Web Centralized Platform for Jiffy Products PVT LTD

Project Report

Sri Lanka Institute of Information Technology

IT2080 Information Technology Project

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Declaration

This project report is our original work, and the content is not plagiarized from any other resource. References for all the content taken from external resources are correctly cited. To the best of our knowledge, this report does not contain any material published or written by third parties, except as acknowledged in the text.

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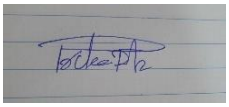
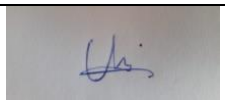
IT21018596	Thilakaratne S.P	
IT21013928	Piyumantha W.U	
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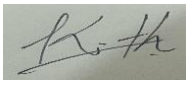
IT21020230	Siriwardana S.M.K.S	

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Abstract

The goal of our project is to design and develop an ERP system that will provide appropriate solutions for the existing problems of Jiffy Products PVT LTD. Among the large number of sectors of the company we have decided to mainly focus on customer, employee, leave, order, finance, inventory, supplier delivery and factory management. Upon doing a thorough requirement analysis and gathering information we realized that most of the work is done manually as well as the challenges and inconveniences faced by the users of the current manual approach. After examining these problems, we decided to develop a system that fills existing gaps by automating the above-mentioned aspects. We have decided to digitalize customer management so that a customer can register and then login to the system and make orders, check order status easily.

Currently the company notifies the order statuses of the customers through emails and as this may lead to problems such as notifications going unnoticed, we have decided to digitalize the order management and giving access to both customer and the supplier. As for the employee management we decided on automating the system for easy management of employee data and leave requests where the company used conventional paper-based methods like using file cabinets to store records of employee information and leave requests.

Then, the finance management which jiffy products currently does manually is to be digitalized and will have functions that facilitates customers to easily do the payments, manage payment methods and view transaction history as well as this will allow the company to do transactions with the suppliers and generate reports and E-bills. Next, the inventory management which also was done manually, is decided to have automated functionalities like easily find the number of available units of each item, manage received or removed stock, and generating inventory report. As for the supplier management function we have provided features to manage supplier details which was paper based and inconvenient. Then the delivery management, which jiffy products PVT LTD did manually provides means to notify the delivery status to the customer as well as the delivery manager and get feedback regarding the delivery. Jiffy PVT LTD has many factories and for their convenience of managing factories, the factory management function has the ability to manage factory details as well as machine details of each factory. We have used the MERN stack for developing our system as it is a powerful tool that delivers simple and efficient results.

Acknowledgement

We would like to express our gratitude and appreciation to our lecturer, Mr. Nalaka Dissanayake and Ms. Kushnara Suriyawansa, our former lecturer, whose sounding advice helped us steer this project in the right direction. Our completion of this project could not have been accomplished without them. We offer our sincere gratitude and appreciation to our instructor Ms. Nalaka Dissanayake for stimulating suggestions and feedback on our progress evaluation.

We would also like to acknowledge with much appreciation the crucial role of the managing director Mr. Ruwan Rajapakshe, the Finance manager Mr.Nishantha Thilakaratne and Mr. Ajith Gunawardena the human resource of JIFFY for allowing us to make this system for their company and their immense help when creating the project.

Last but not least many thanks to the members of MS club of SLIIT for the solid knowledgebase that enabled us to carry out the project with a good understanding at the beginning through the workshop they held.

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Chapter 1 - Introduction

Background

"Jiffy Growing Solutions" provides sustainable plant growing solutions to innovative and top-tier horticultural businesses so they can feed and beautify the planet. Jiffy Products include substrates, plugs, pellets, and coir products. They assist you in enhancing product quality, efficiency, and sustainability by paying close attention to what you have to say and sharing their knowledge. The primary objective is to reduce waste and maximize the yield, thus making it an eco-friendly company.

Problems

- The current approach to notify order statuses is done through emails which may lead to major inconveniences. Such notifications may go unnoticed, leading to orders not being processed.

- Manual handling of information poses several challenges.
  - This is evident in procedures such as order management and leaves management (where an employee is required to fill in a form that may take several weeks or months to be approved.)
  - Paperwork handling some of these processes can be prone to human errors; papers may end up in the wrong hands or be misplaced
  - It is highly time-consuming and expensive to create reports
  - Inadequate user experience
  - Maintaining backups for a longer period is a bit difficult (storing and safety)
  - Data retrieving and tracking from the related inventory is very difficult

- Employees cannot access and manage their personal information directly without going via HR departments or managers because many current systems do not support employee self-service.

- Another difficulty is that the company keeps all employee information in its corporate headquarters, making it challenging to retrieve employee data from remote locations quickly.

Motivation

- The company's existing manual system will be replaced by a centralized management system that allows for faster and more efficient operations. Anyone with elementary computer knowledge can easily handle it because it provides a user-friendly environment. (The new system is to control the following information: product information, sale information, client information, and factory information)
- Place orders via the computerized system.
- Calculation and generating reports make simpler with the system.
- The new system enables customers and employees to interact with each other easily.
- Using the payment portal in the system is much easier than the manual payment methods.
- With a computerized system, paperwork is drastically reduced, data retrieval becomes easy, and duplication of work is avoided.
  (Helps maintain the details of employees, suppliers, customers, raw materials products, and factories etc., in a computerized manner.)

Aim

To centralize the company activities to improve its efficiency and communication via a web centralized platform.

Objectives

This project aims to offer a thorough method for managing business operations. This will be accomplished by creating and putting into use a web-based, centralized platform that will result in a significant paradigm shift in the manner that management duties are carried out.

