Weavora-an ERP system

Submitted By

Jasia Alam Jannat

Section: C(37)

Student Id: 221-35-832

Department of Software Engineering

Daffodil International University

Supervised By

MR. Khalid Been Badruzzaman Biplob

Lecturer(Senior Scale)(DIU)

Department of Software Engineering

Daffodil International University

This project report has been submitted in fulfilment of the requirements for the degree of **Bachelor of Science in Software Engineering**

APPROVAL

This thesis titled on Weavora-an erp System submitted by **Jasia Alam Jannat(221-35-832)** to the Department of Software Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Software Engineering and approval as to its style and contents.

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Daffodil International University

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Daffodil International University

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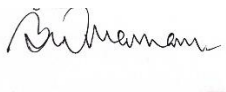
I hereby declare that I have checked this project and in my opinion, this project is adequate in terms of scope and quality for the award of the degree of Bachelor of Science.



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Full Name :Mr.Khalid Been Badruzzaman Biplob

Position: Lecturer(senior scale)

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I hereby declare that the work in this project is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Daffodil International University or any other institution.

(Student's Signature)

Full Name: Jasia Alam Jannat

ID Number : 221-35-832

Date : 27November 2025

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ABSTRACT

WEAVORA- is a fully unified web-based ERP system tailored for garment and textile industry for their highly challenging operational environment. We aim at developing a single platform for the smooth execution of key business process throughout the supply chain.In order to provide complete order management, real-time production reporting and complete raw material-finished goods inventory control the system unifies multiple and isolated processes that are usually managed manually in disjointed manner. Its an end-to-end,web-based solution. The solution has a very intuitive and user-friendly interface to reduce the learning curve and adoption rate in all departments. WEAVORA provides end-to-end transparency of all the processes and enables stakeholders to respond faster, based on data driven insights, reduce costs and meet on-time delivery for a competitive advantage.

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CHAPTER 1 INTRODUCTION

1.1 Introduction

WEAVORA is a single and fully integrated web-based ERP system crafted exclusively for the garment and textile industry requiring highly responsive operational routines. We strive to create a single platform for seamless execution of key business processes across the supply chain. The solution integrates multiple and disparate processes that are normally handled manually in isolation to provide comprehensive order management, real-time production reporting and total raw material-finished goods inventory control. It is an end-to-end, web-based solution. The solution is built with extremely intuitive and user-friendly interfaces to minimize learning curve and adaptation rate within all departments. WEAVORA provides end-to-end transparency of all processes and empowers stakeholders to react quickly, based on data driven insights, minimize costs and ensuring on-time delivery for a competitive advantage.

1.1.1 Context

Industry Context:

WEAVORA is an ERP solution designed for the complex Garment and Textile Manufacturing Industry. This industry requires flexibility due to fast changing trends, diverse product range and production processes across the world.

Trends:

- Cloud-based systems
- Real-time monitoring of machines and resources
- End-to-end tracking materials and production history

Challenges:

- Lack of real-time visibility
- Ineffective production planning
- Inventory management failures

Opportunities:

- Realtime visibility and centralized data
- Adoption of industry
- Demand-driven manufacturing

Weavora will solve complexiety and inefficiency by enabling real-time,traceable and smart manufacturing.

1.1.2 **Problem Identification**

Highlight the problem or gap that your project aims to address. Mention any prior studies or solutions and their limitations.

1.1.3 **Purpose and Justification**

This project is a strong ERP platform that aims to bring together textile manufacturing data.It will help to reduce waste and ensure real-time tracebility.

Value Addition:

- User-Friendly: It helps the users to have a easy way around the system.
- Efficient Administration: It enables easy management and updates for admin
- Error Resilience: It instills trust in ‘about us’,’contact us’ features.
- Future-Ready: Accommodates future features and expansion with new designs.

1.1.4 **Scope**

Project Scope for Weavora

1. User Registration and Management:
    - Create accounts, update profiles,view products and managing productions.
    - Secure login and registration with and option to recover an account
2. Manufacturing Operations
    - Scheduing for all major productions,quality release and inspection of data.
    - Digital storage and application of dyeing chemical formulas.
3. Sales and Order Management:
    - Processing sales orders
    - Distributing finished goods inventory.
4. Inventory management:
    - Inventory Tracking for each raw materials,chemical and finished goods.
    - Tracking bin locations and movement of items inside the factory and warehouses.
    - Automatic calculation of procurement needs .
5. Core financial and accountings:
    - Management of standard chart of accounts
    - Managinf suppliers and billing customers
    - Calculating standard cost of goods sold

1.2 Project Planning and Initiation Feasibility study

The development of a user-friendly, secure and scalable ERP platform that will support product browsing, login/registration, manufacturing operations, sales and inventory management.

1 Preliminary Analysis & Project Scope Definition:

Weavora is a web-based ERP system created for the garment and textile industry. Its main goal is to digitalize and simplify operational processes like production tracking, inventory control, and order management. The project includes system design, development, testing, and deployment, all tailored for small to medium-sized garment businesses.

2 Market Feasibility Analysis (or Market Research):

Market research shows a rising demand for industry-specific ERP solutions in the garment sector. Many companies are using outdated systems and manual processes, which leads to inefficiencies. Competitor analysis reveals that customizable, user-friendly platforms like Weavora have significant market potential.

3 Technical Feasibility Analysis:

Platform: Built with PHP

Tech Stack:

• Backend: PHP, MySQL

• Frontend: HTML5, CSS3, Bootstrap

• Hosting: Linux-based cloud VPS

Development Feasibility:

• Small team needed: Backend developer, Frontend

developer, UI/UX designer, QA

• Moderate to low complexity

1.3 Target User Profile and Tentative Elicitation Process

1.3.1 Target User

Target users include production managers, inventory officers, merchandising teams, and administrative staff in small to mid-sized garment factories. The process for gathering requirements involved interviews, observations, and reviewing existing workflows to customize the system to meet users' needs.

1.3.2 User profile

Table 1.1: User Profile for Admin

User Class	**Note on Characteristics**
Type of user	Administrator
Age range	30-50
Frequency of use	regular
Mandatory	yes
Computer experience	Expert
Education	Graduate
goal	Manages the system
Language skills	English
Number of users	3-5
Training	Yes
Others system use	No
Way of working	Professional

Table 1.2: User Profile for Department heads

User Class	**Note on Characteristics**
Type of user	Production,finance,sales head
Age range	25-40
Frequency of use	regular

Mandatory	yes
Computer experience	Expert
Education	Graduated
goal	Checking on production and sales
Language skills	English
Number of users	8-10
Training	Yes
Others system use	Use of ecommerce platform
Way of working	Professional

Table 1.3: User Profile for end users

User Class	**Note on Characteristics**
Type of user	Foremen.Store keepers
Age range	25-45
Frequency of use	Regular
Mandatory	Yes
Computer experience	Basic
Education	Graduate
goal	To check data and reduce annual work
Language skills	English
Number of users	50-70
Training	Yes
Others system use	
Way of working	Professional

1.5 System Requirements

1.5.1 Hardware Requirements

For developers:

1) OS: Windows 7 above
2) Processor: Intel Xenon or AMD EPYC, 2.0 GHz or higher
3) System type: 32/64-bit operating system

For users:

1) Hardware: Desktop,laptop,smartphone or tablet
2) Ram:4gb above

1.5.2 Software Requirements

For developers:

1) IDE: Visual Studio Code
2) Front end: HTML,CSS
3) Backend: PHP, MySQL
4) For Database: MYSQL

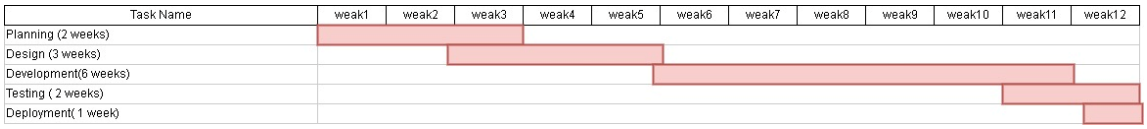
For Users:

1) Browser: Modern Browser(Google chrome,Firefox,Safari etc)

1.5.3 Constraints and Dependencies

1. Budget Limitations
2. Scalability
3. Resource Limitation

1.6 Project Scheduling



1.7 Summary

The focus of this chapter is to design and develop and ERP platform that enhances easy,safe and fast ways for managing a textile industry.It addresses the shortcomings in prevailing systems such as poor performance and handling of errors.

CHAPTER 2 DESIGN AND IMPLEMENTATION

2.1 Introduction

In the project we have 4 kinds of actor

- Admin
- Manager

2.2 Functional Requirements

FR01	**Registration**
Description	Before using the Erp system user must register
Stakeholder	Manager, User,Admin
FR02	**Login**
Description	User must log in before entering the system
Stakeholder	Manager, User, Admin
FR03	Sales order entry and validation
Description	The system must allow entry of new customer sales orders and ideas
Stakeholder	Sales co-ordinator
FR04	Work order generation
Description	The system will automatically generate work orders sequentially
Stakeholder	Production manager
FR05	BOM and costing calculation
Description	System will apply simple BOM and include a fixed calculation for costing
Stakeholder	Production Manager,Inventory Officer
FR06	Raw material Lot Tracking
Description	All incoming Raw material will have unique Lot Number and will ensure tracebility
Stakeholder	Inventory officer

FR07	Supplier Payment Tracking
Description	System will track supplier bills of recorded goods and manage payment status
Stakeholder	Inventory Officer

2.3 Non-Functional Requirements

2.3.1 Performance

The system should Support at least 100 current users without losing performance.

2.3.2 Reliability

It is expected a 99.9% system uptime along with fallback options in case of failure.

2.3.3 Scalability

It should be able to accommodate more users and data with few configuration changes

2.3.4 Security

The system should have implemented data ecryption,secure login methods like HTTP and two factor authentication and conduct regular security check.

