

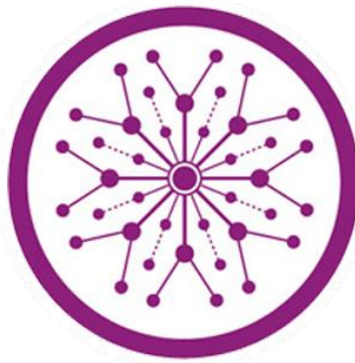
Multilayer Architecture Based ERP System

Final Year Project

Session 2019-2023

A project submitted in partial fulfillment of the degree of

BS in Computer Sciences



Department of Computer Science

Faculty of Computer Science & Information Technology

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*The candidates confirm that the work submitted is their own and appropriate credit has been given where reference has been made to work of others

Plagiarism Free Certificate

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Multilayer architecture-based ERP system

Change Record

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APPROVAL

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HEAD OF THE DEPARTMENT

Comments: _____

Date: _____ Signature: _____

Dedication

I dedicate this Final Year Project, focused on the development and implementation of an ERP system's Production Module, to all those who have supported and inspired me throughout this journey.

First and foremost, I would like to express my deepest gratitude to my project supervisor, [Prof Ahmed Amin]. Your guidance, expertise, and unwavering support have been invaluable in shaping this endeavor. Your insightful feedback and encouragement have helped me overcome challenges and strive for excellence.

I would also like to extend my heartfelt appreciation to the faculty and staff of [Computer Sciences] for providing an exceptional learning environment and the resources necessary to pursue this project. Your commitment to academic excellence and dedication to nurturing young minds have played a vital role in my academic journey.

To my family and friends, thank you for your constant encouragement, understanding, and belief in my abilities. Your unwavering support, love, and patience have been my source of strength, motivating me to push through obstacles and reach for my goals.

I am deeply grateful to the industry professionals and experts who generously shared their knowledge and insights during the course of this project. Your guidance and real-world perspectives have been instrumental in shaping the practical aspects of the ERP system's Production Module.

Lastly, I would like to express my appreciation to all the participants and stakeholders who contributed their time and valuable feedback during the testing and evaluation phase of the project. Your insights and input have been instrumental in refining and improving the functionality and usability of the ERP system.

This project is dedicated to all those individuals who have played a role, big or small, in its realization. Your support, guidance, and belief in my abilities have been the driving force behind this endeavor. Thank you for being a part of this journey, and may this project serve as a testament to our collective efforts and commitment to advancing the field of ERP systems and production management.

Acknowledgements

I would like to express my supervisor individuals and organizations who have contributed to the successful completion of my Final Year Project on the ERP system's Production Module.

I extend my deepest appreciation to my project supervisor, [Supervisor's Name], for their unwavering support, valuable guidance, and expert advice throughout this project. Their dedication and commitment to my academic and professional growth have been truly remarkable.

I am grateful to the faculty and staff of [Superior University] for providing me with an enriching educational experience and a conducive research environment. Their knowledge, expertise, and continuous support have been instrumental in shaping my understanding of ERP systems and production management.

I would like to acknowledge the industry professionals and experts who generously shared their insights and experiences during interviews and discussions. Their valuable inputs have enriched the practical aspects of the ERP system's Production Module and added real-world relevance to my project.

I am indebted to my family and friends for their unwavering encouragement, understanding, and belief in my abilities. Their constant support and motivation have been vital in overcoming challenges and staying focused throughout this journey.

I would also like to express my gratitude to the participants and stakeholders who volunteered their time and provided valuable feedback during the testing and evaluation phase of this project. Their contributions have significantly contributed to the refinement and improvement of the ERP system's Production Module.

Lastly, I would like to acknowledge the support provided by [Asian Sol private Limited]. Their support has enabled me to carry out this research and development work with dedication and focus.

I am truly grateful to everyone who has played a part, big or small, in the completion of this project. Your contributions have been invaluable, and I am honored to have had the opportunity to work with such a supportive and inspiring community.

Executive Summary

ERP (Enterprise Resource Planning) is a well-maintained management system for enterprise resources. It has various modules having different functionalities and operations. Some of its main modules are listed below.

1. Setup
2. Accounts
3. Sale
4. Purchase
5. HR
6. Warehouse
7. Production

The purpose for which the system has high demand is that it manages all the resources Of a company or an organization and leaves the owner satisfied and not worried about his resources. The resources can be of any type like raw material, finished goods, purchased goods, factory machines and human resources etc.

Our focus in this ERP system is production module. This module deals with the processes of a product through which it will pass while its manufacturing. There are different types or numbers of processes for different products. This module will be managed by production manager which will allocate manpower and machinery for a desired order keeping in view the time given for the order.

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Chapter 1

Introduction

Chapter 1: Introduction

1.1. Background

Although the Gartner Group originally introduced ERP in the 1990s, enterprise resource planning systems have a long history dating back to the 1960s in the manufacturing sector.

Manufacturers at this time required a better method for tracking, managing, and controlling their inventories. To address their needs, fundamental software programs known as MRPs or Material Requirements Planning systems were created. These systems assisted manufacturers in maintaining inventory levels, balancing accounts, and performing extremely fundamental manufacturing, purchasing, and delivery tasks.

MRP systems were adopted by an increasing number of manufacturers throughout the 1970s, and the systems themselves developed in complexity. Manufacturing resource planning systems, often known as MRP II systems, were developed from MRP systems by the 1980s. The initial MRP systems had more manufacturing processes added to them, and the MRP II systems were more capable and better able to manage scheduling and production operations.

The first real ERP systems were implemented in the 1990s. These systems went beyond the fundamental manufacturing and inventory management procedures of earlier versions to incorporate other divisions and tasks, including accounting, finance, and sales. Due to their ability to integrate numerous processes and departments into one system, these systems laid the groundwork for ERP solutions as we know them today.

1.2. Motivations and Challenges

One of the most widely used company management systems is the enterprise resource planning (ERP) system, which offers real-time capabilities and seamless communication for business in large enterprises. But not every ERP implementation has been a success. The introduction of ERP systems can provide a lot of difficulties for businesses because it affects the entire organization, including the people, processes, and culture.

Recently, some universities have started to replace their legacy systems with ERP systems in order to improve the administration and management of . This paper focuses on his ERP implementation challenges between enterprise and university environments. We review previous studies that identify critical success factor (CSF) and risk factors for implementing ERP in both environments. In particular, the case study of this work explores the organizational dynamics involved in his ERP implementation using CSF and his three phases of Miles and Huberman's (1994) framework: antecedents, implementation process, and outcomes. is emphasized. This study uses insights from case studies to assess ERP readiness and his CSF fulfillment. The results of this study contribute to contextualizing the specific challenges in implementing ERP between corporate and university environments.

1.3. Goals and Objectives

The purpose of any ERP business transformation strategy is to modernize and consolidate business processes and systems. This “leap” into the future will enable staff and students to access information and deliver services through intuitive and integrated interfaces, ultimately achieving the following goals:

1. Improve Service Experience
2. Enhance Competitiveness
3. Modernize Business Processes and Systems
4. Automate Business Solutions
5. Increase Operating Efficiency
6. Provide Access to Standardized College Data

1.4. Literature Review/Existing Solutions

Oracle Enterprise resource planning:

Tomorrow’s leaders are those most capable of adapting to change today. Oracle Fusion Cloud ERP is a complete, modern, cloud ERP suite that provides your teams with advanced capabilities, such as AI to automate the manual processes that slow them down, analytics to

react to market shifts in real time, and automatic updates to stay current and gain a competitive advantage.

SAP ERP system:

SAP ERP is enterprise resource planning software developed by the company SAP SE. ERP, or enterprise resource planning, the software is modular software made to integrate the main functions of an organization's core business processes into a unified system.

Odoo ERP:

Odoo ERP system is enterprise resource planning software used company-wide for the management of business processes. Odoo provides seamlessly integrated functional business apps called Odoo apps that form an ERP solution when combined.

1.5. Gap Analysis

- Multiple Role Management in single business unit
- Multiple Companies
- Multiple tenant System
- Dynamic Forms

These are the features or function through which we take advantage on other ERP systems we provide many different facilities to our users and provide them many advantages to handle different companies or different Business units and we also provide the facility of handling different roles in one and more than one company by single Account on our ERP system.

1.6. Proposed Solution

- Our ERP system is very efficient and easier to use than other ERP systems our production operation in the ERP system handles all kinds of productions and their status. It tells us all about the new or existing productions very efficiently. In the inventory operation of our ERP system, the industry has all the data about the raw material of products stored in warehouses. This operation indicates the industry when the quantity of raw material becomes below the level set by the industry. It is very

easier to use and it helps us to manage our time and data very easily in this system we manage all orders, all the productions, information about all the machines and all the processes of production. In the production process the industry implements the complete road map of operations that it has to apply for manufacturing the product. In this process industry manage all the operations through which the product passes for its complete manufacturing.

- Our ERP system is very efficient and easier to use than other ERP systems
- Production operation in the ERP system handles all kinds of productions and their status.
- Our ERP system is able to manage multiple roles.
- Know about all the data of raw material of products stored in warehouses.
- It is very easier to use and it helps us to manage our time.
- Capability to manage all these operations efficiently.

1.7. Project Plan

1.7.1. Work Breakdown Structure

Sample WBS

1. Project Management

- 1.1. Work Breakdown Structure (WBS)
- 1.2. Roles & Responsibility Matrix
- 1.3. Change Control System

2. Reports / Documentation

- 2.1. Final Documentation Introduction
- 2.2. Literature / Market Survey
- 2.3. Requirements Analysis
- 2.4. System Design
- 2.5. Implementation
- 2.6. Testing & Performance Evaluation