Everything has been computerized in this age of advancing technologies. The Human workforce has grown due to the abundance of job options. Consequently, a system that can manage the data from such a massive volume of information is required. Due to its user-friendliness, this project makes the process of managing records simpler.

- Identify the user requirements through observations and interviews/meetings
- Identify potential drawbacks of the existing system and how the new system provides solutions to hem
- Design wireframes and present them to the client to get the feedback and make any changes if necessary
- Acquire necessary information from the client regarding employees, suppliers etc.

- Draw ER diagrams to identify the high-level/conceptual model for the database and then develop the relational schema for it.
- Develop the database for the system.
- Develop individual components and get client's feedback time to time to perform any changes if needed. At the end perform unit testing to ensure the components work as expected. Once the components are integrated, integration testing could be performed to ensure that the whole system functions as expected.
- Deliver the fully functioning product to the client

Literature Review

Existing Solution

"Microsoft Dynamics AX" is a comprehensive enterprise resource planning (ERP) software suite for finance and operations. It assists global enterprises in organizing, automating, and optimizing their processes whether on-premises, in the cloud, or via hybrid deployment. It is a component of Microsoft Dynamics, a collection of intelligent business applications.

[1]

It involves several advantages and disadvantages.

- *Advantages*
  - Microsoft Dynamics AX, as an integrated ERP solution, propels your organization forward by simplifying complex silo data. This allows a user to obtain a detailed analysis using KPIs and reporting tools. With familiar user interfaces, decision-making is quick and easy.
  - Since the subscription plans are monthly/annually, the initial price to be paid is less.

- *Disadvantages*
  - Microsoft Dynamics AX provides different plans/subscriptions to a company intending to buy it. These plans could be monthly/annual. Therefore, when considering the cost factor, the company has to pay on a long-term basis for lifetime usage.
  - Since this is generic software, it provides a plethora of sophisticated functions/features, where some functions/features may not be essential to an organization using it. Thus, there can be potential performance issues.

- It is mainly a standalone desktop application with limited web and mobile-add-on capabilities. So, there is little cross-platform functionality.

Due to the above-mentioned drawbacks, a custom-designed web portal would be beneficial. Since it is targeted solely at the client, there would be minimum performance issues. Although the initial cost of purchasing the web portal is expensive, there are no monthly payments for renewal, except for minor upgrades. Moreover, since it is web-based, the portal becomes cross-platform, where users can access it even using a smartphone. This improves the reliability as well.

In conclusion, the web portal provides self-service for employees, supervisors, and other users. The organization will be able to delegate to individual users the task of viewing and modifying data, and this will radically alter how users, including employees, get information and interact with it.

Methodology

Structure of the report

GitHub Repository

https://github.com/SLIITITP/y2_s2_wd_it_01-itp2022_s2_b01_g04.git

Chapter 2 - Requirements

Stakeholder Analysis

Customers who interact with the company, company staff and suppliers are the main stake holders of the system. People in charge of system's main functions can use the system and system admins can lead the system.

Requirement Analysis

Order Management

- As a customer I want to know the order acceptance so that I can keep hopes about the product
- As a customer I want to see the past order details so that I can use them in a case
- As a customer I want to know the order status so that I can get order updates
- As the person in charge of order function I want to update the order status so customers can see the order status
- As a manager I want a monthly order report so I can take future decision

Customer Management

- As a customer, I want to register as a new customer so that I can place orders
- As a customer, I need to access my account so that I can customize account details
- As a customer, I should be able to give feedback for the overall service so that I can share my experience and opinions about the service
- As a customer, I should receive notifications related to my account so that I can login to account when only it is necessary 4
- As a site administrator/selected employee, I am able to generate customer account usage reports so that I take actions against customer accounts by looking at generated information

Finance Management

- As a customer I want to see my E-bill so that I can get an idea about my payment amount.
- As a customer I want to confirm my payment so that I can manage my money
- As an Accountant I want to pay the suppliers so that I can manage company's financial account details.
- As a finance manager I want to see a daily transaction report so that I can take decisions easily.

Inventory Management

- As an inventory associate, I want to search an item by its name/item code so that I can find the desired item easily.
- As an inventory associate, I want to view the number of available units and re-order the level of raw materials so that I can avoid a stock-out/over-stock situation.
- As an inventory associate, I want to generate a list of items for any re-ordering of raw materials so that I can send it to the relevant supplier.
- As the inventory manager, I want to obtain a detailed report of the inventory by the end of the month so that I can determine any actions to be taken if necessary.

Supplier Management

- As a supplier manager, I want to add and manage suppliers in the system so I can keep the supplier information up to date.
- As a supplier manager, I want to search for a specific supplier by name or by raw material so I can find supplier details faster.
- As a supplier manager, I want to get reports on Supplier Active/ Inactive status and Suppliers filtered by raw material they supply.
- As an accountant, I want to get suppliers bank details so I can make payments to suppliers

Employee Management

- As a HR manager I want to add and modify employee details so that I can manage employee data effectively.
- As a HR manager I want to record the attendance of employees so that the salaries are computed accordingly.
- As a HR manager I want to approve/decline leave requests so that I can manage shifts effectively and check leave days accrued.
- As a HR manager I want to access performance reviews so that I can evaluate and give feedback to employees.

Delivery Management

- As a customer I want to see the order status so that I can check the delivery date.
- As a customer I want to see my delivery History so that I can check my past orders.
- As a delivery manager I want to see the order status of any product so that I can check whether orders are delivered.
- As a customer I want to give feedback about delivery so that I can rate the service.

Factory Management

- As a senior factory manager, I want to view and manage factory details so that I can get details of all factories in one place.
- As a factory manager I want to generate reports so that I can get an idea about the production process done within the factory.
- As a senior factory manager, I want to be notified about statistics so that I can compare all the factories related to the company.