2.4Object-oriented System design using UML

2.4.1 Use Case Diagram

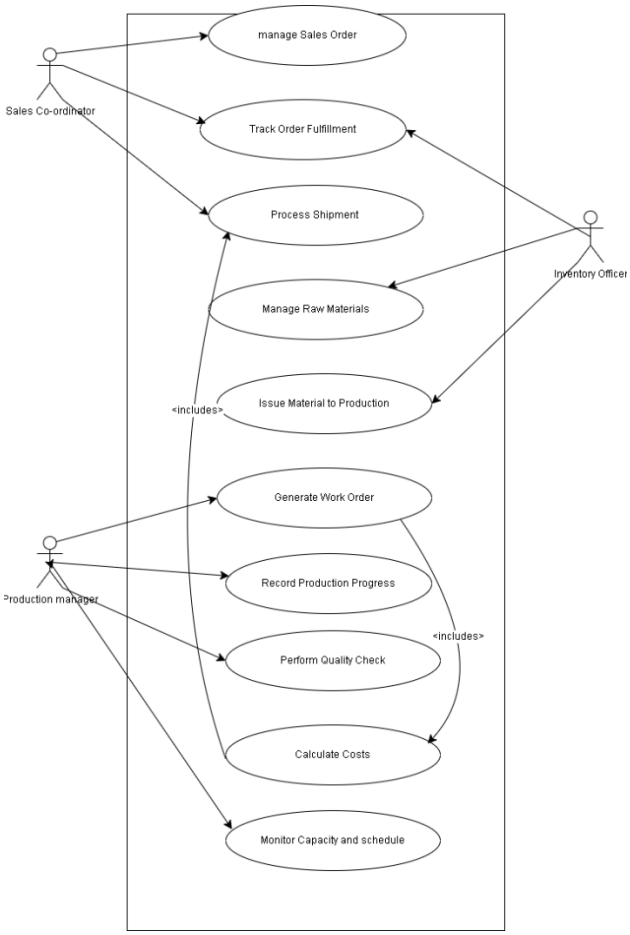


Figure 2: Use case Diagram

2.4.2 Case Description

Case Description-01: Manage sales order

<table>
<tr><td>Use Case</td><td>Manage sales order</td></tr>
<tr><td>Goal</td><td>To know customer demand and get accurate requirements for the goods</td></tr>
<tr><td>Precondition</td><td>Customer data exists in the system</td></tr>
<tr><td>Success End Condition</td><td>Notification: !!!Successfully Data Found!!!</td></tr>
<tr><td>Failed End Condition</td><td>Notification: “Data Not Found!!!</td></tr>
<tr><td>Primary Actors:
Secondary Actors:</td><td>Sales co-ordinator</td></tr>
<tr><td>Trigger</td><td>Recording a sales order</td></tr>
<tr><td>Description / Main Success Scenario</td><td><table>
<tr><td>1.</td><td>Press “Create new Sales order”</td></tr>
<tr><td>2.</td><td>Enters Customer ID,Delivery date and Shipping details</td></tr>
<tr><td>3.</td><td>Select Fabric Code</td></tr>
<tr><td>4.</td><td>Enters required Quantity</td></tr>
<tr><td>5.</td><td>System calculates Total price</td></tr>
<tr><td>6.</td><td>Coordinator saves sales order with Unique ID</td></tr>
</table></td></tr>
<tr><td>Alternative Flows</td><td><table>
<tr><td>1.1</td><td>A order is missing</td></tr>
<tr><td></td><td>1.1.a. Contact inventory management team</td></tr>
</table></td></tr>
<tr><td>Quality Requirements</td><td>The user Will fill up all the details in 30 minutes.</td></tr>
</table>

Case Description-02: Generate Work Order

<table>
<tr><td>Use Case</td><td>Generate Work Order</td></tr>
<tr><td>Goal</td><td>To translate customer demand into manufacturing instruction.</td></tr>
<tr><td>Precondition</td><td>Open sales order exists</td></tr>
<tr><td>Success End Condition</td><td>Notification: !!!Successfully Updated!!!</td></tr>
<tr><td>Failed End Condition</td><td>Notification: “ERROR!!!</td></tr>
<tr><td>Primary Actors:
Secondary Actors:</td><td>Production Manager</td></tr>
<tr><td>Trigger</td><td>Generating work order</td></tr>
<tr><td>Description / Main Success Scenario</td><td><table>
<tr><td>1.</td><td>Press “Generate work order”</td></tr>
<tr><td>2.</td><td>Calculate sales quantity</td></tr>
<tr><td>3.</td><td>Calculate required raw materials</td></tr>
<tr><td>4.</td><td>Check estimated delivery date</td></tr>
<tr><td>5.</td><td>Assign Work order</td></tr>
<tr><td>6.</td><td>Confirms work order</td></tr>
</table></td></tr>
<tr><td>Alternative Flows</td><td><table>
<tr><td>1.1</td><td>Insufficient capacity</td></tr>
<tr><td></td><td>1.1.a. Alerts Manager</td></tr>
</table></td></tr>
<tr><td>Quality Requirements</td><td>The user Will fill up all the details in 30 minutes.</td></tr>
</table>

Case Description-03: Issue material to Production

<table>
<tr><td>Use Case</td><td>Issue Material to Production</td></tr>
<tr><td>Goal</td><td>To officially transfer reserved inventory to production floor</td></tr>
<tr><td>Precondition</td><td>Work order in progress</td></tr>
<tr><td>Success End Condition</td><td>Notification: !!!Successfully Issued!!!</td></tr>
<tr><td>Failed End Condition</td><td>Notification: “ERROR!!!</td></tr>
<tr><td>Primary Actors:
Secondary Actors:</td><td>Inventory manager</td></tr>
<tr><td>Trigger</td><td>Ready for material</td></tr>
<tr><td>Description / Main Success Scenario</td><td><table>
<tr><td>1.</td><td>View”Work order”</td></tr>
<tr><td>2.</td><td>Physically pulls the material</td></tr>
<tr><td>3.</td><td>Officially record the Lot Id</td></tr>
<tr><td>4.</td><td>Confirms the transaction</td></tr>
<tr><td>5.</td><td>System deduce the quantity from inventory count</td></tr>
<tr><td>6.</td><td>Confirms issued materials</td></tr>
</table></td></tr>
<tr><td>Alternative Flows</td><td><table>
<tr><td>1.1</td><td>Lot Mismatch</td></tr>
<tr><td></td><td>1.1.a. Issue and alert</td></tr>
</table></td></tr>
<tr><td>Quality Requirements</td><td>Must be done in order</td></tr>
</table>

Case Description-04: Perform Quality Check

<table>
<tr><td>Use Case</td><td>Quality Check</td></tr>
<tr><td>Goal</td><td>To verify the product meets required standards at critical points</td></tr>
<tr><td>Precondition</td><td>Work order has reaches a critical hold point</td></tr>
<tr><td>Success End Condition</td><td>Notification: !!!QC on process!!!</td></tr>
<tr><td>Failed End Condition</td><td>Notification: “Data Not Found!!!</td></tr>
<tr><td>Primary Actors:
Secondary Actors:</td><td>Product Manager
QC technician</td></tr>
<tr><td>Trigger</td><td>Work order has almost done</td></tr>
<tr><td>Description / Main Success Scenario</td><td><table>
<tr><td>1.</td><td>Press “Work order”</td></tr>
<tr><td>2.</td><td>Inputs measurement data</td></tr>
<tr><td>3.</td><td>Compares input values against tolerance range</td></tr>
<tr><td>4.</td><td>If in range”QC Approved”</td></tr>
<tr><td>5.</td><td>Outside range”QC Failure”</td></tr>
<tr><td>6.</td><td>Critical alert</td></tr>
</table></td></tr>
<tr><td>Alternative Flows</td><td><table>
<tr><td>1.1</td><td>QC failure</td></tr>
<tr><td></td><td>1.1.a. Rework Lot</td></tr>
</table></td></tr>
<tr><td>Quality Requirements</td><td>The user Will fill up all the details in 30 minutes.</td></tr>
</table>

2.4.3 Activity Diagram

Diagram 01:

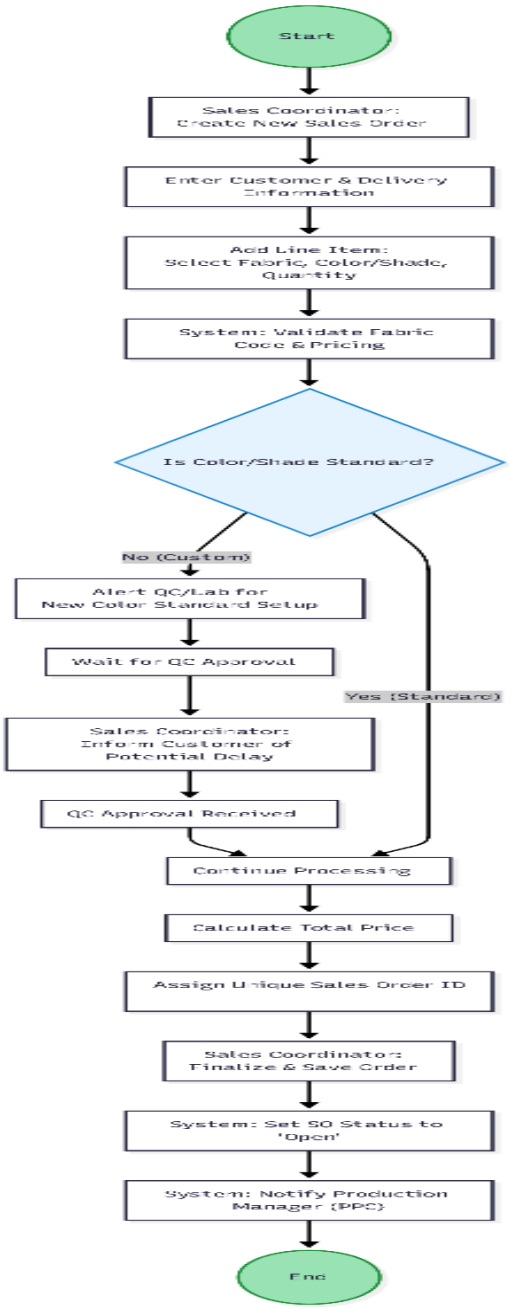


Figure 3.1: Manage sales order

Diagram 02:

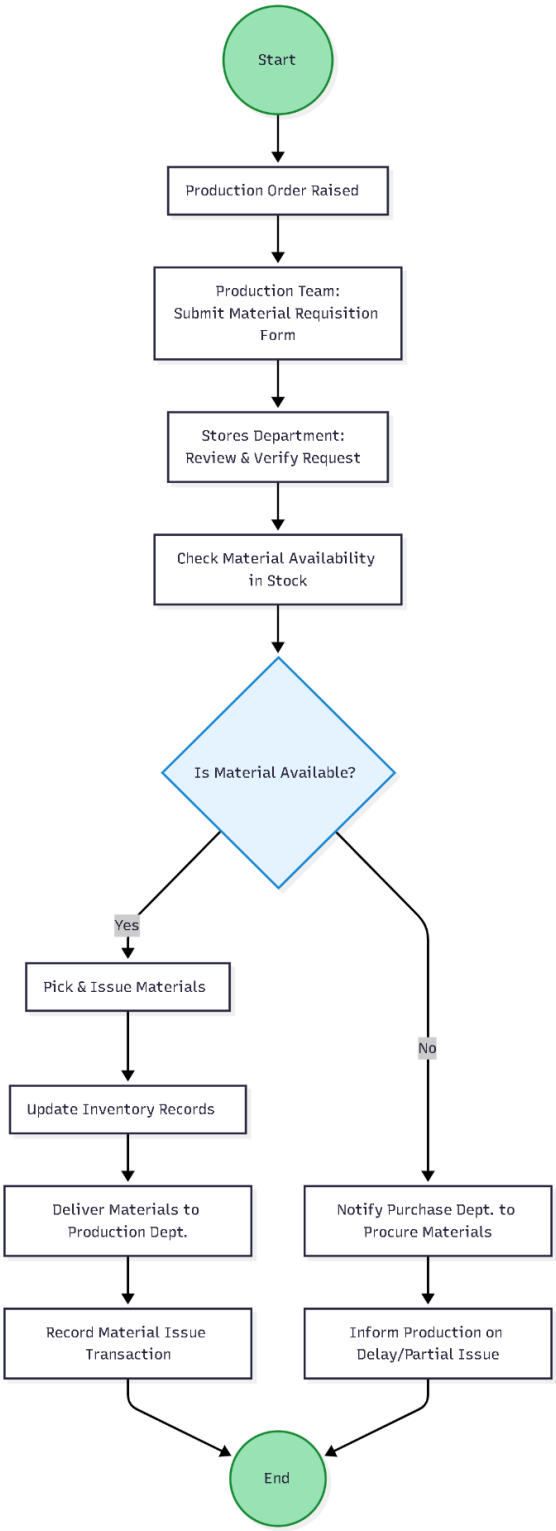


Figure 3.2: Issue Material to production

Diagram 03:

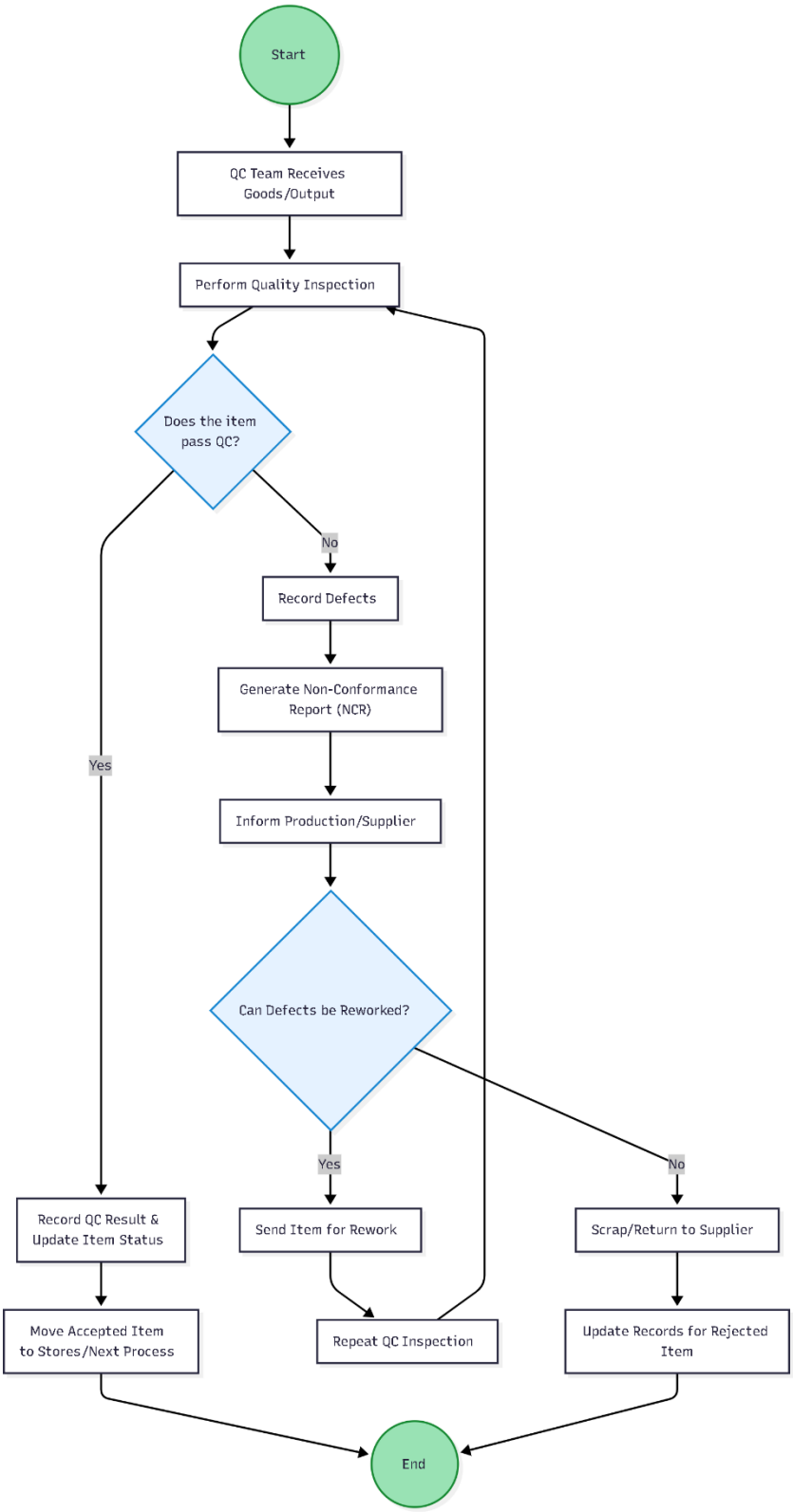


Figure 3.3:Perform Quality check

Diagram 04:

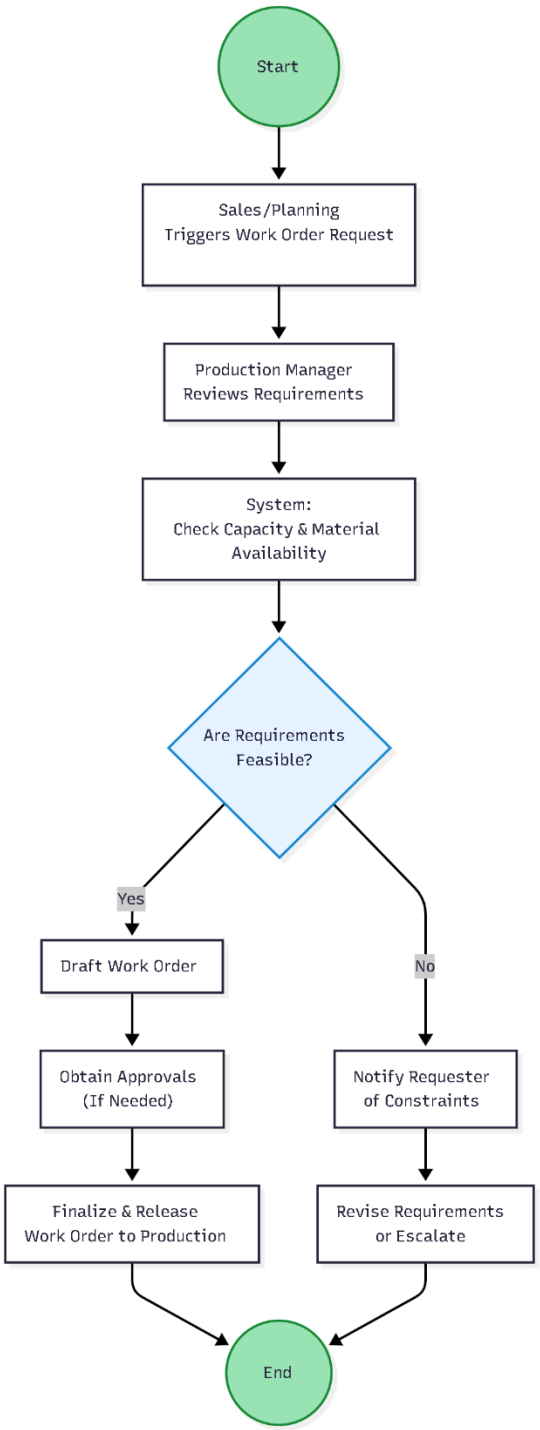


Figure 3.4: Generate work order

Diagram 05:

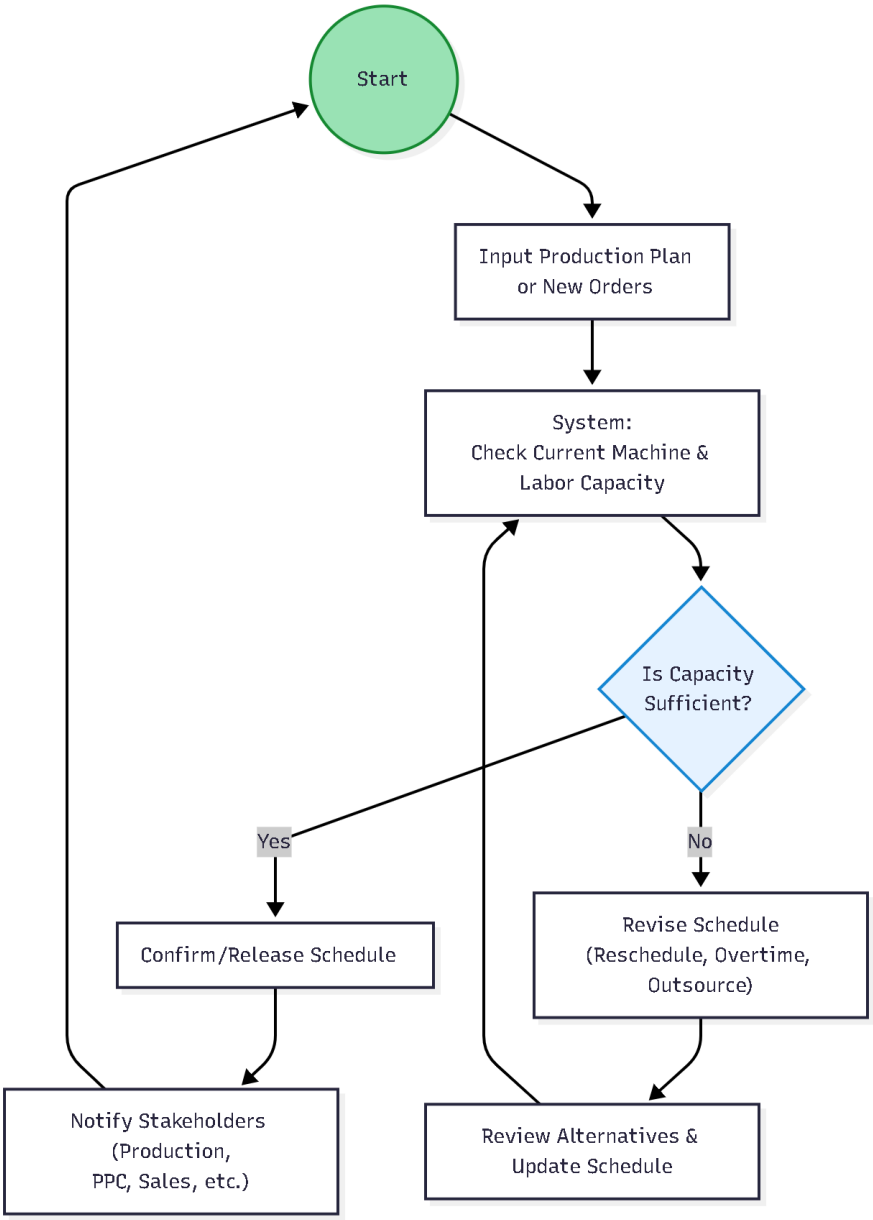


Figure 3.5:Monitor capacity and schedule

2.4.4 Sequence Diagram

Diagram 01:

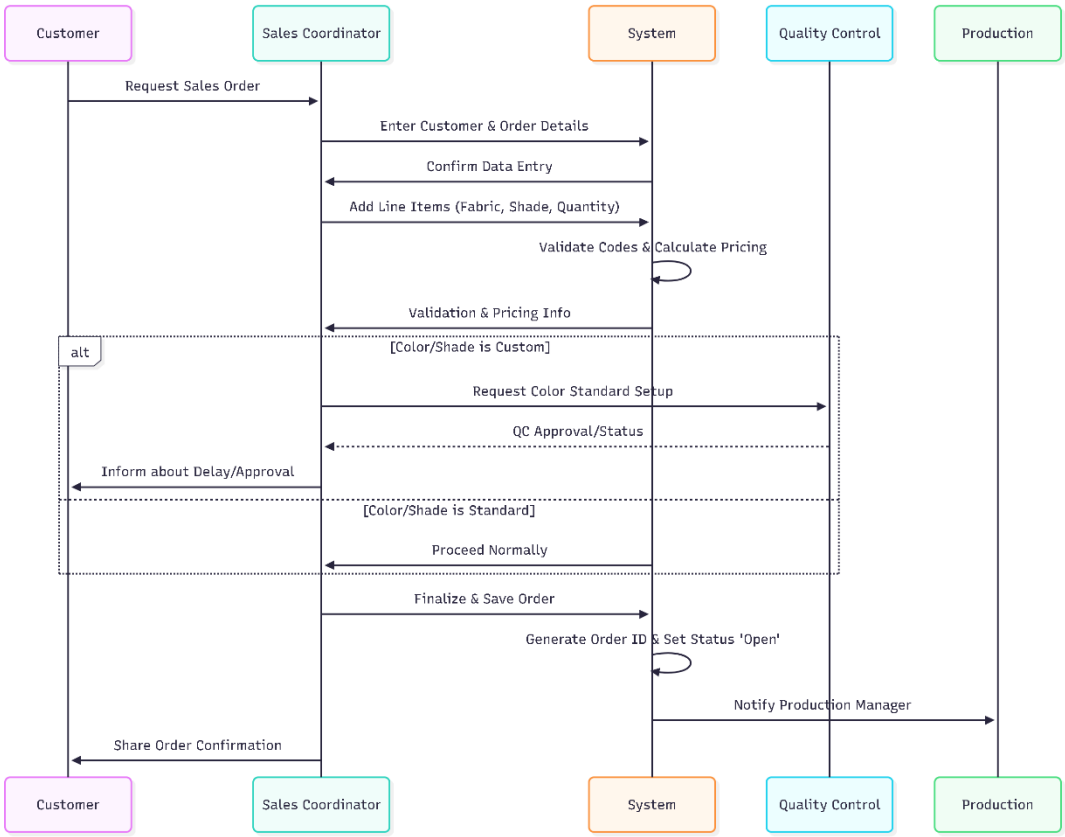


Figure 4.1:Manage sales order

Diagram 02:

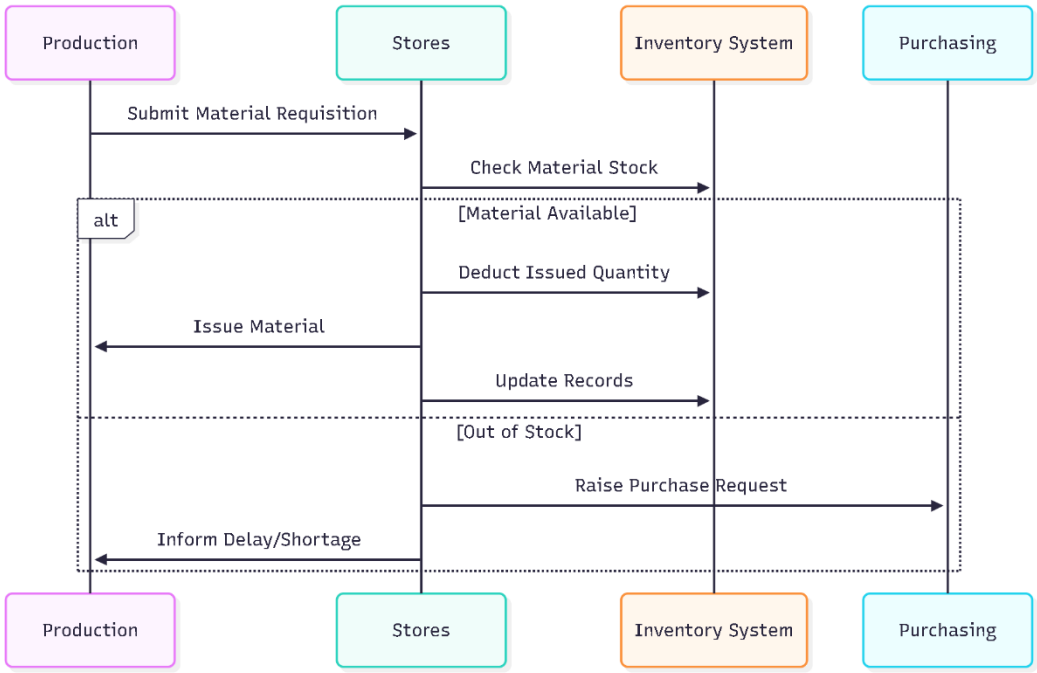


Figure:Issue materials to production

Diagram 03:

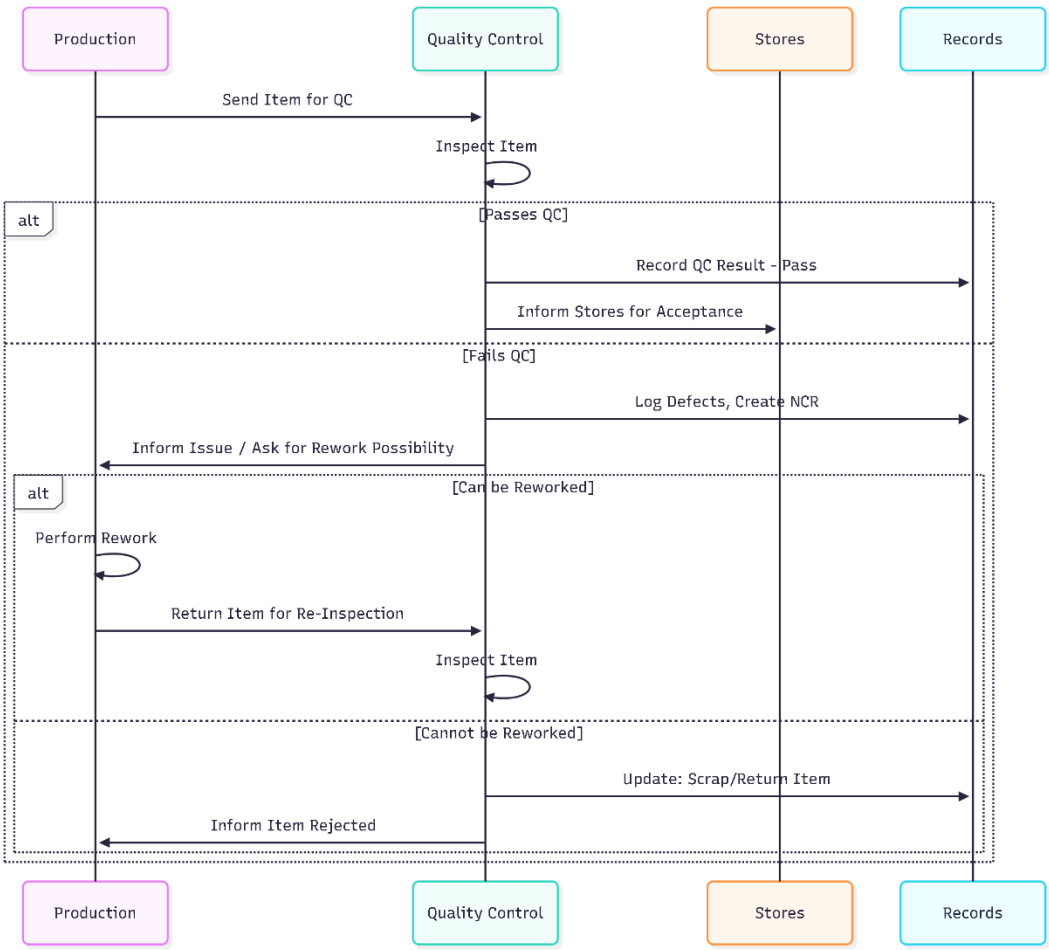


Figure 4.3:Perform quality check

Diagram 04:

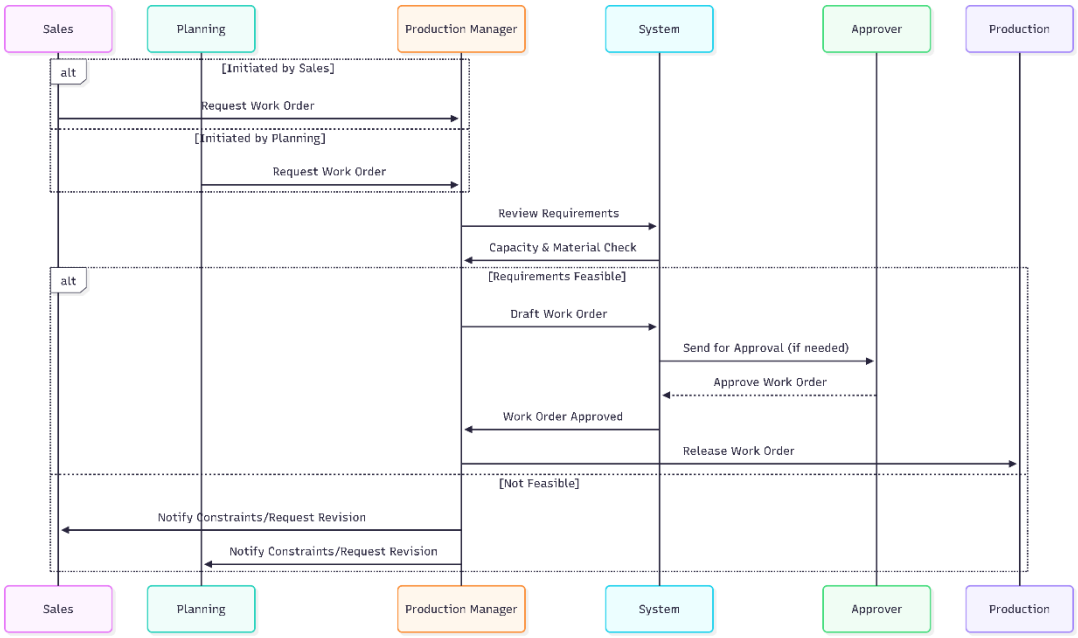


Figure 4.4:generate work order

Diagram 05:

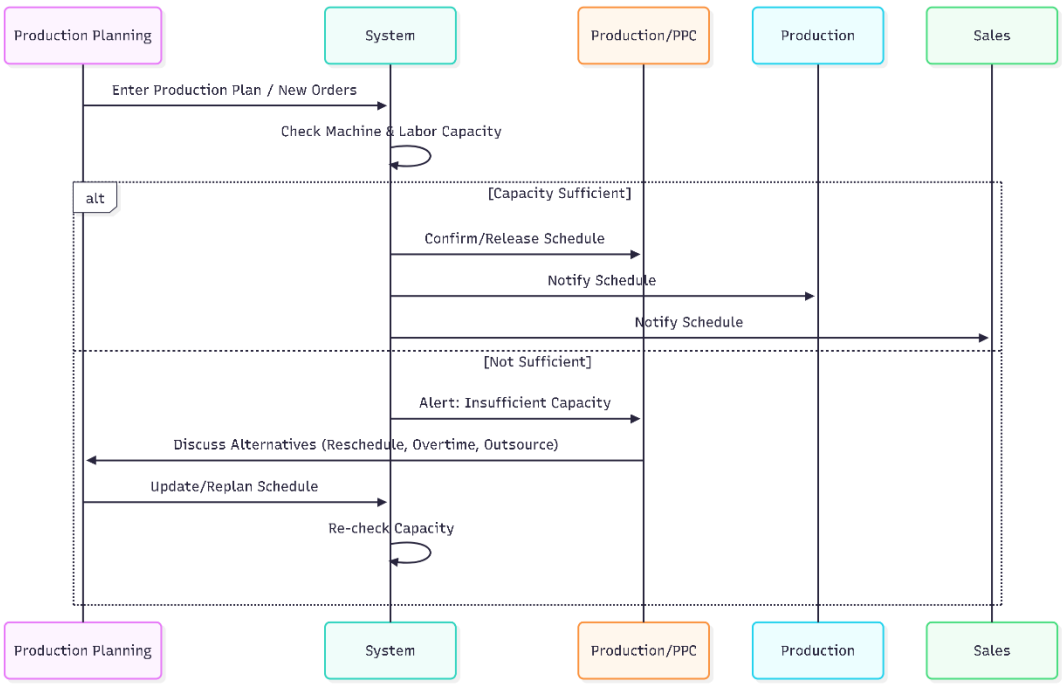


Figure 4.5: Monitor capacity and schedule

2.4.5 Class Diagram

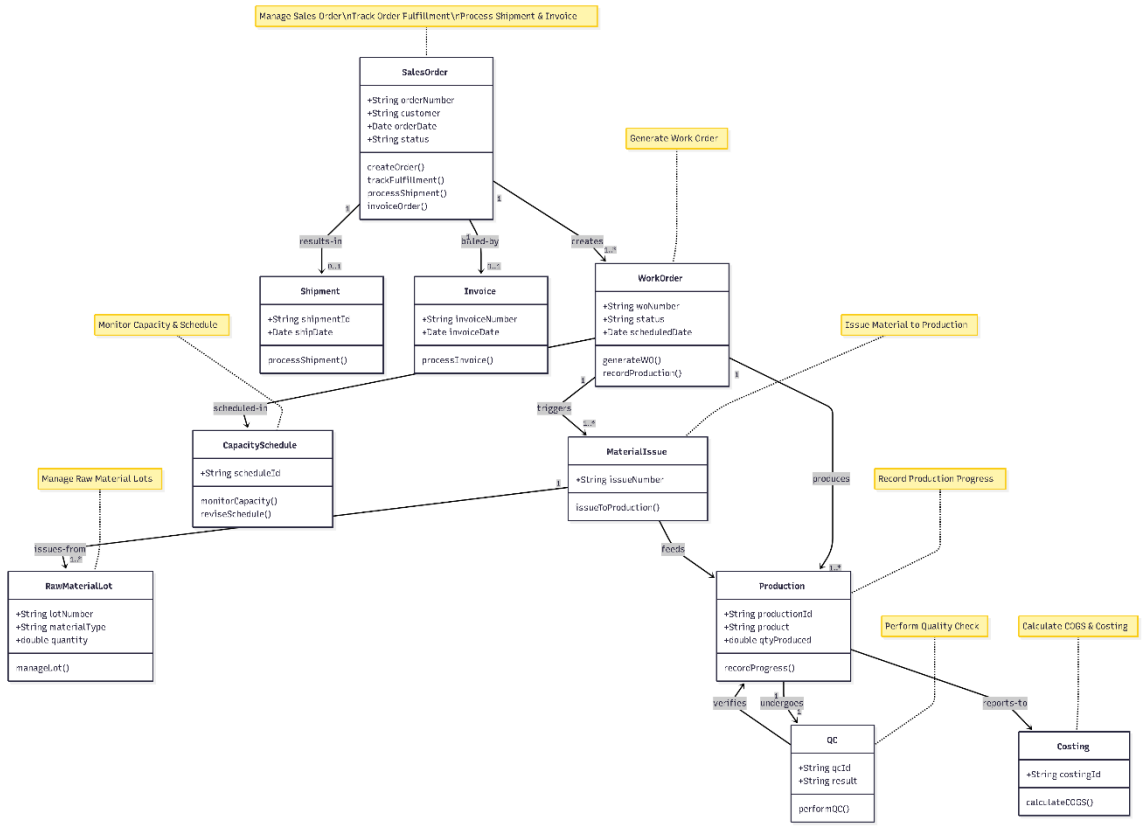


Figure 5: Class Diagram

2.4.6 ER Diagram

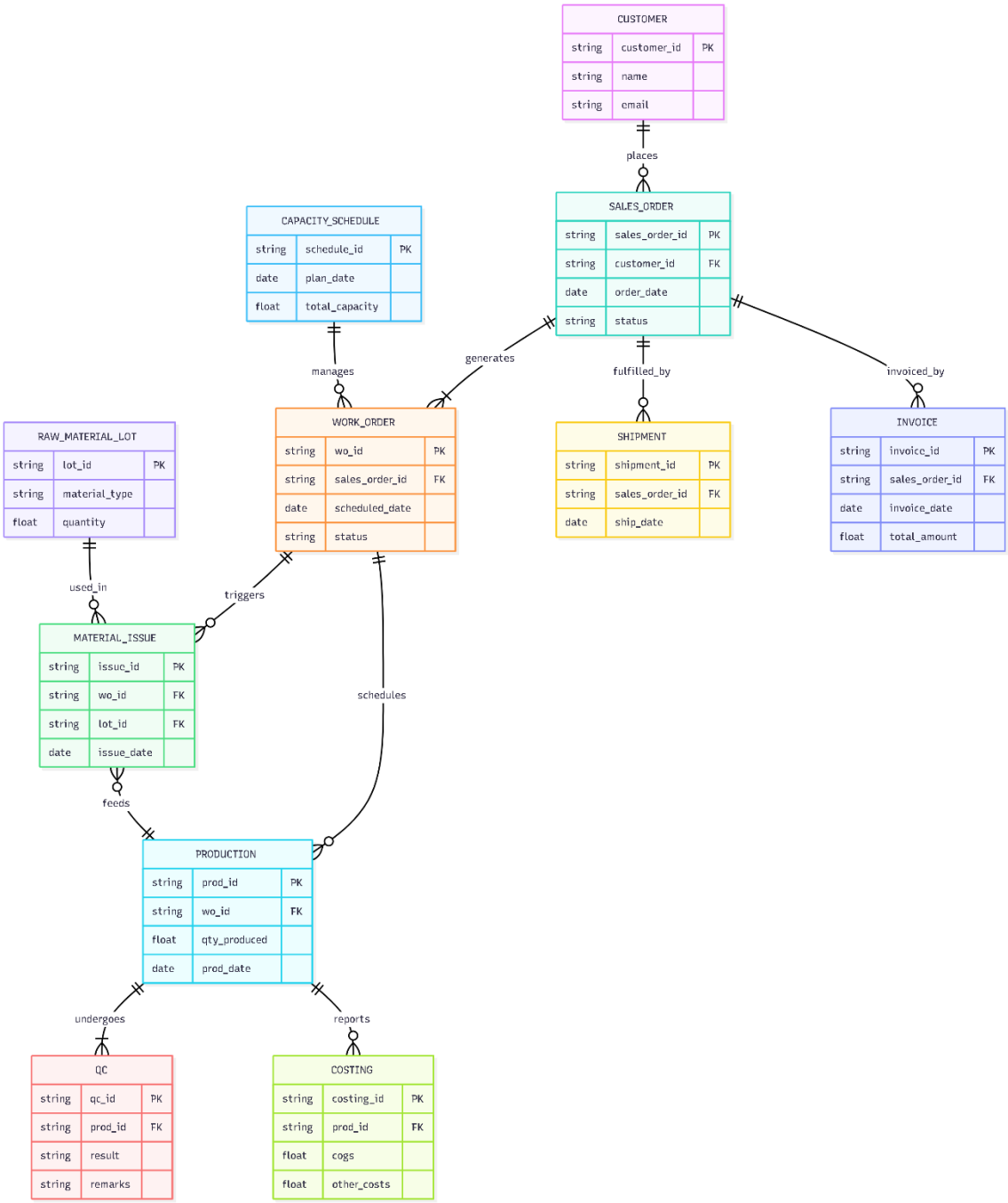


Figure 6: ER Diagram

2.5 Coding

This phase implements the designs and requirements into functional codes.The complete source code of the project, including the PHP backend code and HTML,CSS based frontend and all related configuration files is available for review in the project's code repository.

Here is the Repository Link: https://github.com/Jasia035/Weavora.git

2.6 Summary

This chapter provides the complete technical blueprint for the design and implementation of Weavora.It begins with formally defining the functional and non functional requirements which serves as the criteria for the project's success.Following the requirements the chapter also contains detailed object-oriented system design using UML.A series of diagram including Usecase,Activity,Sequence, Class and ER diagrams were presented to define the architecture of the project. Finally the chapter provided a coding appendix where implementation of the design can be found.This chapter helps building the initial structure and well-defined technical design.

Chapter 3 Software Testing

3.1 Introduction

We will test some features of the ERP system with help of two different database.

3.2 Testing Features

a. User Registration
b. User Login
c. Admin Login
d. Admin Dashboard
e. Add new sales order
f. Work orders
g. Add new materials
h. Staff management

3.2.1 Features to be tested

1.Authentication

ID	Feature	Action	Expected Result
Auth 01	Login	Enter valid admin credentials.	Access granted; redirected to index.php.
auth02	Security	Access materials.php directly via URL without logging in.	System blocks access and redirects to login.php.
auth03	Error Handling	Enter incorrect password.	Display "Invalid Credentials" alert; block entry.

2.Dashboard

ID	Feature	Action	Expected Result
dashboard01	Stat Cards	Check "Total Volume" against the sum of the DB quantity column.	Numbers must match perfectly.
dashboard02	Graphs	Change a material's category in the DB.	Chart.js doughnut chart updates distribution immediately.
dashboard03	Low Stock	Set a material to 5 units.	Dashboard "Low Stock Alert" count increases by 1.

3.Material Management

ID	Feature	Action	Expected Result
mat01	Create	Add a new "Linen Fabric" with 50 units.	Entry appears in table; success message displayed.
mat02	Read	Use the search bar for "Cotton."	Only materials with "Cotton" in the name remain visible.
mat03	Update	Edit an existing item's quantity from 10 to 100.	Table reflects 100 immediately; DB is updated.

ID	Feature	Action	Expected Result
mat04	Delete	Click "Delete" and select "Cancel" on the JS popup.	Material remains in the list
mat-05	Logic	Add 10.75 units	System accepts float value without rounding to integers.

3.3 Testing Strategies

3.3.1 Test Approach

1.Manual Testing:

- Used functional testing of cores features such as registration, login, Add work order,Add sales order,Add new materials,Quality check.

2.BlackBox testing:

- **U**sed BlackBox testing for input-output verification also it ensures that all features meet the functional requirements.

3.WhiteBox testing:

- Applied on critical backend features and internal workings.

4.Regression Testing:

- Used to ensure that any future change or update wont break existing functionalities.

3.3.2 Pass/Fail Criteria

Pass Criteria:

- UI elements are responsive and accessible for all devices and browsers.'
- All user inputs are correctly stored.
- The system will perform expected function without any errors.
- Security measures will function correctly.

Fail Criteria:

- UI elements broken and not responsive
- System performance is low.
- Errors occurring during a process.
- Produces incorrect results.

3.4 System Testing

Test case 01: Register

Field	Details
Test case: 3.3.1	Test case name: Register
System:Weavora	Subsystem: User Authentication
Designed By:Jasia	Executed by: Jasia
Description: The user registers by providing required information	
Pre-condition: User is on registration page	

steps	Name	Email	password	Retype password	Pass/fail	comment
1	admin	admin@gmail.com	123456789	123456789	Pass	Valid information.
2	empty	abc@gmail.com	12345678	12345678	Fail	Name required
3	abcd	abcd	12345678	12345678	Fail	Email required
4	abcdef	abcdef@gmail.com	12345	1234567	Fail	Password doesnot match

Test case 02:Login

Field	Details
Test case: 3.3.2	Test case name: Login
System:Weavora	Subsystem: User Authentication
Designed By:Jasia	Executed by: Jasia
Description: The user login by providing required information	
Pre-condition: User is on login page	

steps	Email	password	Pass/fail	comment
1	admin@gmail.com	123456789	Pass	Valid information.
2		12345678	Fail	Email required
3	abcd	12345678	Fail	Email invalid
4	abcdef@gmail.com	12345	Fail	Incorrect password

Test Case 03: add sales order

step	Order ID	Response	Pass/Fail	Comment
1	Valid order	Product found	pass	Order issued
2	Invalid order	Product not available	fail	error
3	Invalid order	Not found	fail	Order not found

Test case 04: Add new material

Step	Material ID	Material Type	Response	Pass/fail	Comment
1	0001	Fabric	Material added	Pass	Working
2	0002	Denim	Material not found	Fail	Error
3	0003	Glass	Material type don't match	fail	Doesn't match

Test case 05:Manage order

step	Order ID	Action	Response	Pass/Fail	Comment
1	Valid ID	Update status	Status updated	Pass	Updated
2	Wrong ID	Update status	Order not found	fail	Error

Test case 06:Manage User

step	action	response	Pass/fail	comment
1	Delete User	User deleted	Pass	Working
2	Wrong ID	error	fail	error

3.5 Summery

The focus of the chapter is on software testing for weavora to ensure all features working correctly. It covers functional testing,Non functional testing and also discuss testing strategies,test approaches,pass/fail criteria.The testing phase ensures the software is reliable,secure and user friendly for users.

4.1 Introduction

In this chapter. We'll cover our plan for getting weavora running for users.We'll also plan how we intend to keep it working well and make it better in time. Our whole project is guided by agile mindset building in small steps constantly listening to feedback.It carried out the whole project giving us the ideas from user suggestions also make it easy to ensure the requirements.

4.2 Software Release Life Cycle

To get from a finished code to a kive server we broke the process in a few steps:

1. Building and testing

First, we built the features.Every piece of code for each class goes through testingto make sure it is reliable, works as we expected and met the goals.

2. Going Live

The xampp server bundle host the container on cloud services.We have also set up a work flow withGItHub actions so if there is a new update in code…sytem will be updated automatically.

3.Life after Launch:

Once weavora is live,our focus is to make sure the system stays healthy and useful.It involves some activities ,such as-

- Keeping watch
- Fixes and updates
- Future Improvements

Chapter 5 User Manual

5.1 Introduction

This chapter will provide user manual for weavora.It will guide users step by step through the system. It explains about registration,login,dashboard,adding sales order,adding new orders,adding new materials,managing users. The manuals aim is to make sure the user can navigate the system easily.

