simulating real-world scenarios. With strategies like using embedded databases and mocking, we ensure reliability while testing integration points. These tests, executed within our Continuous Integratio Pipeline, catch issues early, ensuring a robust and cohesive system that meets stakeholder needs.

7.4 User Acceptance Testing

User Acceptance Testing (UAT) is vital for our Spring Boot ERP project, ensuring the system aligns with user needs. Stakeholders execute predefined test cases, providing feedback to resolve issues. Successful UAT signifies user approval for production release, validating System reliability and usability.

7.5 Test cases

User Authentication:

- Verify that users can log in with valid credentials.
- Test for error messages when incorrect credentials are provided.
- Check if users are redirected to the appropriate page after successful login.

Dashboard Functionality:

- Confirm that the dashboard displays relevant metrics and data.
- Test the responsiveness of the dashboard across different screen sizes.
- Verify that users can customize the dashboard layout and widgets.

Customer Management:

- Add a new customer and verify that the information is saved correctly.
- Edit existing customer details and ensure the changes are reflected.
- Test deleting a customer record and confirm that it is removed from the system.

Inventory Management:

- Add a new product to the inventory and verify its details.
- Test updating product information such as quantity and price.
- Check the inventory level after adding or removing products.

Order Processing:

- Create a new order for a customer and verify the order details.
- Test updating the status of an order (e.g., processing, shipped, delivered).
- Verify that inventory levels are updated accordingly after order fulfillment.

Reporting and Analytics:

- Generate a sales report for a specific time period and verify the accuracy of the data.
- Test exporting reports to different file formats (e.g., PDF, CSV).
- Verify that users can create custom reports based on predefined criteria.

Employee Management:

- Add a new employee to the system and verify their access rights.
- Test updating employee details such as department and job title.
- Verify that employees can be assigned to specific tasks or projects.

Billing and Invoicing:

- Create a new invoice for an order and verify the billing details.
- Test applying discounts or promotions to the invoice and confirm the calculations.
- Verify that invoices can be sent to customers via email or printed.

Integration Testing:

- Test integration with external systems such as payment gateways or shipping providers.
- Verify data synchronization between the ERP system and external databases or APIs.
- Check for proper error handling and logging of integration events.

7.5.1 Login Activity

Valid Login Credentials:

- Test logging in with a valid username and password.
- Verify that the user is successfully authenticated and redirected to the dashboard.

Invalid Username:

- Attempt to log in with an invalid username.
- Verify that the system displays an appropriate error message indicating that the username is incorrect.

Invalid Password:

- Attempt to log in with an invalid password for a valid username.
- Verify that the system displays an appropriate error message indicating that the password is incorrect.

Remember Me Functionality:

- Test the "Remember Me" option during login.
- Verify that the system remembers the user's login credentials and automatically logs them in on Subsequent visits.

Session Timeout Handling:

- Log in to the system and wait for the session to expire.
- Verify that the user is redirected to the login page after the session has timed out.

7.5.2 Admin Activity

Create New User Account:

- Test creating a new user account with valid information.
- Verify that the new user account is added to the system with the correct role and permissions.

Edit User Account Details:

- Test updating user account details such as username, email, or role.
- Verify that changes to user account details are reflected accurately in the system.

Delete User Account:

- Test deleting an existing user account from the system.
- Verify that the user account is removed from the system and associated data is handled appropriately.

View User Account Details:

- Test viewing the details of an existing user account.
- Verify that all relevant information about the user account is displayed correctly.

Reset User Password:

- Test resetting the password for a user account.
- Verify that the user receives a notification email with instructions to reset their password.

Assign Roles and Permissions:

- Test assigning roles and permissions to user accounts.
- Verify that users with assigned roles have access to the appropriate functionalities and data.

Access Control Testing:

- Test admin activities with different user roles to ensure proper access control.
- Verify that only users with administrative privileges can perform admin activities.

Chapter 8

Concluding Remarks

8.1 Strength of the system

The application has been developed using state of the art technologies which ensure:

- Best possible user experience
- Performance of the device as well as application
- Security of data.
- Ensure data accuracy
- Proper control of the accounting members.
- Minimize paper-based data entry thus ensures eco friendliness.
- Minimum time needed for the various processes.
- Greater efficiency.
- Better service.
- User friendliness and interactive.
- Minimum time required.

Reliability and Performance Assurance:

- Assessing the strength of your ERP system ensures its reliability and performance under varying conditions.
- It helps identify potential bottlenecks, vulnerabilities, and areas of improvement, ensuring Uninterrupted Operation and optimal performance.

Security and Compliance Confidence:

- Evaluating the strength of your ERP system ensures robust security measures are in Place to protect sensitive data.
- It helps maintain compliance with industry regulations and standards, safeguarding against data Breaches and legal liabilities.

8.2 Limitations of system

Although we have put our best efforts to make the software flexible, easy to operate but limitations cannot be ruled out. Though the software presents a broad range of options to its users some intricate options could not be covered into it; partly because of logistic and partly due to lack of sophistication. Paucity of time was also major constraint; thus, it was not possible to make the software foolproof and dynamic. Lack of time also compelled us to ignore some part. Considerable efforts have made the software easy to operate even for the people not related to the field of computers but it is acknowledged that a layman may find it a bit problematic at the first instance. The user is provided help at each step for his convenience in working with the software.

List of limitations in the Farm Management System:

- Limited scalability
- Dependency on internet connectivity
- Complexity of integration
- Data security concerns
- Compatibility issues
- Limited customization
- Training and adoption challenges
- Cost of implementation and maintenance
- Reliability on weather conditions
- Limited support for offline usage.

8.3 Scope for Future development:

In a nutshell, it can be summarized that the future scope of the project circles around following objectives.

- We can give more advance features for Farm Management System including more facilities
- Integrate multiple load balancers to distribute the loads of the system
- Create the master and slave database structure to reduce the overload of the database queries

Conclusion

In conclusion, understanding the theoretical foundations of Enterprise Resource Planning (ERP) systems provides valuable insights into their design, implementation, and impact on organizational performance. Through the lens of information systems theory, ERP systems are recognized as essential tools for integrating and optimizing information flows within organizations. Leveraging principles from business process management ensures that ERP implementations align with organizational goals and streamline core business processes. Moreover, drawing upon change management theory facilitates the successful navigation of organizational transitions inherent in ERP projects. By grounding ERP initiatives in these theoretical frameworks, organizations can better comprehend the underlying principles guiding ERP system development and deployment. This understanding fosters more informed decision-making throughout the ERP project lifecycle, ultimately leading to enhanced organizational efficiency, agility, and competitiveness. Looking ahead, continued research and exploration of theoretical concepts will further refine our understanding of ERP systems and their evolving role in shaping the modern business landscape.