Requirement gathering related to each function

Order Management

There are two main stakeholders that use the order management function.

1. As customers, can place orders for the products
2. As in charge of order management function, can control orders from the point of placing the order to delivering the order to the customer successfully.

The requirements gathering for this function mainly done with the head of the order management, people who are work with orders and customers who's willing to place orders from the company. We identified their requirements from this function as, Customers should be able to place orders with the products they want and with selecting the quantity they need. They can use the shopping cart feature too. People in charge of the function should be able to accept that orders, update them and complete the orders successfully. Once the changes are made to the order, customers should be notified via an Email. Also, they should be able to refer the auto generated order reports if they want.

Customer Management

The customer management is handled by the HR Department. There are mainly two stakeholders who use this section of the system.

- HR Manager
- Site Administrator

The requirements regarding these functions were mainly gathered through interviews with respective stakeholders, HR Manager, and the Managing Director. Through interviews and conversations, the benefits and drawbacks of their current systems were acquired. The primary topics of discussion during interviews were what participants expected from the new system, what aspects they were comfortable and uncomfortable, etc.

Customer details can be added by both customer and employee who has access to the customer management in the system. Customer can provide details when creating user account and through the account page. If customer has no experience interacting with the web, customer can get support from one of the employees who work under HR management for creating and manage their accounts. Once account is created

successfully, customer receives an email including user credentials. After that customer can easily access to account using account credentials and manage customer account through the website. Managing account details can be done via customer account page. Customer can view the placed orders and the site provides full capability to manage payment method via account page.

Customers can provide feedbacks whatever they feel about the company and their services through the account page. The provided feedbacks are stored in the database. By default, these feedbacks are private and only visible to the selected employees. They can analyze and make these feedbacks public and then new visitors come to the website they can view these feedbacks which were made public by employees. These public feedbacks help to new visitors to get an idea how the company provides services to its customers.

Employees can easily manage customers via provided admin dashboard. When company needs to get an idea about how customers use their websites over time, it is easy to generate customer account usage report as chart in details. Also selected employees can analyze accounts older than two years which were never made a single order and remove those account from the database.

Finance Management

All the transactions between the company, customers and company, and suppliers are processed through the financial management function. Once the user clicks on the buy now button in the product overview page or checkout button in the cart, the system calculates the total amount to be paid and generates the E-bill. Customers can add their bank details and pay the company via the system. After every successful payment system will make an order, notify the customers that their payment has been successfully received via email, and decrease the available stocks in the inventory management. Also, customers can manage the existing payment details/method by either updating details or removing the records.

The company has to pay the suppliers using this system when buying raw materials from them. So the financial manager can add payment details within the receipt to the system. After adding the payment to the system, System notifies suppliers via email and update the order status as paid. Using those entered transaction details system will calculate and generate the reports for the financial manager. And system calculates every income and expense and generates graphs. Using those reports and graphs, the financial manager can easily get decisions and predict ideas. This is how financial management works.

Inventory Management

The main stakeholders interested in this section are the Inventory Manager and employees who handle the inventory.

Requirements were mainly gathered via online meetings with the respective stakeholders. Moreover, certain discussions were held regarding their expectations from the system and any features that should be kept the same.

The Inventory mainly consists of 2 parts namely, products and raw materials. All the details to be inserted/updated are mainly done via forms for both products and raw materials. A search bar allows the user to easily search for a product/raw material by typing the respective name of the item. For products, the user can upload an image of that particular product. Whilst this is optional, the user can update the image any time. Uploaded images are stored in a local folder via file handling and the original file name is stored in the database.

Both products/raw materials could be deleted if a particular product is no longer being produced or if a particular raw material is no longer needed.

In addition, the Inventory Dashboard displays the total no of product categories, total no.of suppliers whom the company is currently connected with and the all inventory value (total value of all the existing products and raw materials in the inventory). This value is important since the company is concerned about minimizing it as much as possible. Furthermore, the dashboard also comprises 2 clustered bar charts showing the quantity in stock and reorder level for both products/raw materials so that the user could easily take any decision whether to reorder or not.

Moreover, if any product/raw material needs to be reordered, the desired item name and quantity could be filled via a form and a request could be made to the factory. Then this request would be shown as pending in the "Pending Orders" section. Once the status changes to "completed"/"paid" as per updated by any employee in charge of Factory Management/Financial Management respectively, the inventory user can then update the stock by simply clicking a button.

The "Pending Orders" section also displays the customer orders that are initially in the "pending" state and needs to be changed to "packaged" state so that any employee in charge of "Delivery Management" could do the needful.

Additionally, the inventory user could also obtain detailed reports regarding the "Inventory Stock Cost" and the "Inventory Item List" from the "Reports" section.

Supplier Management

The Supplier Management Function is responsible for managing the relationships with suppliers. The main Stakeholders of this function are the Supplier Manager, Inventory Manager, and Accountants. The requirement gathering was mainly done via online meetings with the stakeholders mentioned above.

Supplier's data can be updated and inserted into the database by using forms and these processes are done by employees with relevant access privileges. If there is no business relationship between the company and the supplier, the supplier status can be updated to "inactive". A summary of existing supplier details

is displayed in a table on the "suppliers" page. To get more details about a supplier a user can click on the "More Details" icon on the relevant row which will direct to the "Supplier details page". Users can update supplier details by selecting the "Update" icon on the relevant supplier's row.

Users can search suppliers by the raw material that they provide or by their name. Also, the users can get reports on "Suppliers by Product" and "Supplier Status".

In addition, users can provide, view, and delete feedback about suppliers on the "Supplier Details" page

Employee Management

The employee management is handled by the HR Department. There are mainly two stakeholders who use this section of the system, namely HR manager and the administrator.