2.7. Conclusion & Outlook

2.8. End User Documentation

2.9. Application Administration Documentation

2.10. System Administrator Documentation

3. System

3.1. Development Environment

3.1.1. IDE = Visual Studio

3.1.2. Version Control = IE 10 or above

3.1.3. Server = SQL Server

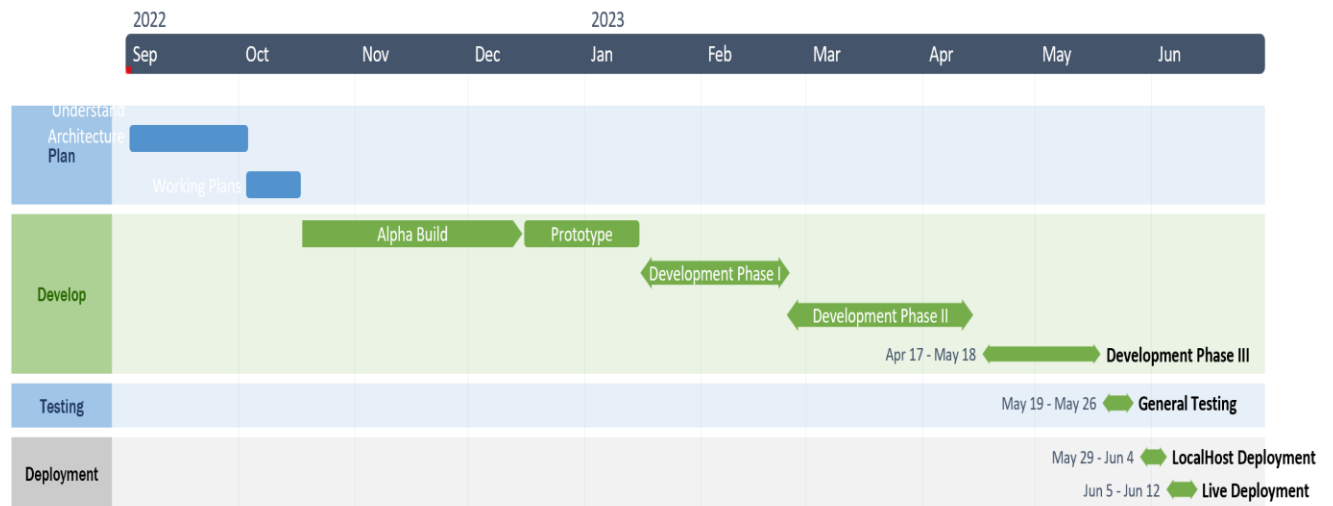
3.1.4. Database = MSSQL-DBMS

1.7.2. Roles & Responsibility Matrix

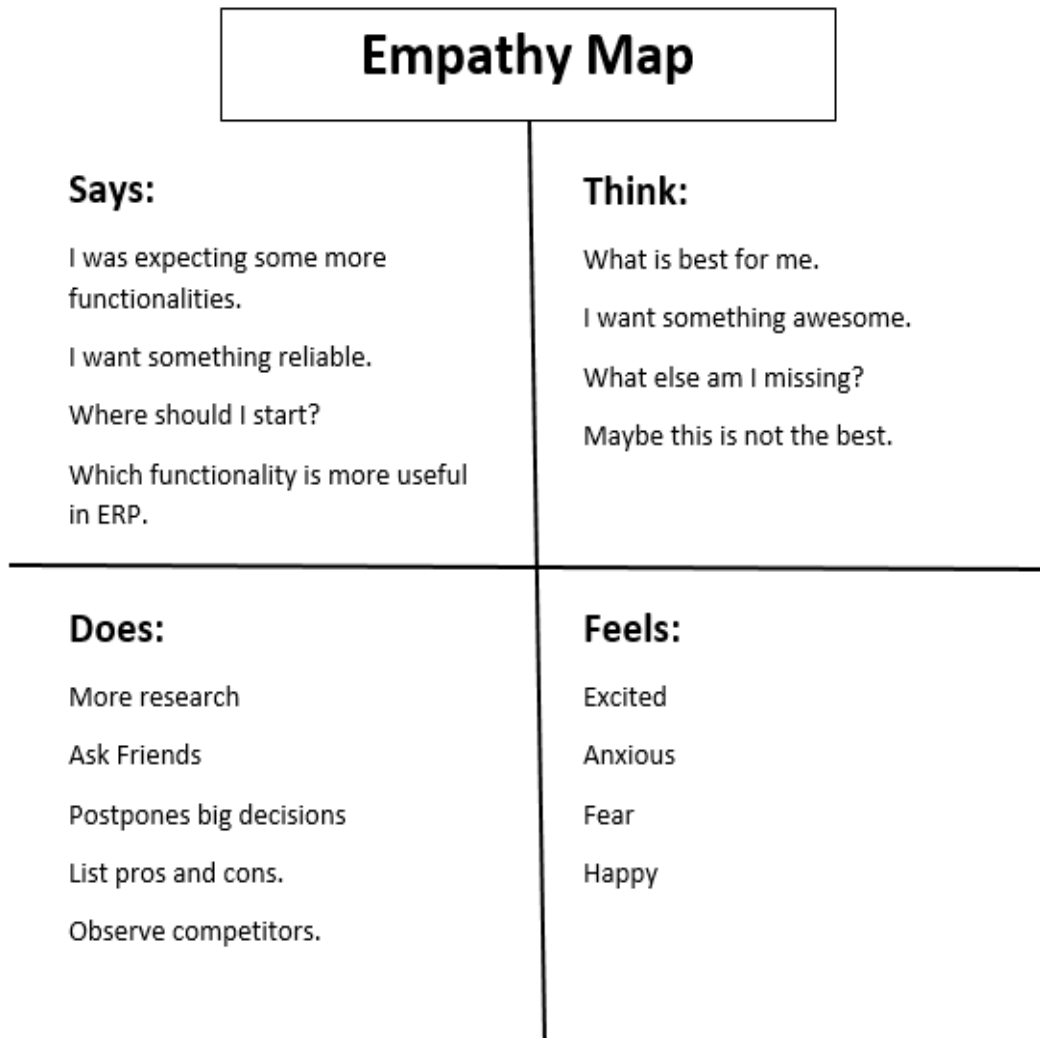
WBS #	WBS Deliverable	Activity #	Activity to Complete the Deliverable	Duration (# of Days)	Responsible Team Member(s) & Role(s)
01	REQUIREMENT	1		7	ALI HAMZA
02	PROTOTYPE PREPRATION	2		45	WHOLE TEAM
03	PLANNING AND DESIGNING	3		15	WHOLE TEAM
04	PROPOSAL PREPRATION	4		7	WHOLE TEAM
05	FRONT-END Development	5		45	WHOLE TEAM
06	BACK-END Development	6		45	WHOLE TEAM
07	SERVER-END	7		60	WHOLE TEAM

	Development				
08	TEST AND DEBBUGING	8		20	WHOLE TEAM
09	DEPLOYMENT	9		15	WHOLE TEAM
10	FINAL PRESENTATION	10		7	WHOLE TEAM

1.7.3. Gantt Chart



1.8. Empathy Map



Chapter 2

Software Requirement Specifications

Chapter 2: Software Requirement Specifications

2.1. Introduction

2.1.1. Purpose

The purpose of our system is to maintain the managerial tasks of the industry easier and more efficient. We provide better and more advanced facilities to improve the managerial standards of industries. we provide a better user-friendly environment to handle managerial tasks in easier and advance way.

2.1.2. Document Conventions

DB	Database
ERP	Enterprise resource planning
SRS	Software Requirement Specification

2.1.3. Intended Audience and Reading Suggestions

In this system the intended audience is the company owner, administrators, advisors, developers, software testers and clients who are going to use the code on different types of browsers having different types off versions.

2.1.4. Product Scope

Our Country is a developing country and there is a need of industries that will be fulfilled soon in the future so that's why our product is very suitable for our country. Our product facilitates all types of industries to manage their production units and there are many industries that are existing in our country like the paper industry, sugar industry, steel industry, floor industry, etc. our product also facilitates those industries in the managerial processes. Our product manages all the operations in a very efficient and easier way.

2.1.5. References

<https://www.odoo.com>

<https://www.sap.com>

<https://www.oracle.com>

2.2. Overall Description

2.2.1. Product Perspective

Our product is a component of the large ERP system in this system we handle the production planning and its overall costs. In this module we can create a proper plan for the production of products of different qualities then we define the products according to the quality plan and starts the process of manufacturing. In this we also manage the total detail of our clients and their orders that he placed.

2.2.2. User Classes and Characteristics

- Production Manager
- Admin
- Users

2.2.3. Operating Environment

A system or machine that supports any operating system or have any web browser our ERP system will run on that machine.

Our ERP system needs

- Google Chrome
- Mozilla Firefox
- Safari
- Edge etc.

web browsers for its implementation.

2.2.4. Design and Implementation Constraints

- Dot net (MVC)
- AngularJS

- Angular Material
- MSSQL

2.2.5. Assumptions and Dependencies

The following assumptions are made for the specifications:

- The user must have an active internet connection
- Any Browser will have to be available

2.3. External Interface Requirements

2.3.1. User Interfaces

- HR Module
 - Labor
 - Finance and accounting
- Warehouse
 - Raw Material
- Machines (Types and spare parts)
- Product recipes
- Order Management

2.3.2. Hardware Interfaces

- 2GB RAM and above (For Better Performance)

Ram that supports the browsers:

- Google Chrome
- Mozilla Firefox
- Edge etc.

2.3.3. Software Interfaces

- **Frontend:** Angular JS
- **Backend:** DOT NET MVC
- **OS:** Windows, IOS and any other which support browser
- **Browsers:** Google Chrome, Mozilla Firefox, Edge

- **IDE:** Visual Studio

2.3.4. Communications Interfaces

- HTTP (Hypertext transfer protocol) protocol is used for function calls
- In our ERP system through HTTP we can communicate with the server
- Different web browsers like Google Chrome, Mozilla Firefox, Edge are used

2.4. System Features

This system concludes your output according to our inputs. So, we have entered some raw material inputs and system calculates the accordingly us choose option. We use objects so that we don't need enter the objects of that raw material data again and again. This system has machine line production. It means that we have more than one production units in which the material process. The output of previous production unit is the input of next production unit.

2.4.1. System Feature 1

Calculate how much ingredients required for your production

2.4.1.1. Description and Priority

First we input the raw material data to calculate the how much quantity is required for production to complete the process. It has too much high priority because if the system calculates the wrong outputs then loss of material and financial also which might not be bared. Benefits are we know in advance how much quantity of material in required so waste of material and time of production unit. Rate of this feature is 9.

2.4.1.2. Stimulus/Response Sequences

When the user enters on the module home screen user want to input the raw material data for how much production units he/she will produce then system calculates the data and give the output according to input. The output recipe is early calculated by programmer on the fixed ratio.

2.4.1.3. Functional Requirements

When the user enter the data system check whether this material is available or not if the material is available then a notification is appeared that your material according to your quantity and calculates the recipe.

If the material is not available, then a message of alert is send to storage area staff that this material is must require on due time. After availability, staff confirm to system for availability of material then system again check that material and send ok message to production unit.

REQ-SF1-1: Check the material is available

REQ-SF1-2: Material is not available (send alert to staff)

REQ-SF1-3: Again confirm

2.4.2. System Feature 2

Raw Material Production start

2.4.2.1. Description and Priority

When the material is available for production then system generates the message of completion of material. Then staff put the material in production line for first process.

2.4.2.2. Stimulus/Response Sequences

Production will start after the completion of ingredients of raw material. Suppose we have to produce the bags of 1000 units then we will cut the sheets of clothes on equal manner. This is the first production unit and it will be our output. It has high priority because if the output of first production unit is not correct then it will create disturbance on other units after that.

2.4.2.3. Functional Requirements

System checked weather material is fulfilling our requirements or not. If it is yes, then start the first step of production of production line. After production it will be the output.

REQ-SF2-1: Production completion

REQ-SF2-2: Start of production line

REQ-SF2-3: Output of first production

2.5. Nonfunctional Requirements

2.5.1. Performance Requirements

Yes, there is performance requirement on which output is based either the production unit output is correct or not. If the product units are correct then its fine otherwise check the line machine line and also the staff that is properly working or not. Check that we input the data calculates accordingly to that recipe or not. If the calculation is not correct then our recipe is wrong. We have to check every functionality individually.