5.2 Project Functionalities

5.2.1 Registration

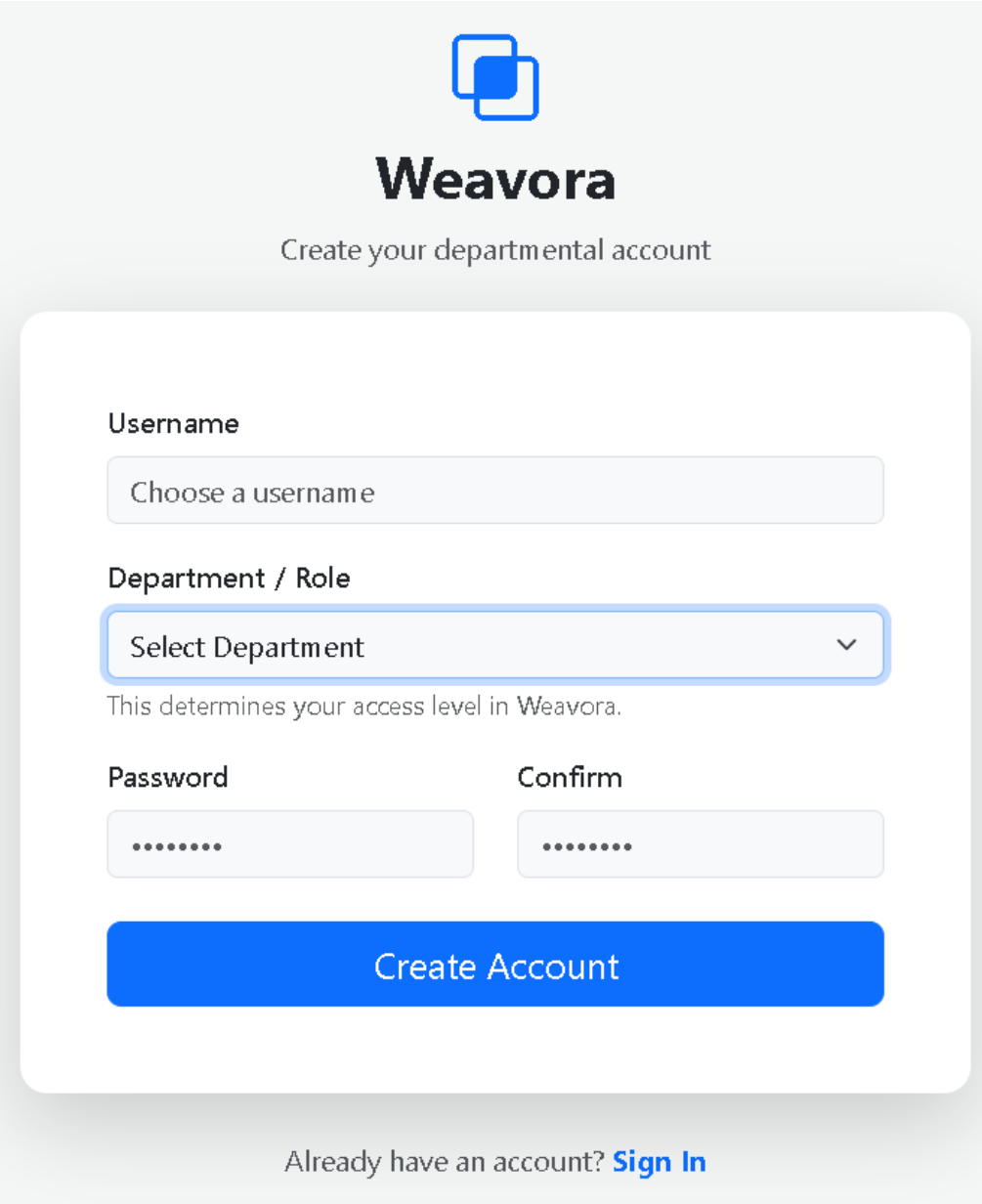


Figure 5.2.1 : Registration

5.2.2 Login

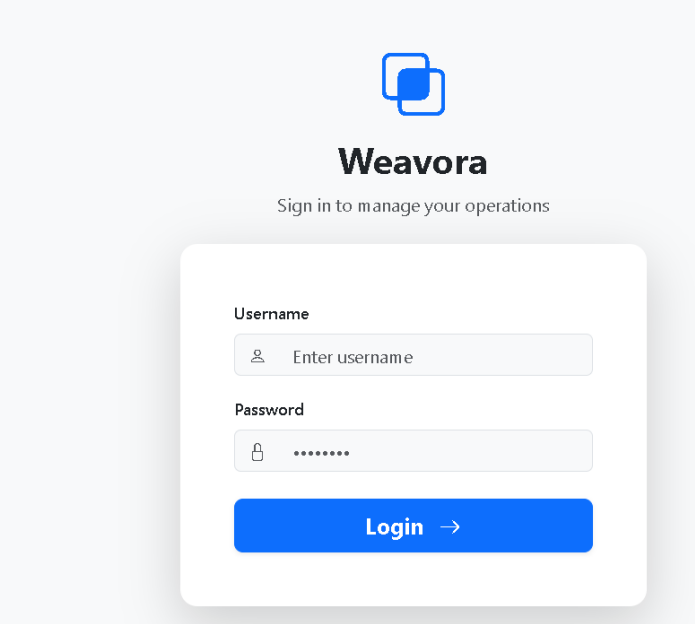


Figure 5.2.2: Login

5.2.3 Dashboard

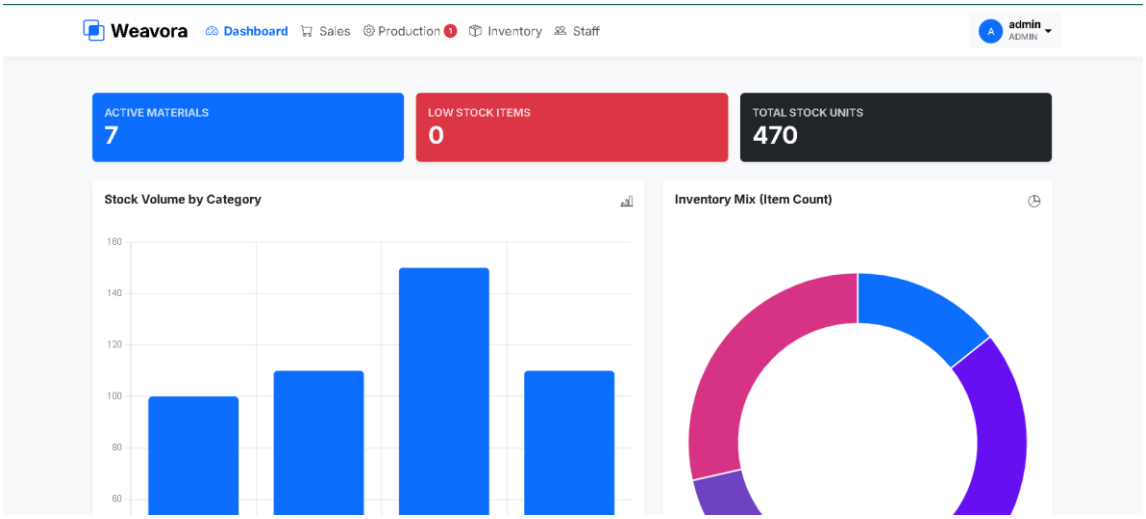


Figure 5.2.3: Dashboard

5.2.4 Sales order

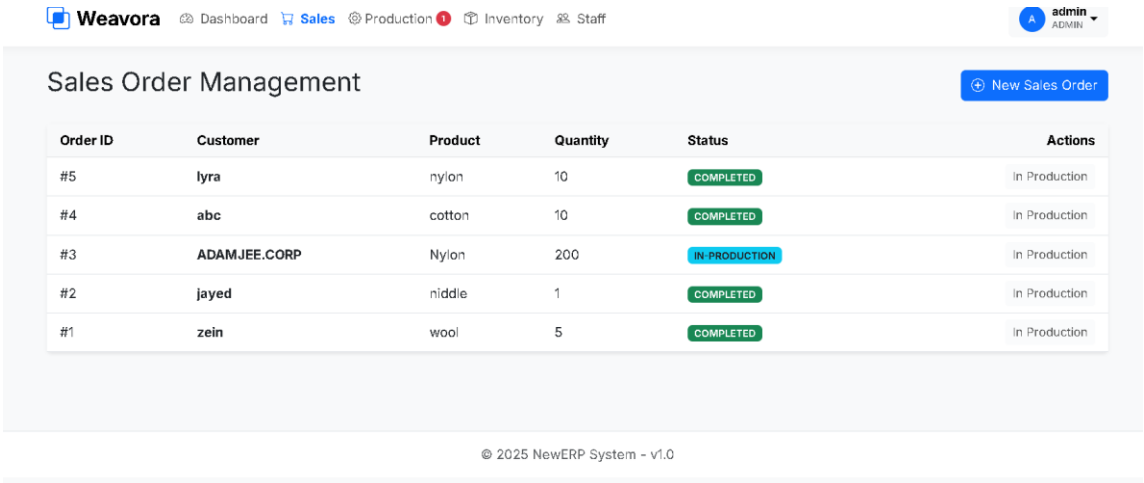


Figure 5.2.4 Sales order

5.2.5 Production

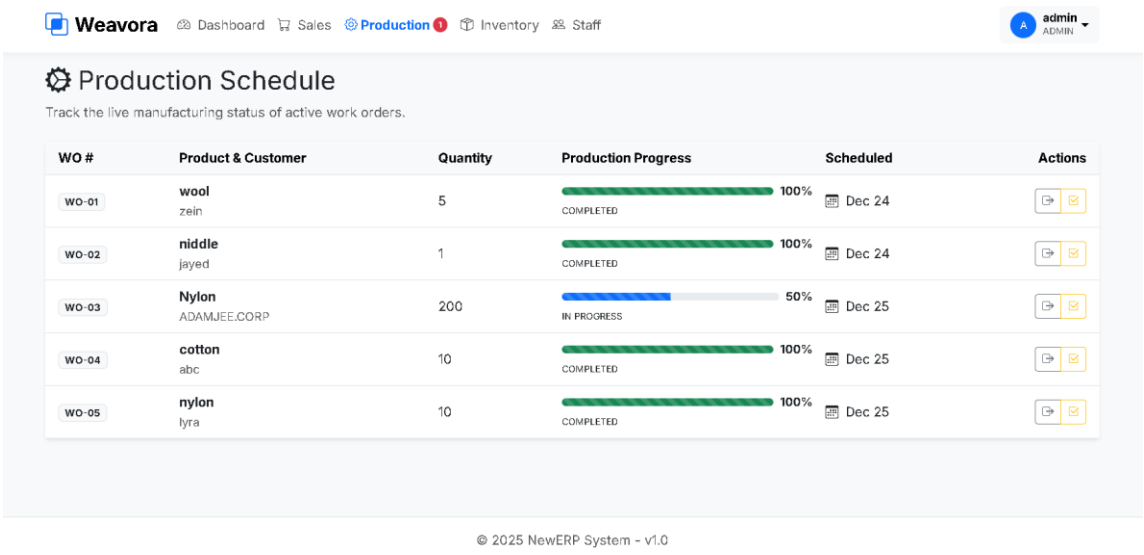


Figure 5.2.5 production

5.2.6 Inventory

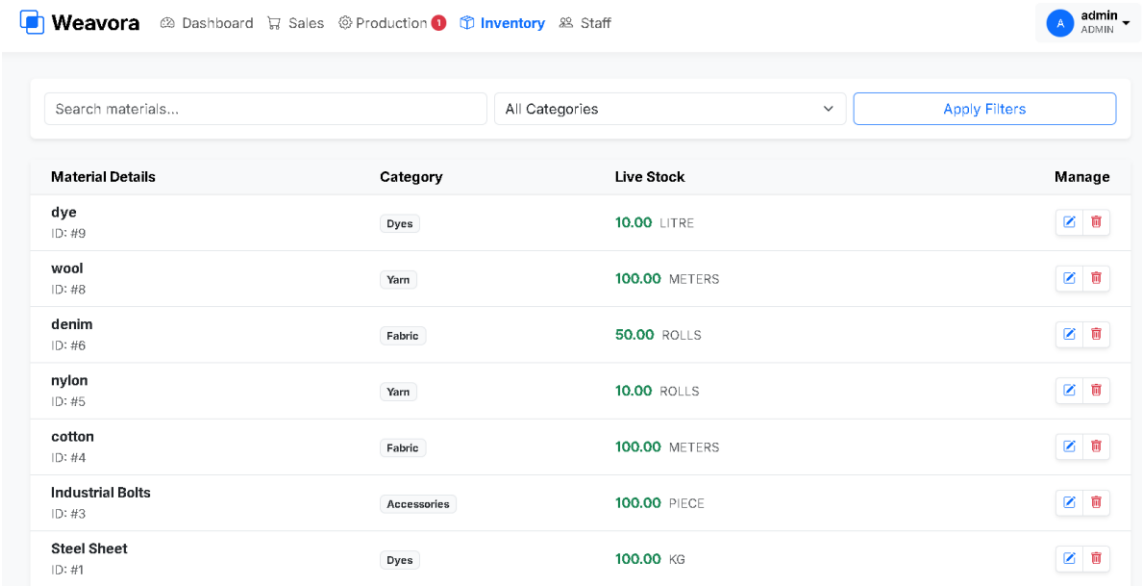


Figure 5.2.6 Inventory

5.2.7 Manage staff

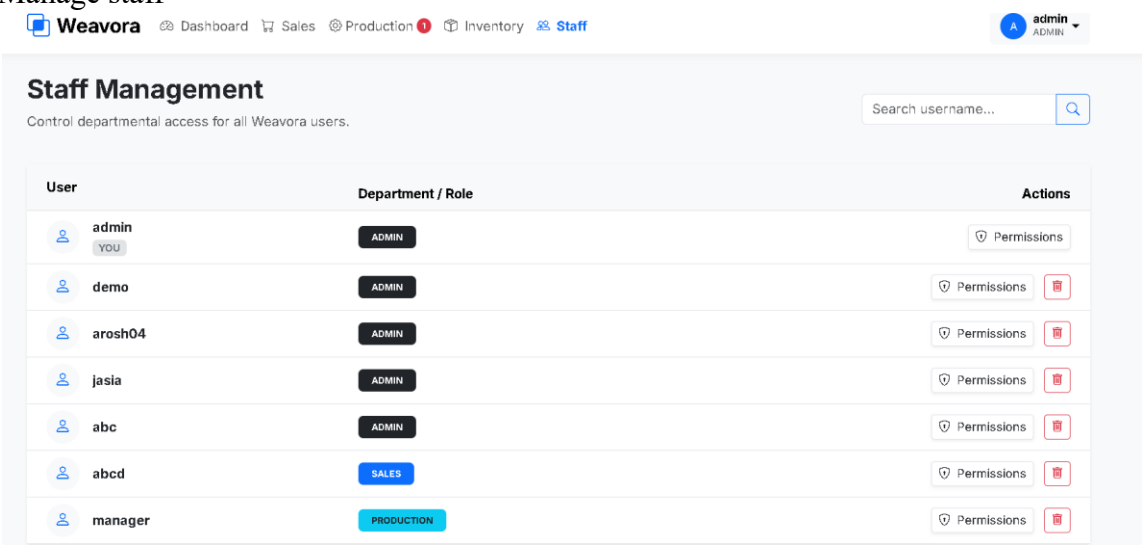


Figure 5.2.7 Manage staff

5.2.8 Update profile

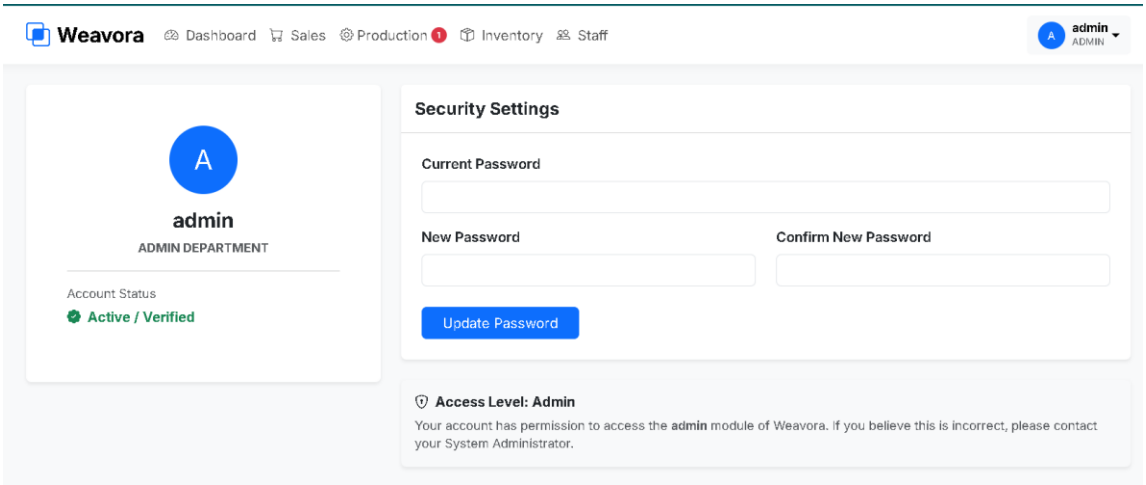


Figure 5.2.8 Update profile

5.2.9 Log out

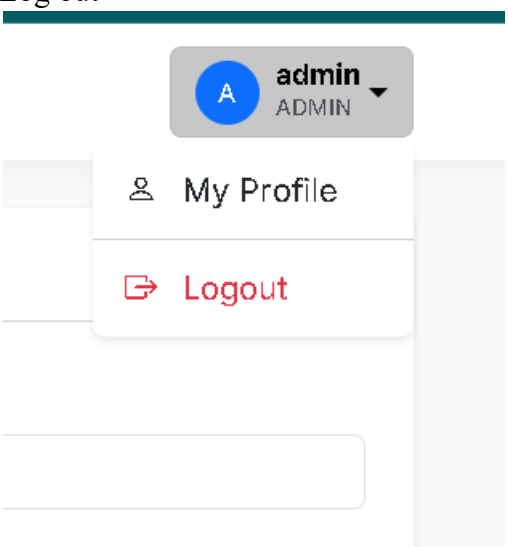


Figure 5.2.9 Logout

5.3 Summary:

This chapter provides a guideline to use the erp system. It shows the key functionalities for users to go navigate throught the system smoothly.The user manual ensures the user can do the task effectively and utilize the system features to its fullest.

Chapter 6: Project summery

6.1 Introduction

The textile industry has a high inventory turnover and a variety of raw materials. Many small to medium textile businesses traditionally rely on manual ledger entries or simple spreadsheets. This approach creates data silos and increases the risk of running out of stock. Weavora was created as a specialized ERP module to solve this problem. It offers a central digital "Control Center" that tracks fabrics, yarns, and dyes in real-time. With its web-based setup using PHP/MySQL, it makes inventory data accessible, visual, and useful, helping production managers make better decisions about purchasing.

6.2 Project Limitation

The project limitations are-

- Supporting only one physical location for the warehouse.
- The system relies on manual data entry
- The security model is binary
- It requires local network and internet connetion

6.3 Future Work

- Implementing QR scan for every stock.
- Use AI to predict the material production speed
- A module for vendors
- Developing an app tp update from mobile phones

6.4 Conclusion

In summery the project was successfully developed.We created and textile based ERP system named Weavora.The system foundation is strong.The final product works as intended amd provides smooth experience for users.

Ultimately, the project is a meaningful system with real world value.It highlights the potential in textile companies by creating a big data warehouse like weavora where every data can be stored.Its user friendly and advance with a solid foundation in ERP system.The system has more potential if improved.

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