Interviews with the appropriate stakeholders were the major method used to collect the requirements for these functions. Through interviews and conversations, the benefits and drawbacks of their current systems were acquired. The primary topics of discussion during interviews were what participants expected from the new system, what aspects they were comfortable and unhappy with.

Employee details are added using a form. The role of the employee must be added along with the other details. The employee role is important as different employee roles have different authorizations and it can be used to limit access permissions. All employees' details will be displayed in a list so that the HR manager can easily view each of the records individually and update with the use of buttons available in the page. The search function will allow relevant users to search employees based on the role or using the names making it more convenient to the user. The report function enables the user to get a report of all employees or the searched list of employees.

The leave management function allows an employee with a user role to apply for a leave by filling out a form entering the type of leave along with the time duration in means of days. The leaves can be searched by the type and the description as well. A report of the leaves can be also generated.

Factory Management

Handling factories and machines within the company's factory is the main task done by this function.

Employees of the company can create records for new factories using forms. And they can add machines to these factories. After adding data, employees can retrieve and view any information they want; also, employees can maintain (update and delete) any record related to the factory and machines.

Since this is a factory, there are lots of machines operated. Therefore, listing all the machines in one place may not be practical. As a solution, employees will be able to filter out the machines by

their respective factory IDs. Moreover, machines can be searched by using the product created using the machine.

Additionally, there is a form to insert data regarding the productions done by the machines. The employees enter production data by day by day. Not only that but to create products, raw materials must be used. After consuming raw materials, that data was also inserted into a database using a form. Meanwhile, that consumed amount is automatically deducted from the inventory collection in the database. And these data will be used to generate charts and to create reports. These created charts and reports are useful in taking future decisions in the company.

When products in the inventory get lower, the inventory manager requests products from factories. That placed orders are displayed under the factory management function. Then employees in factories will complete that order and change the order status to "Completed" from "Pending."

This is how the factory management system works.

Delivery Management

In order to build an effective Delivery Management function that fulfills the needs and requirements of the stakeholders' interviews were held. Through the interviews detailed requirements about what the system must provide have been identified. According to that I have identified that there are two stakeholder, client and employee and must implement the delivery management for both client side and employee side.

From the client side the client should be able to see, identify, and understand where their package is throughout the delivery process and mark the delivery process as completed when the product(s) is/are delivered to the client. The status of the delivering item will be updated in real time as the status of an order or package changes. The existing system does not have feature to get customer feedback after the delivery, so I decided to add a form to get the client feedback along with a rating of the company's service.

The delivery manager wanted to easily manage the delivery process, so I decided to add status wise features. These features display the packaged, completed and delivering items. The delivery manager will be able to set the status of the packaged item to delivering and the completed items will be displayed along with the feedback provided by the client. There is an overview of the delivering and completed items as well and a pie chart of feedback ratings which will help the delivery manager to get an understanding of the client satisfaction. He will also be able to get a customer feedback report.

Chapter 3 – Design and Development

Technology

MERN Stack for development

- M – MongoDB

MongoDB stores data in flexible, JSON-like documents, which means that fields can differ between documents, and the data structure can change over time. The document model corresponds to the objects in your application code, making it simple to work with data. Ad hoc queries, indexing, and real-time aggregation are all powerful methods for accessing and analyzing data. MongoDB is fundamentally a distributed database, so high availability, horizontal scaling, and geographic distribution are built-in and simple to use.

- E – Express

Express is a Node.js web application framework that is versatile and lightweight and provides a full range of functionality for both web and mobile applications.

API - Creating a robust API is quick and easy with a plethora of HTTP utility methods and middleware at your disposal.

Performance - Express adds a thin layer of basic web application features without interfering with Node.js features.

- R – ReactJs

React is a JavaScript library used to create user interfaces.

Declarative - The development of interactive user interfaces is made easier with React. Create straightforward views for each stage of your application, and when your data changes, React will only update and render those components that are absolutely essential. Declarative views improve the predictability, comprehension, and debuggability of your code.

Component-Based - Create encapsulated components that manage their own state, then combine them to create complex user interfaces. Because component logic is written in JavaScript rather than templates, you can pass rich data through your app while keeping the state out of the DOM.

Learn once, write anywhere - Because we don't make assumptions about the rest of your technology stack, you can create new React features without rewriting existing code. React can also be used to render on the server with Node and power mobile apps with React Native.

- N – NodeJs

Node.js is an open-source server environment that is free to use. It runs on a variety of platforms (including Windows, Linux, Unix, and Mac OS X) and employs JavaScript on the server. Node.js skips the waiting and immediately moves on to the next request. Node.js is a single-threaded, non-blocking, asynchronous programming language that is extremely memory efficient.[5]

NodeJs is capable of doing the following,

- Generate the dynamic page content
- Can create, open, read, write, delete, and close files on the server
- Can collect form data
- Can add, delete, and modify data in your database

Tools

- *Figma for wireframing*

Figma distinguishes itself as a powerful cloud-based alternative to tools such as Sketch and Adobe XD. The best part is that it doesn't limit free users, offering a suite of features that work well whether you're a solo designer or part of a larger team. This is an excellent choice if the design team needs a single, simple tool for the entire design process. To brainstorm and map user flows, FigJam could be used, an online whiteboard that works alongside Figma. Wireframing/Prototyping process could then be started without exporting your ideas to another design app.

- *Visual Studio Code as a code editor*

Visual Studio Code is open-source, cross-platform, and free. This means that it is compatible with Windows, Linux, and macOS. unlike many other code editors, Visual Studio Code includes an in-built debugger, which makes the development process less "clicky," and it maintains a single view that includes both code and the debugger.