2.5.2. Safety Requirements

There are some safety requirements that we check our product arrangements the actions taken for modifying the raw material into product is correct or not.

2.5.3. Security Requirements

Yes, there are some issues regarding the data privacy that we develop the recipes that are confidential. We may secure our data from unauthorized users and make sure to keep the data protect. There are some privacy policies that admin must write a written agreement for sharing the data that he/she make it confidential from others.

2.5.4. Usability Requirements

The recipes that are specified for the system is try and tested. So, efficiency is almost correct however it is not 100% ever. The interface is easy and friendly environment. It is also fast and easy inputting for user that we use grids and clicking system for better facilities.

Reliability Requirements

2.5.5. Maintainability/Supportability Requirements

2.5.6. Portability Requirements

As we know we make a system for large industries environment where machine line produces large number of production units. They include system files and program where hardware

includes with system instructions. This system is developing for more than one production line system where one production unit output is the input of second production.

2.5.7. Efficiency Requirements

System is fast tracking due user friendly environment. System contain different recipes on different situation with different quantity production unit. So, efficiency is good because as input output is also fast as system takes less memory than other systems.

2.6. Domain Requirements

<Define any other requirements not covered elsewhere in the SRS. This might include database requirements, internationalization requirements, legal requirements, reuse objectives for the project, and so on. Add any new sections that are pertinent to the project.>

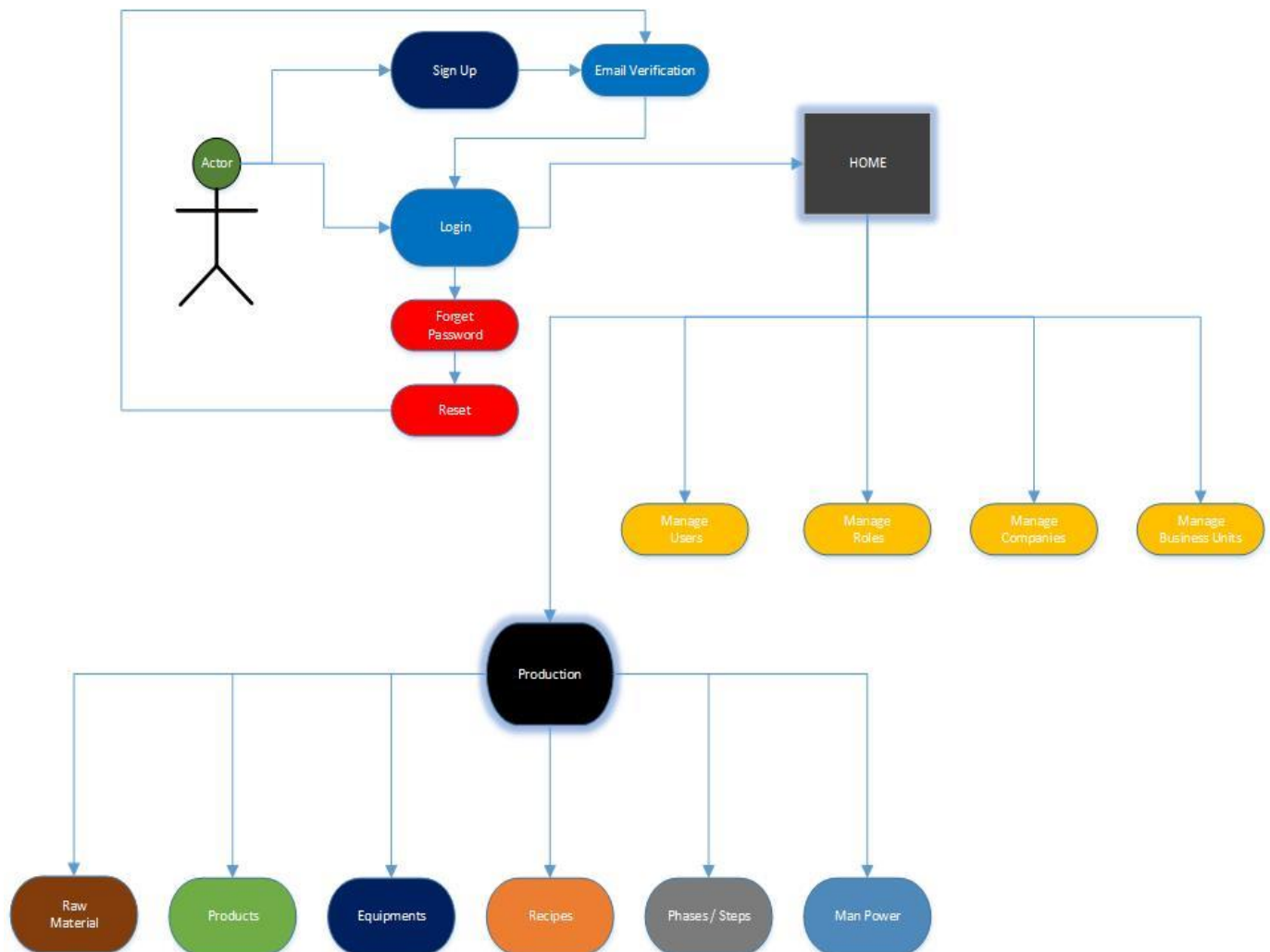
Chapter 3

Use Case Analysis

Chapter 3: Use Case Analysis

In this chapter, we discuss the main roles of the users of the ERP system. In this, we explain which part of the system is made and assigned to which person, and All roles of the owner and all roles that were assigned to any other person by the owner are completely explained. There are different companies managed by a single owner and there are different persons having the similar authority in a single branch of the company. In this chapter we are going to explain all the use cases.

3.1. Use Case Model



3.2. Use Cases Description

Owner

- Signup
- Email Verification
- Login
- Forget Password
- Home
- Manage Users
- Manage Roles
- Manage Companies
- Manage Business Units
- Manage Production module

Role

This is the person to which an owner assigned any role it has only access to that role if he wants to manage companies or other things then he has to Sign up as an owner.

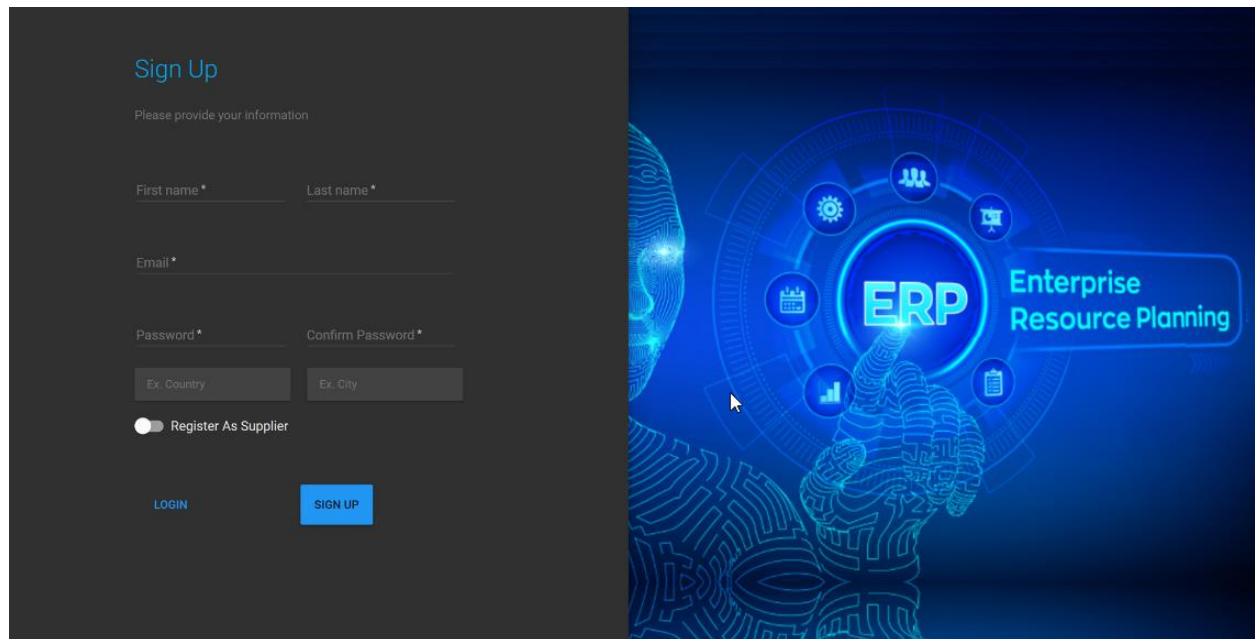
If an owner gives him the access to production Module:

- Login
- Forget Password
- Home
- Production Module

Chapter 4

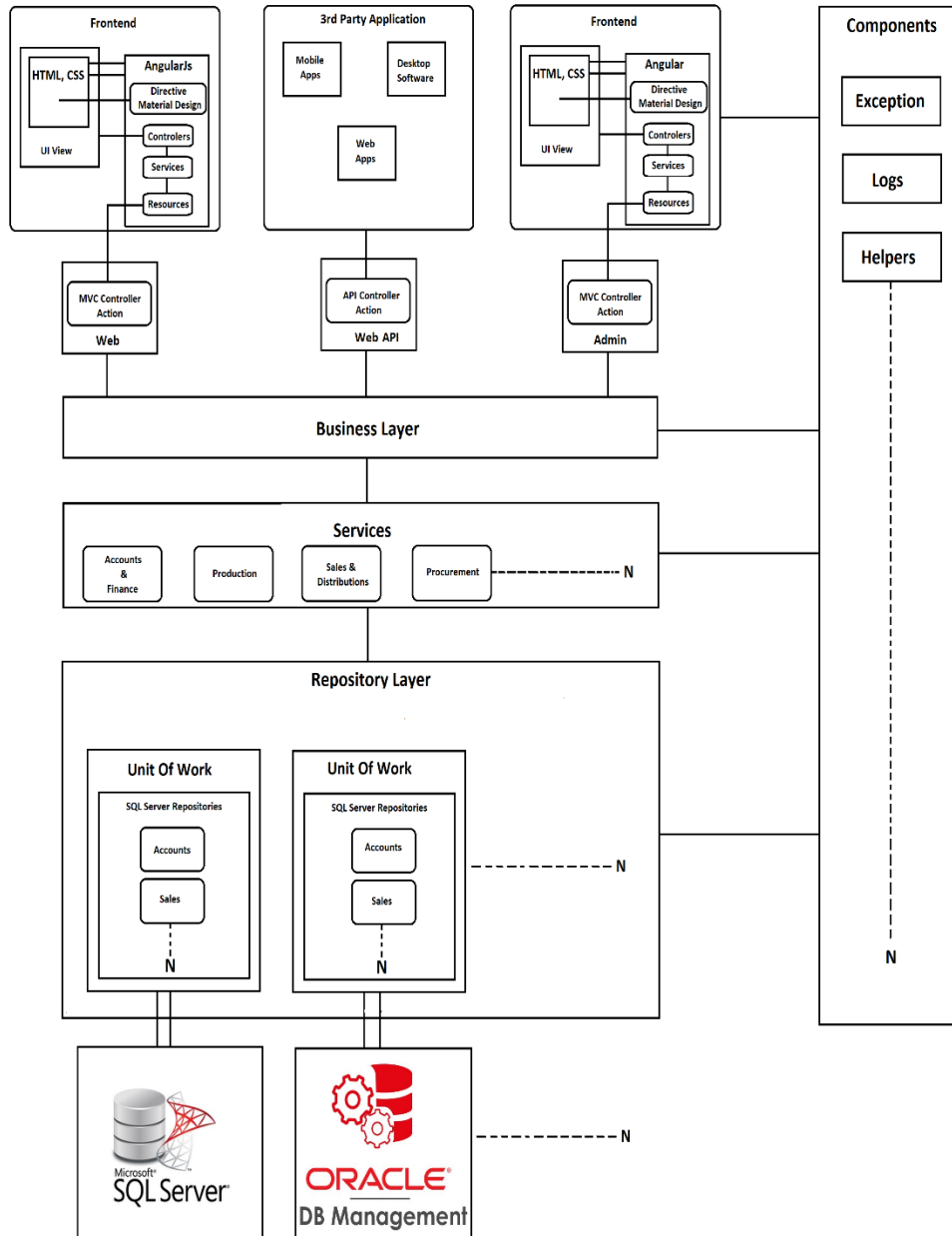
System Design

Chapter 4: System Design



4.1. Architecture Diagram

System Architecture

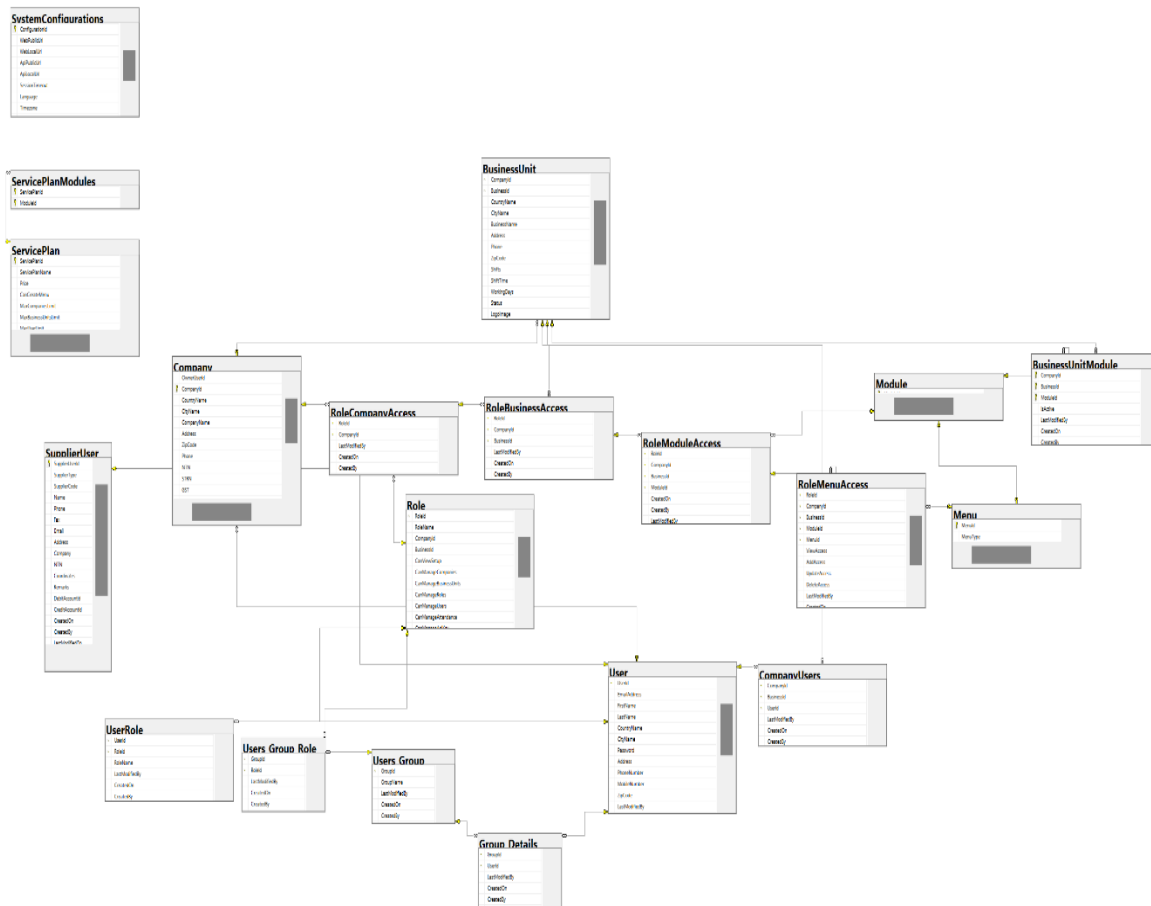


4.2. Domain Model

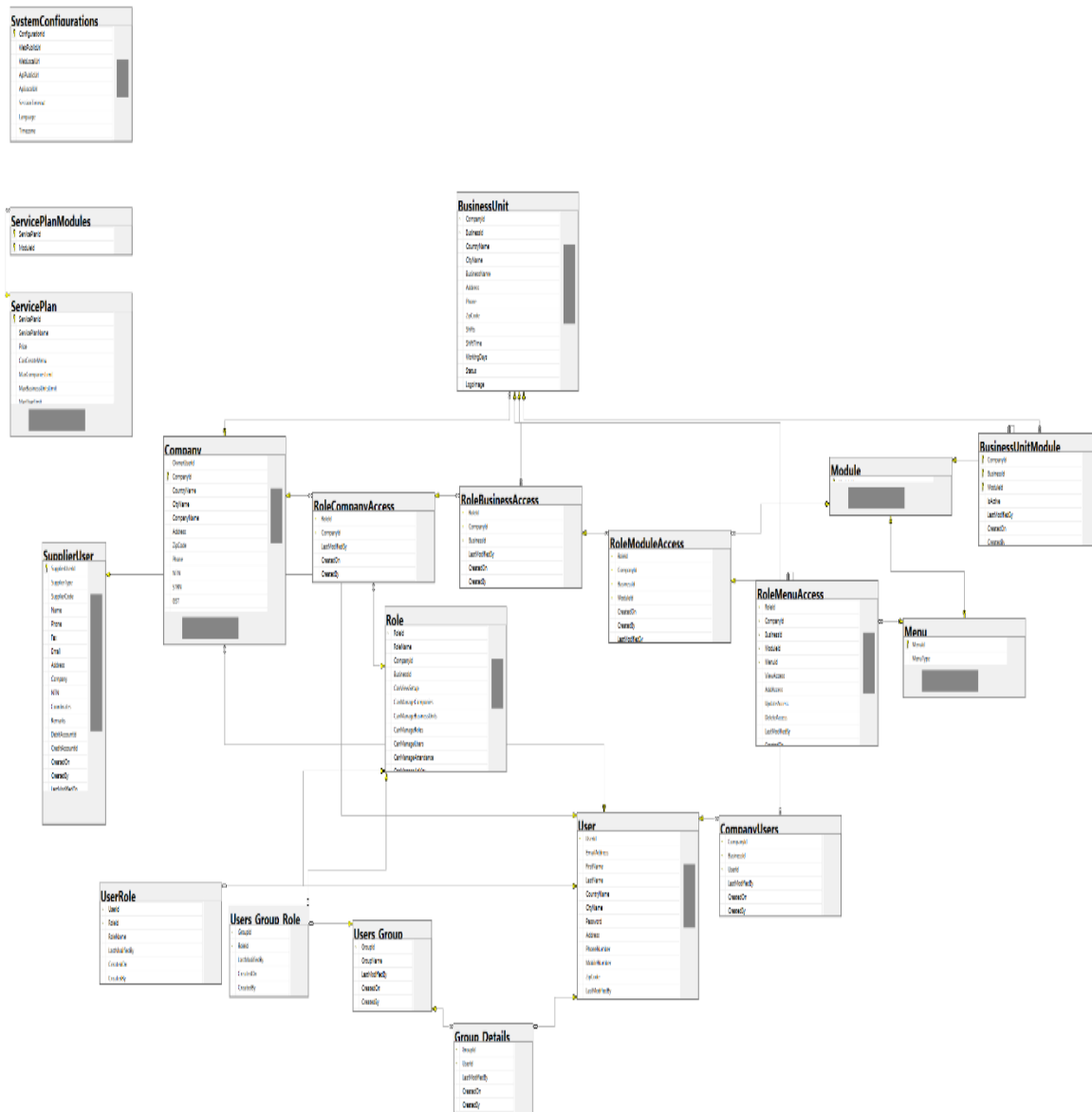
The domain model typically includes entities (e.g., production order, material, resource) represented as classes or objects, along with their attributes and associations. It showcases how these entities interact with each other, capturing relationships such as "production order has materials" or "resource is allocated to a production order." The domain model can also depict behaviors or operations associated with the entities, such as creating a production order or updating material availability.

The purpose of a domain model is to provide a high-level overview and common understanding of the key components and relationships within the production domain. It serves as a communication tool among stakeholders, including business analysts, developers, and users, facilitating discussions and requirements gathering. The domain model forms the basis for further system design and development activities, ensuring that the production module aligns with the business domain and captures the necessary functionalities and interactions.