These factors make it a perfect alternative to editors like *Sublime Text* and *Atom.*

- *Jira as a project management tool*

Jira is a software application used for project management and issue tracking.

We considered using Jira as a project management tool because Jira is widely used in the industry nowadays. When comparing Jira and Trello(another popular tool), Jira provides

kanban, scrum, and sprint boards, whereas Trello only provides kanban boards. Therefore, Jira is a better project management tool than Trello for teams that use agile methodologies.

- *Git as a version control system*

Git is a distributed version control system that is free and open source and made to manage projects of all sizes quickly and effectively. Git is easy to use, has a small footprint, and performs quickly. It performs better than SCM solutions such as Subversion, CVS, Perforce, and ClearCase thanks to characteristics like affordable local branching, practical staging zones, and numerous processes

Diagrams of Components

Order Management

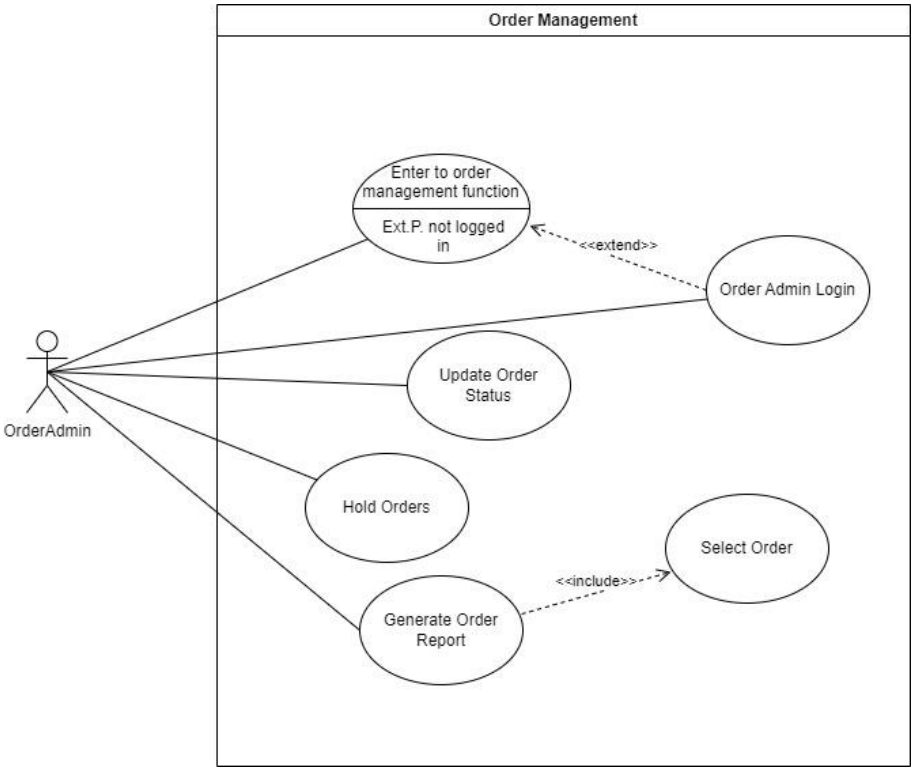


Figure 1 Order Management Use Case

Customer Management

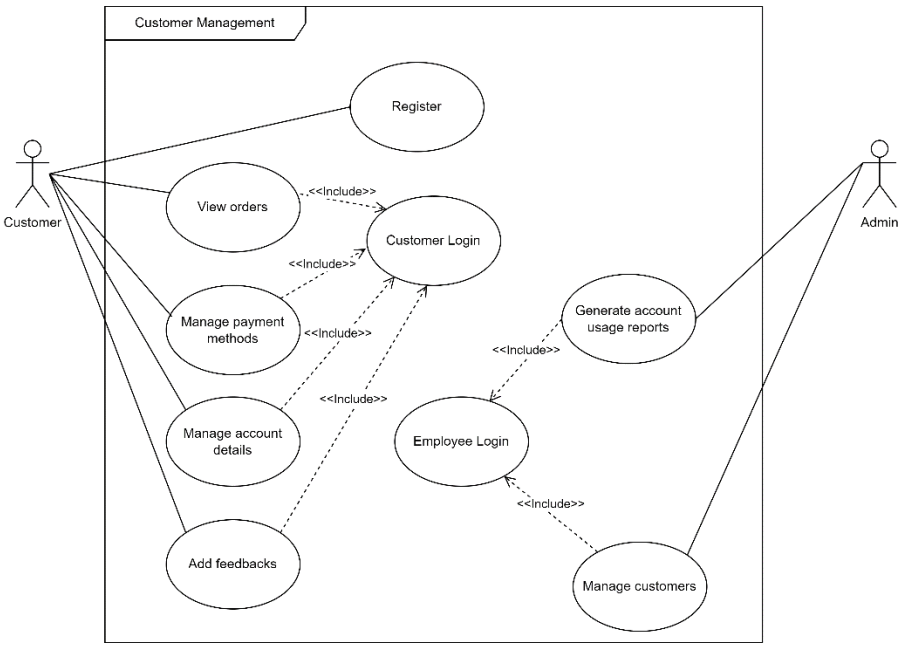


Figure 2 Customer Management Use Case

Factory Management

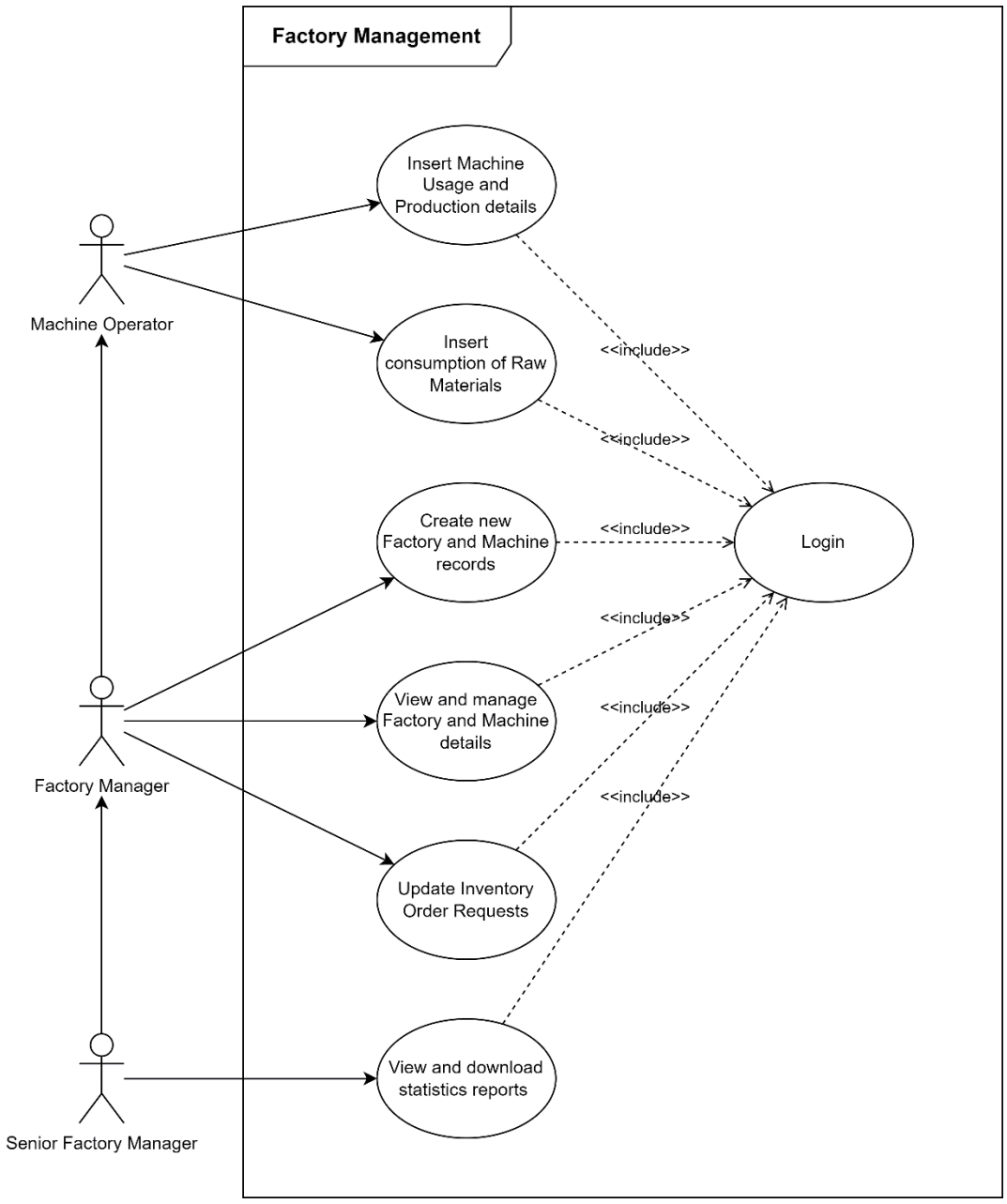


Figure 3 Factory Management Use Case

Finance Management

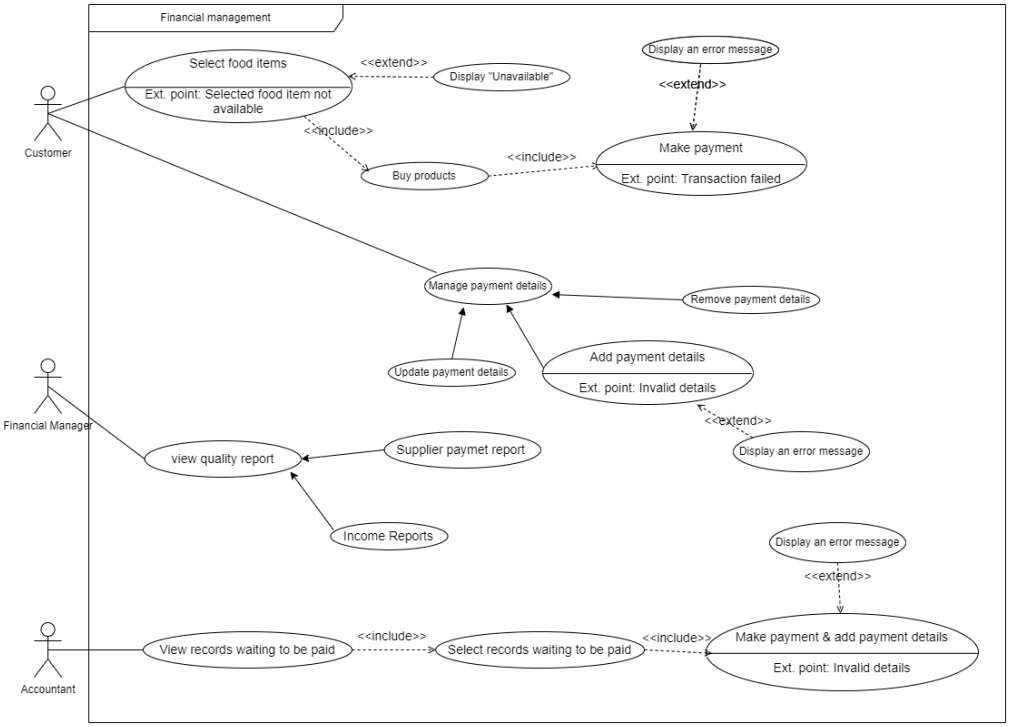