4.3. Entity Relationship Diagram with data dictionary

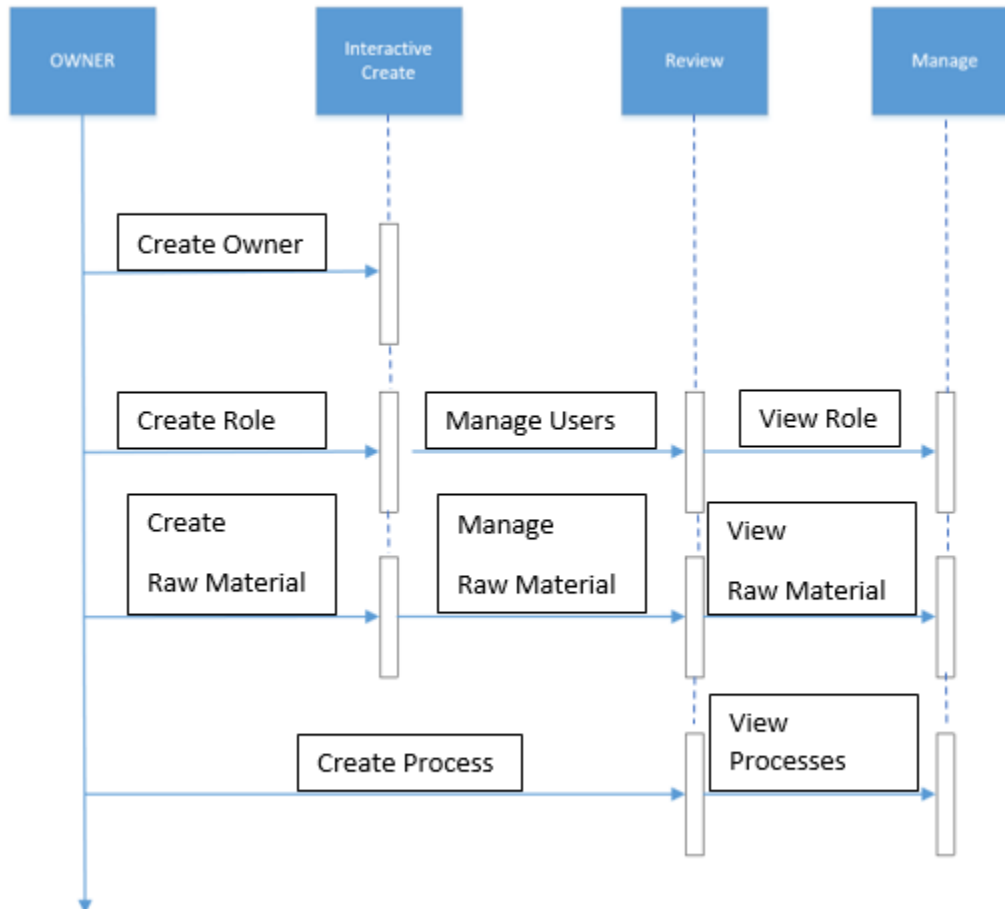


4.4. Class Diagram

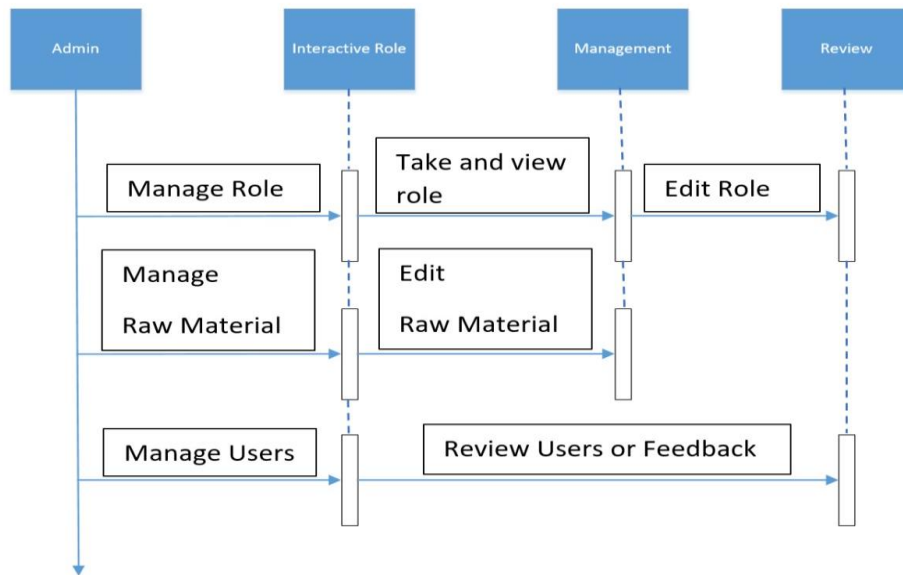


4.5. Sequence / Collaboration Diagram

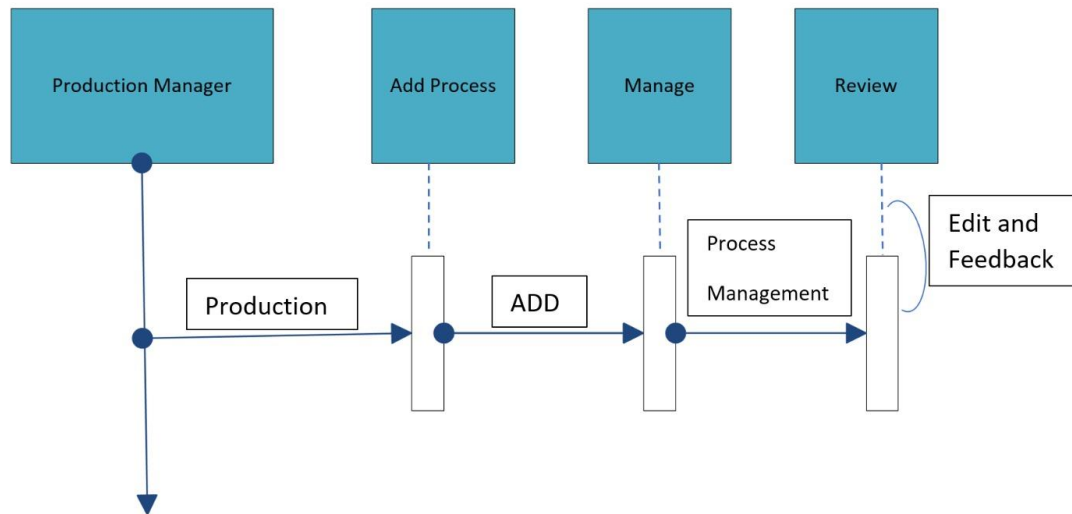
Owner Activity Diagram



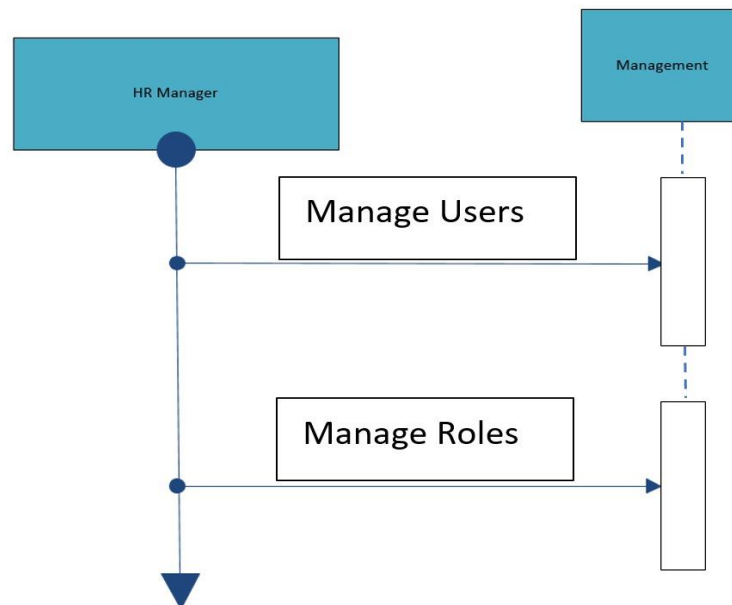
Admin Activity Diagram



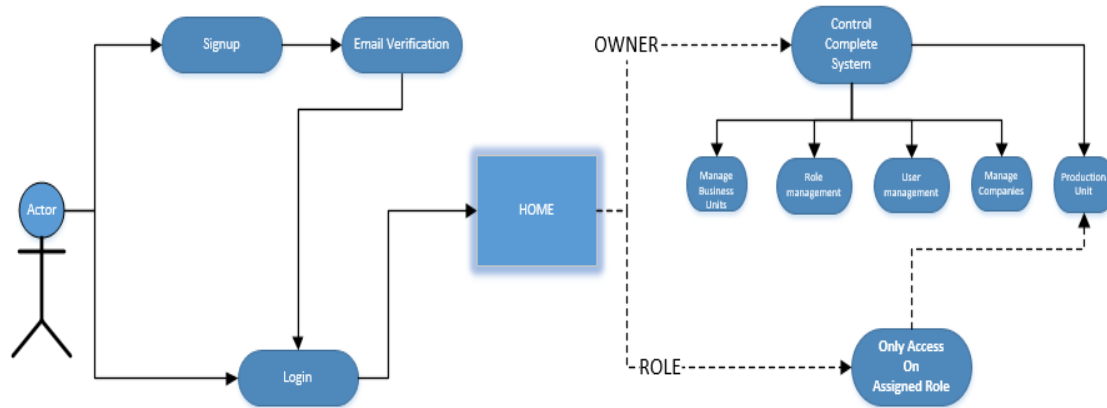
Production Manager Activity Diagram



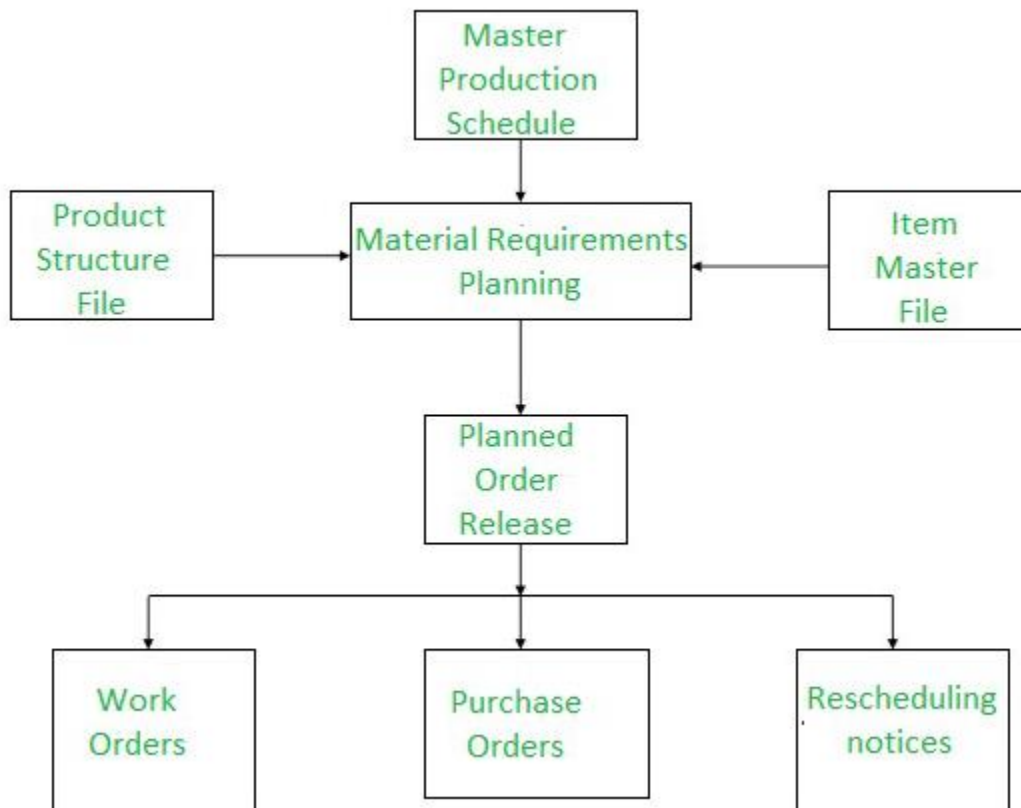
HR Manager Activity Diagram



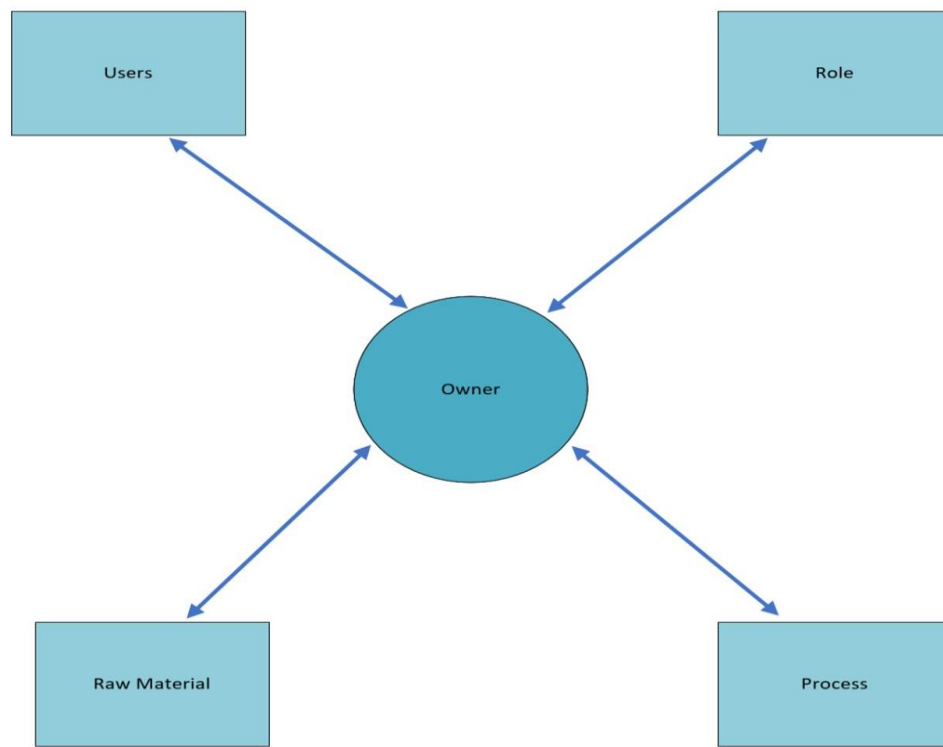
4.6. Activity Diagram



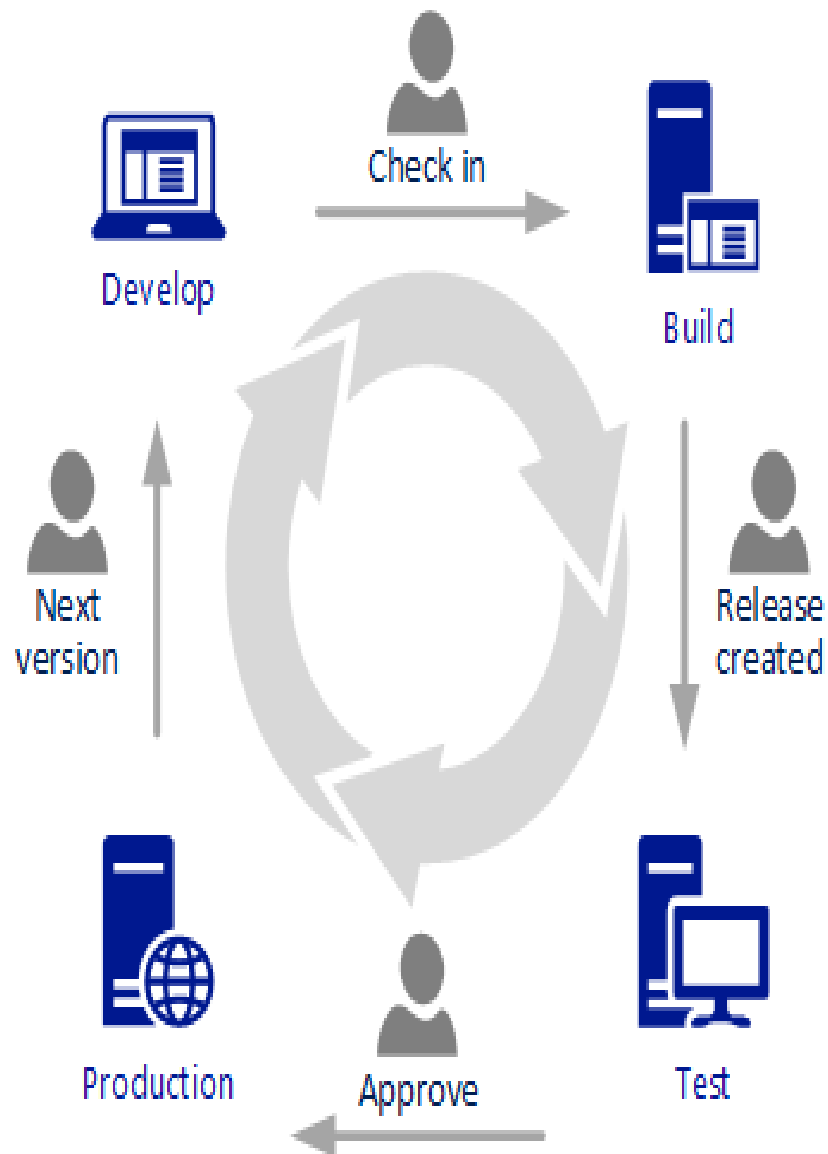
State Transition Diagram



Data Flow Diagram



4.7. Deployment Diagram



Chapter 5

Implementation

Chapter 5: Implementation

We have used AngularJs, ASP.NET MVC and MSSQL in this application development.

For the front end designing we have used AngularJs along with (CSS, AngularJs Material). For the login purpose, we have used MSSQL real time databases. For the Backend Development, we will be using ASP.NET MVC, C#. All the Information will be stored in database MSSQL.

5.1. Important Flow Control/Pseudo codes

if condition:

Code block executed when condition is true

statements

else:

Code block executed when condition is false

Statements

Production Order Processing:

function processProductionOrder(order):

if order.status == "Pending":

if checkMaterialAvailability(order.materials):

allocateResources(order.resources)

updateInventory(order.materials)

updateProductionStatus(order, "In Progress")

else:

updateProductionStatus(order, "Delayed")

elif order.status == "In Progress":

updateProductionStatus(order, "Completed")

else:

print("Invalid order status")

5.2. Components, Libraries, Web Services and stubs

- ASP.NET MVC
- C#
- AngularJs
- AngularJs Material
- CSS
- Visual Studio

5.3. Deployment Environment

For the deployment purpose of our ERP System product we have been used

- Proxmox Server ISS Express

5.4. Tools and Techniques

Tools are given below:

- Visual studio
- Google
- Microsoft SQL (MSSQL)
- Google Chrome web browser
- Photoshop
- Android Studio

Here comes the Techniques:

- (AngularJs Material, CSS) used for structuring and designing.
- Photoshop for designing.

5.5. Best Practices / Coding Standards

Pascal casing and Camel casing are used for the best coding practices these techniques are used for making the code clean and more understandable.

- camelCase

- PascalCase

5.6. Version Control

We are using GitHub for version controlling.

Chapter 6

Testing and Evaluation

Chapter 6: Testing and Evaluation

Use Case Testing

Main Screen

Test Case ID: 1			Test Design By: M Umair		
Test Module Name: Instructor Dashboard Screen			Test Design Date: 17 March 2023		
Test Priority: High			Test Executed By: Ali Hamza		
Test Title: To test Main Dashboard screen is showing all the functional requirement			Test Executed Date: 17 March 2023		
Description: Test Main Dashboard screen is showing all the functional requirement					
Pre-condition: Open site and login/register to Main dashboard					
Dependencies:					
Step	Test Step	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Login to main dashboard		Main dashboard is shown	Main dashboard is shown	Pass
2.	Wait for Backend to respond		Backend response is successful	Backend response is successful	Pass
3.	View analytics and check reviews		Data shown on dashboard is correct	Data shown on dashboard is correct	Pass
Post Condition: Main page works perfectly					

Test Case ID: 2			Test Design By: M Umair		
Test Module Name: Add Equipment Screen			Test Design Date: 21 March 2023		
Test Priority: High			Test Executed By: M Umair		
Test Title: To test Equipment add module			Test Executed Date: 21 March 2023		
Description: Test Equipment add screen has all its functional requirement					
Pre-condition: Open site and login/register to Equipment dashboard					
Dependencies:					
Step	Test Step	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Login to Production dashboard		Equipment dashboard is shown	Equipment dashboard is shown	Pass
2.	Wait for Backend to respond		Backend response is successful	Backend response is successful	Pass
3.	View Equipment add screen		Form shown to add data	Form shown to add data	Pass
4.	Check validation and complete steps to add a course		Validations shown and equipment add successfully	Validations shown and equipment add successfully	Pass

Test Case ID: 3			Test Design By: Ali Hamza		
Test Module Name: Equipment replacement part screen			Test Design Date: 24 March 2023		
Test Priority: High			Test Executed By: M Salman		
Test Title: To test Equipment replacement part screen			Test Executed Date: 24 March 2023		
Description: Test Equipment replacement part screen main screen follow its functional requirement.					
Pre-condition: Go to application and register/login as a ERP					
Dependencies:					
Step	Test Step	Test Data	Expected Result	Actual Result	Status (Pass/Fail)
1.	Login to ERP application		Production main screen is shown	Production main screen is shown	Pass
2.	Wait for Backend to respond		Backend response is successful	Backend response is successful	Pass
3.	View and search courses.		Data are of Equipment replacement part screen can be enrolled.	Data are of Equipment replacement part screen and can be enrolled.	Pass

Functional Testing: In the production module, functional testing ensures that all production-related functionalities work correctly. This includes verifying the system's ability to create and manage production orders, schedule production activities, track material consumption, monitor

work-in-progress, and generate production reports. It ensures that the system accurately supports the production processes and follows the defined workflows.

Security Testing: Security testing in the production module aims to safeguard production-related data and processes. It involves assessing access controls to ensure that only authorized personnel can perform critical production activities or view sensitive information. Additionally, security testing ensures that the system implements data encryption, secure authentication, and proper audit trails to protect against unauthorized access or data breaches.

User Acceptance Testing (UAT): UAT in the production module involves involving end-users, such as production supervisors and operators, to validate the system's usability and effectiveness. It allows users to perform tasks like creating production orders, updating production statuses, and generating production reports. Feedback from UAT helps ensure that the system meets the specific needs of the production team and is intuitive to use.

Documentation and Training Evaluation: In the production module, documentation and training materials play a crucial role in guiding users on how to effectively utilize the system's production capabilities. Evaluating the documentation ensures that it provides clear instructions, process flows, and troubleshooting information related to production activities. Training evaluation ensures that the training materials effectively convey the necessary knowledge and skills required to operate the production module.

6.1. Use Case Testing

Use case testing for the production module involves validating the ERP system's ability to handle real-life scenarios. It includes testing production order creation, material planning, resource allocation, quality control, and production reporting. The testing ensures accurate execution of production orders, effective management of material availability, proper resource planning, adherence to quality standards, and generation of accurate production reports. By simulating real-life scenarios, use case testing identifies functional gaps and performance

issues, enabling organizations to address them and ensure the smooth operation of production processes.

6.2. Equivalence partitioning

Equivalence partitioning is a testing technique that groups input data into partitions or classes where each partition is expected to exhibit similar behavior. In the context of the production module, equivalence partitioning involves dividing the input data related to production processes into different classes based on their characteristics or attributes. Test cases are then designed to represent each partition, ensuring that at least one representative test case is executed from each partition.

For example, in the production module, equivalence partitioning may involve categorizing production order quantities into partitions such as small, medium, and large. Test cases would be created to cover a representative value from each partition, such as a small quantity, a medium quantity, and a large quantity. This approach helps reduce redundancy in testing by focusing on representative data points within each partition, while ensuring that all relevant scenarios are covered.

By using equivalence partitioning, testing efforts are optimized by selecting a minimal set of test cases that effectively cover the entire range of inputs, reducing the overall testing time and effort required for the production module.

6.3. Boundary value analysis

Boundary value analysis is a testing technique that focuses on testing the boundaries or limits of input or output values. In the context of the production module, boundary value analysis helps identify potential issues and vulnerabilities related to input or output boundaries. For example, in testing the production order quantity, boundary value analysis would involve testing values that are at the lower and upper limits of the acceptable range, as well as values just below and above those limits. This technique helps uncover issues such as data truncation,

overflow, or underflow, ensuring that the production module handles boundary values correctly and effectively.

6.4. Data flow testing

Data flow testing is a testing technique that focuses on verifying the correct flow and transformation of data within a system. In the context of the production module, data flow testing ensures that data related to production orders, materials, resources, quality control, and production reports is correctly processed and passed between different components or modules. It involves creating test cases that exercise different data paths and transformations, including input validation, data manipulation, data storage, and output generation. The goal is to identify any potential data-related issues such as data corruption, loss, inconsistency, or incorrect calculations within the production module.

6.5. Unit testing

Unit testing for the production module involves testing individual components and functions within the ERP system to ensure their correctness and functionality. It focuses on verifying the behavior of specific production-related code units, such as functions, classes, or methods. The testing includes validating production order creation, material planning algorithms, resource allocation logic, quality control routines, and production reporting functions. By isolating and testing these units, developers can identify and fix any issues or bugs, ensuring the reliable and accurate operation of the production module.

6.6. Integration testing

Integration testing in the production module ensures that the ERP system seamlessly integrates with other relevant systems and modules. This includes testing the integration with inventory management to ensure accurate material availability, the integration with procurement to

facilitate the timely sourcing of raw materials, and the integration with quality control systems to ensure proper inspection and adherence to quality standards.

6.7. Performance testing

Performance testing in the production module focuses on assessing the system's ability to handle production-related tasks efficiently. It involves measuring the system's response time in generating production orders, scheduling activities, updating real-time production data, and generating reports. Performance testing helps identify any bottlenecks or inefficiencies that could impact the production process.

6.8. Stress Testing

Regression testing in the production module ensures that changes or updates made to the ERP system do not disrupt or negatively impact the production processes. It involves retesting key production functionalities and scenarios after system updates, patches, or customizations to ensure that they continue to work as expected.

Chapter 7

Summary, Conclusion and Future Enhancements

Chapter 7: Summary, Conclusion & Future Enhancements

7.1. Project Summary

ERP (Enterprise Resource Planning) is a well-maintained management system for enterprise resources. It has various modules having different functionalities and operations. Some of its main modules are listed below.

1. Setup
2. Accounts
3. Sale
4. Purchase
5. HR
6. Warehouse
7. Production

The purpose for which the system has high demand is that it manages all the resources of a company or an organization and leaves the owner satisfied and not worried about his resources. The resources can be of any type like raw material, finished goods, purchased goods, factory machines and human resources etc.

Our focus in this ERP system is production module. This module deals with the processes of a product through which it will pass while it's manufacturing. There are different types or numbers of processes for different products. This module will be managed by production manager which will allocate manpower and machinery for a desired order keeping in view the time given for the order.

7.2. Achievements and Improvements

Our product facilitates all types of industries to manage their production units and there are many industries that are existing in our country like the paper industry, sugar industry, steel industry, floor industry, etc. our product also facilitates those industries in the managerial

processes. Our product manages all the operations in a very efficient and easier way. Our main objective to provide the platform which handle all the modules on a single login.

7.3. Critical Review

Alignment with Business Requirements: Assess whether the production module effectively aligns with your organization's specific production requirements, workflows, and goals. Evaluate how well it supports your unique production processes and if any customization or additional features are needed.

Usability and User Experience: Evaluate the user interface and overall user experience of the production module. Consider factors such as intuitiveness, ease of navigation, and clarity of information presentation. Identify any areas where improvements can be made to enhance user productivity and satisfaction.

Core Functionality: Evaluate the core functionalities of the production module, including production order creation, material planning, resource allocation, quality control, and reporting. Assess their effectiveness, accuracy, and efficiency in supporting your production operations.

7.4. Lessons Learnt

This software is handling complex tasks of a business; it does require a powerful server machine with high band internet access.

Another performance requirement is a storage space.

Software should be developed as lightweight application so that it can work on almost at any platform even with slower machine or internet connection.

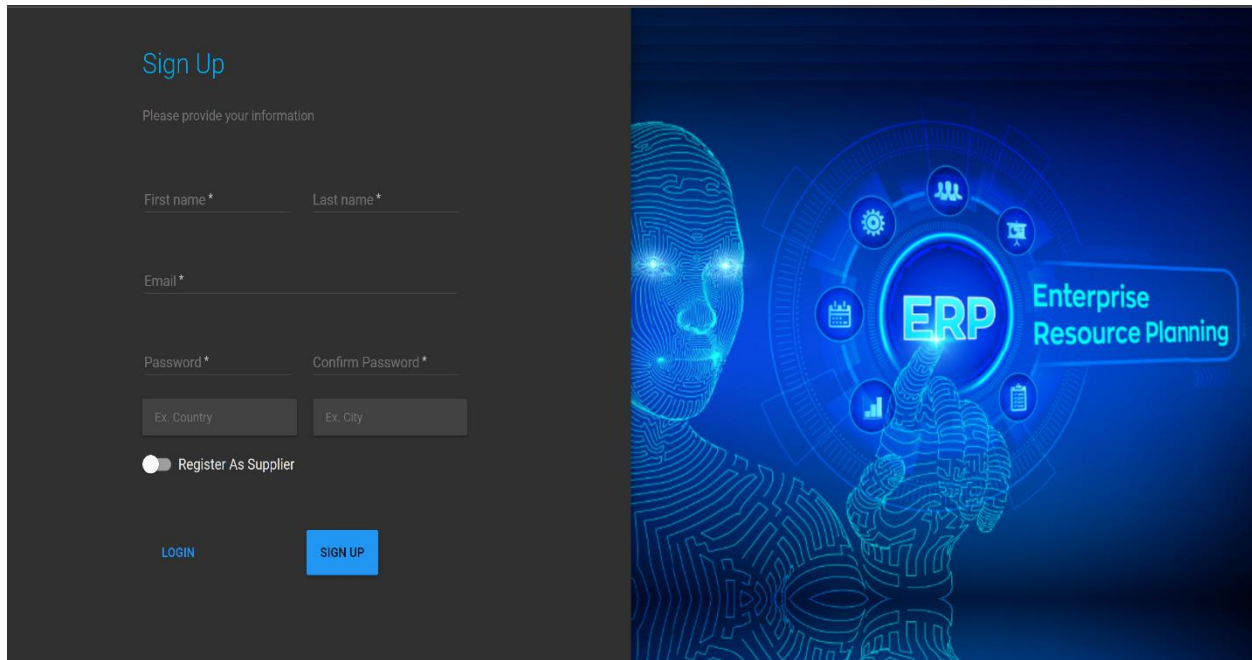
7.5. Future Enhancements/Recommendations

In future we want to propose this solution in international market by making it easier to user most user friendly platform for managing the data of any enterprise. We want to provide all the enterprise resource planning modules on single login.

Appendices

Appendix A: Appendix A: User Manual

Sign-up Screen



Sign Up

Please provide your information

First name * Last name *

Email *

Password * Confirm Password *

Ex. Country Ex. City

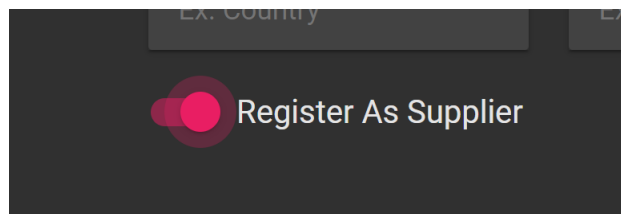
☐ Register As Supplier

[LOGIN](#) [SIGN UP](#)

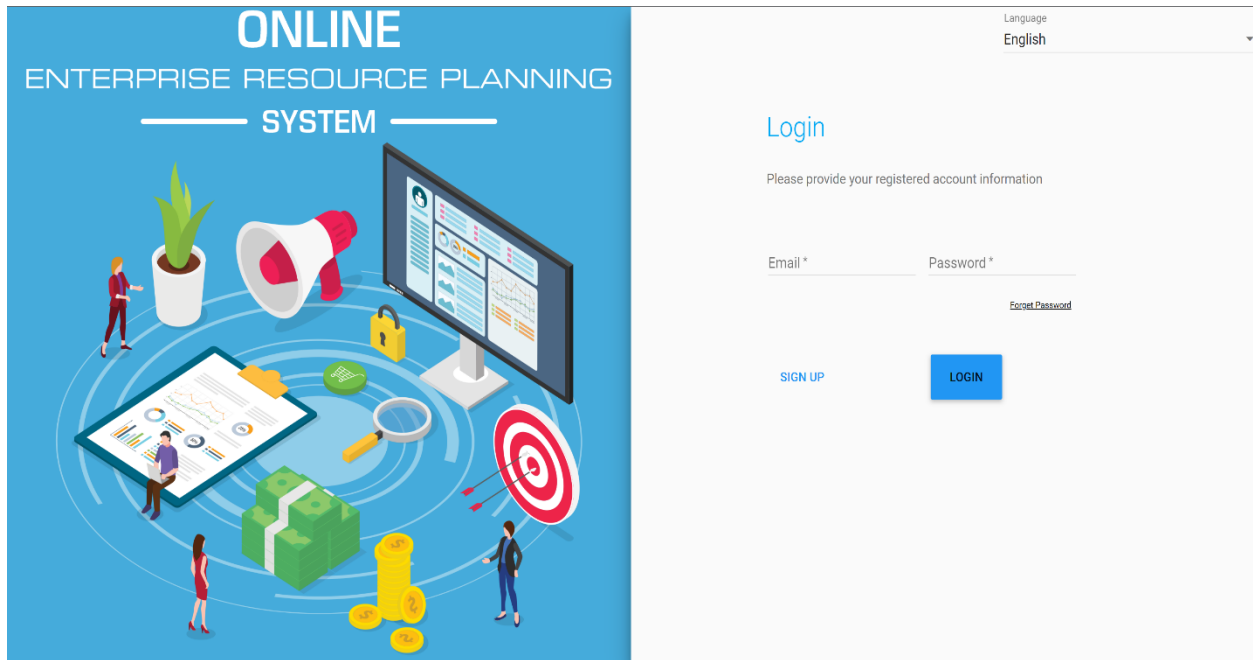
This is the sign-up screen where you fill the sign-up form which will make you authorized for this ERP system. On this form you have to provide your

- First Name
- Last Name
- Email (for Authentication)
- Password
- Country
- City

If you are a supplier you have to slide the button (Register as Supplier).



Login Page



This is the login Page where you have to fill the login form.

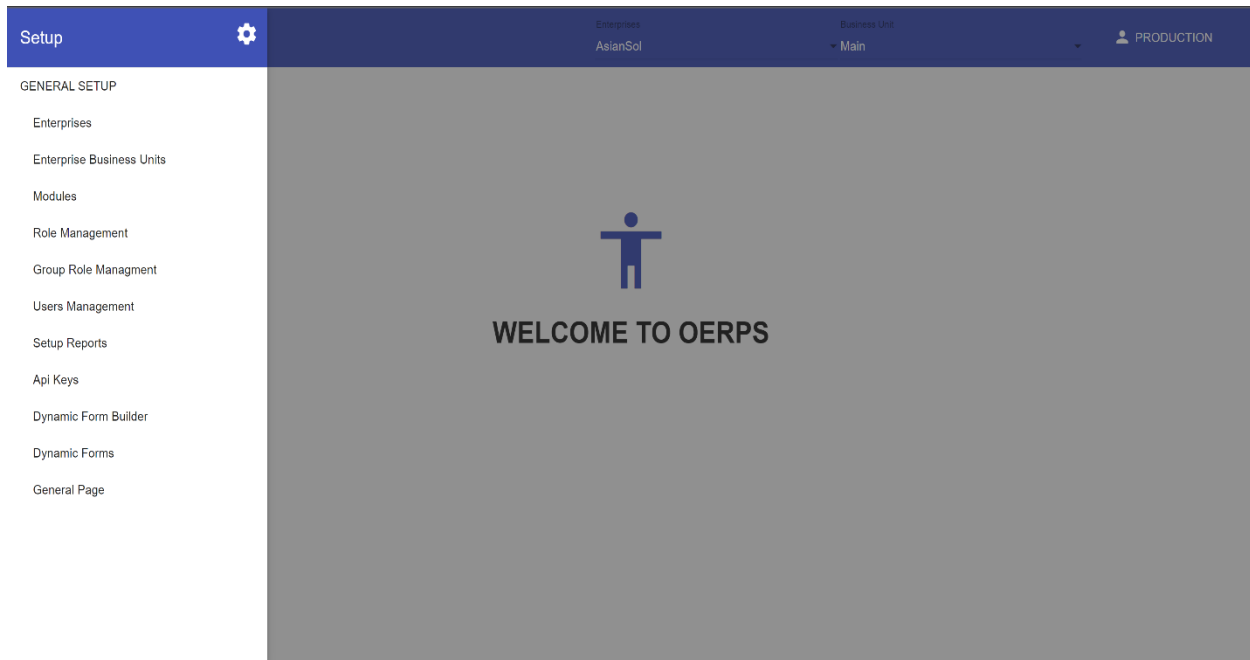
You have to provide yours registered

- Email
- Password

After filling this form you can get access to the main dashboard of this ERP system.

On main dashboard we provide all the things according to the need of user and enterprise to manage or maintain all their records.

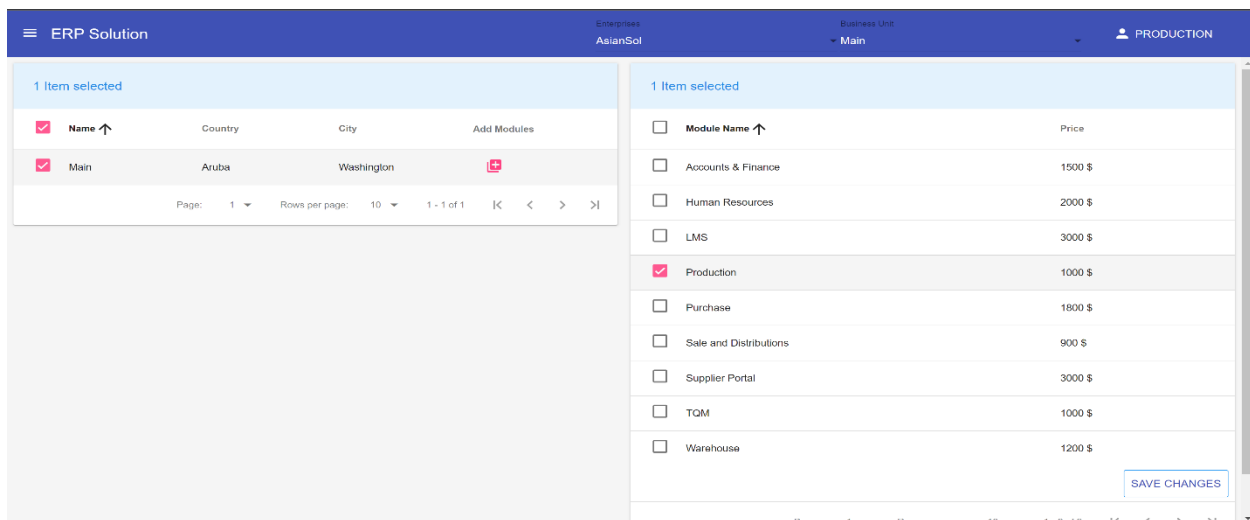
Dashboard



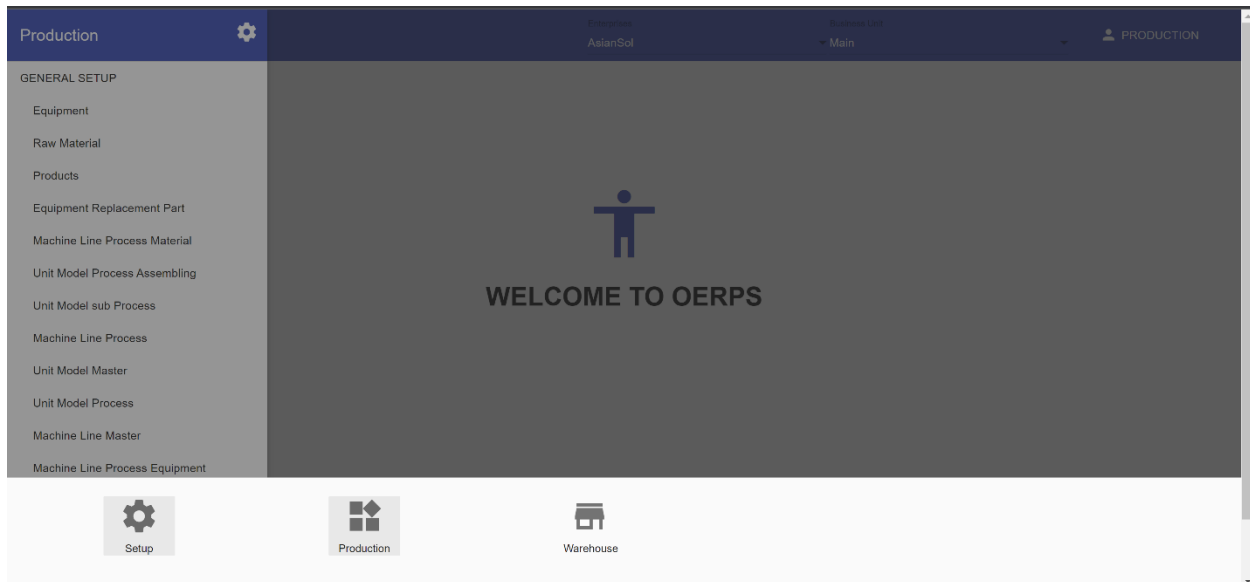
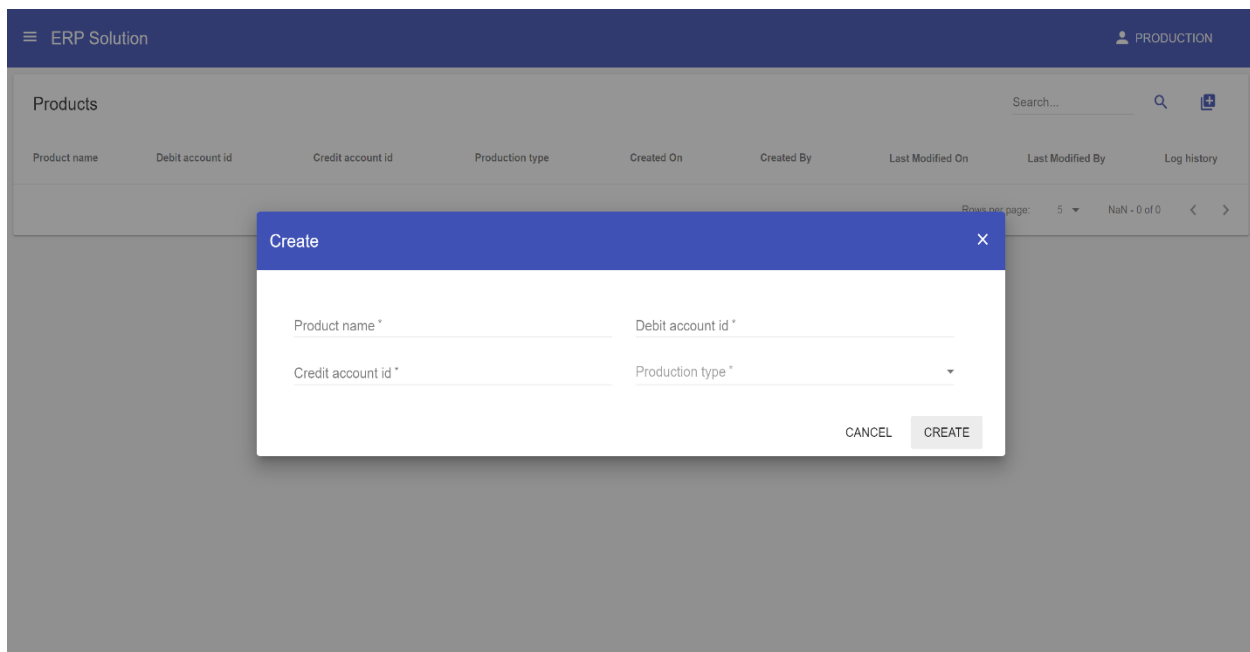
This is the Dashboard through which you can add new business units, new modules, new enterprises and manage users etc.

On this dashboard here are all the things available according to need of users to manage their records.

For adding new module



(ADD MODULE) → Select business unit → Select Module → (Save Changes)

Select required Module from bottom**Adding New Record**

This is the form for Adding new record in table.

Reference and Bibliography

Reference and Bibliography

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- [2] Ikhsan, I., Ridwan, A.Y. and Saputra, M., 2020, June. Green Production Using ERP: Case Study in The Leather Tanning Industry. In *2020 8th International Conference on Information and Communication Technology (ICoICT)* (pp. 1-6). IEEE.
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