Figure 4 Finance Management Use Case

Employee Management

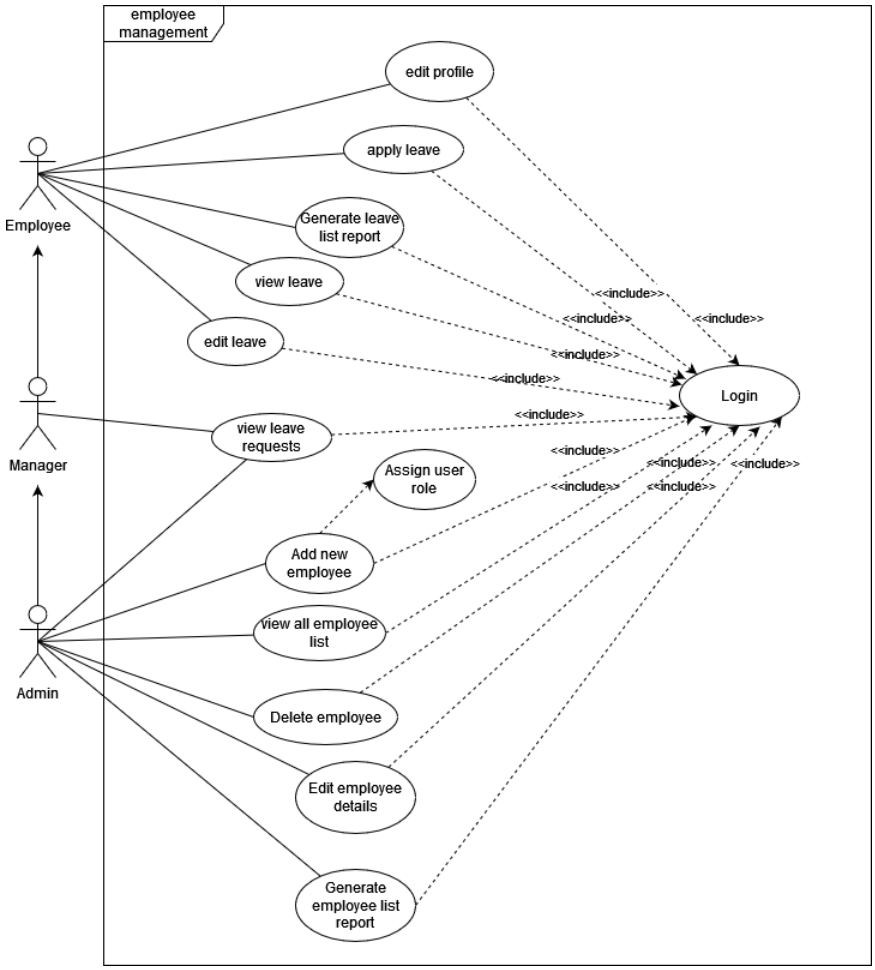


Figure 5 Employee Management Use Case

Delivery Management

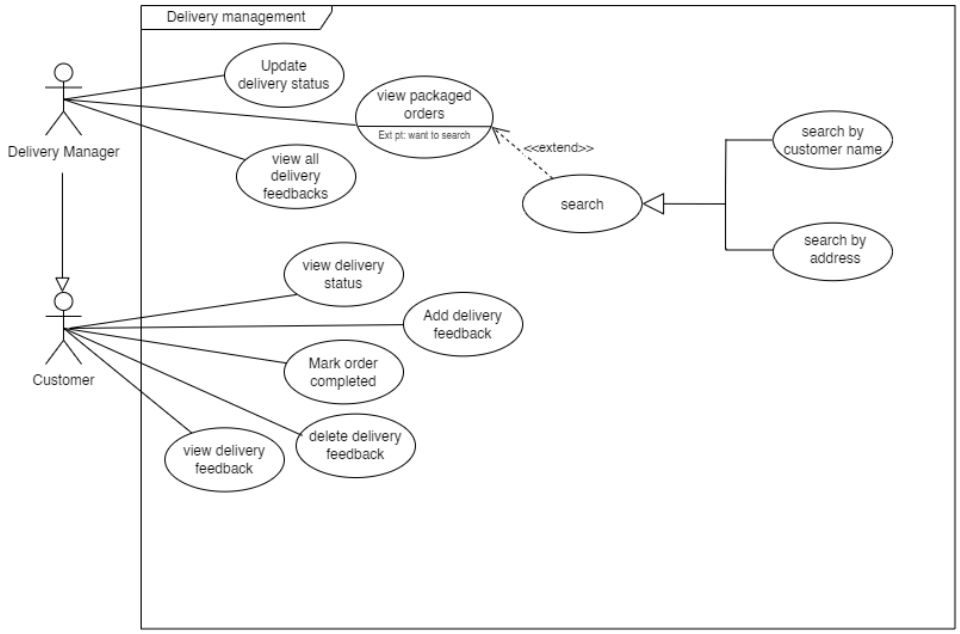


Figure 6 Delivery Management Use Case

Inventory Management

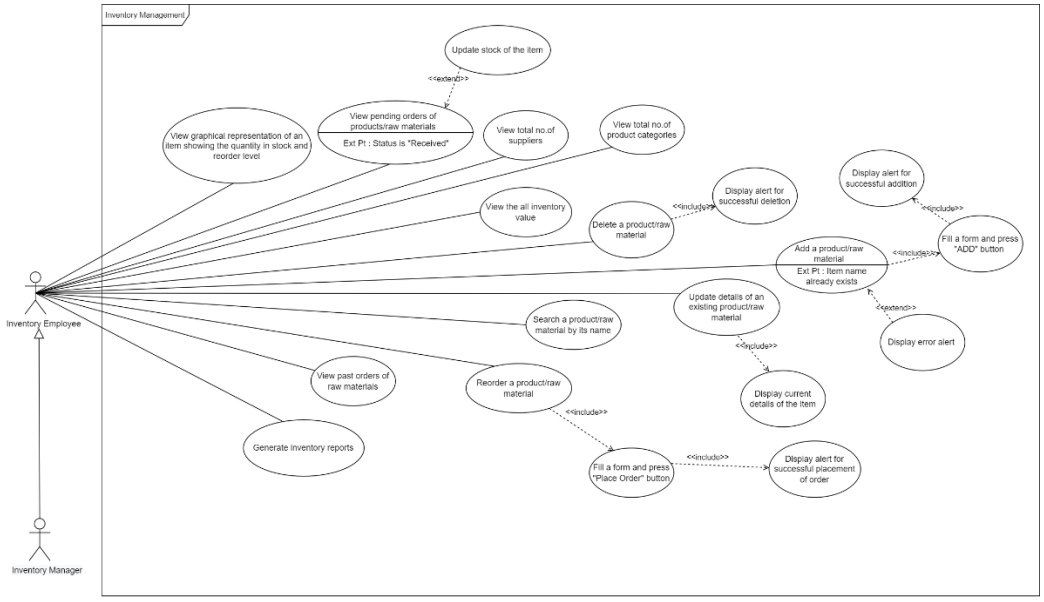


Figure 7 Inventory Management Use Case

Supplier Management

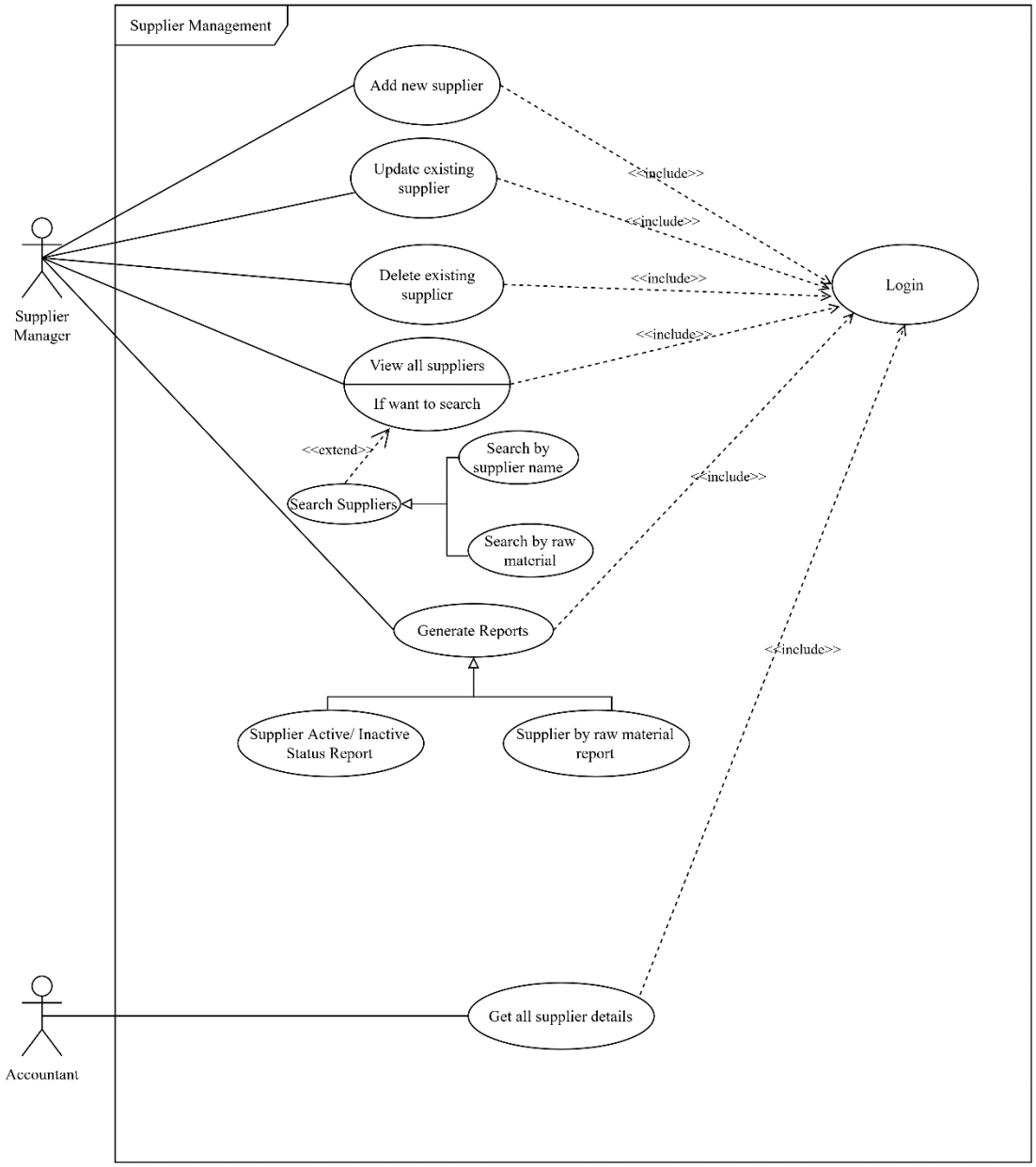


Figure 8 Supplier Management Use Case

Workflows

Order Management

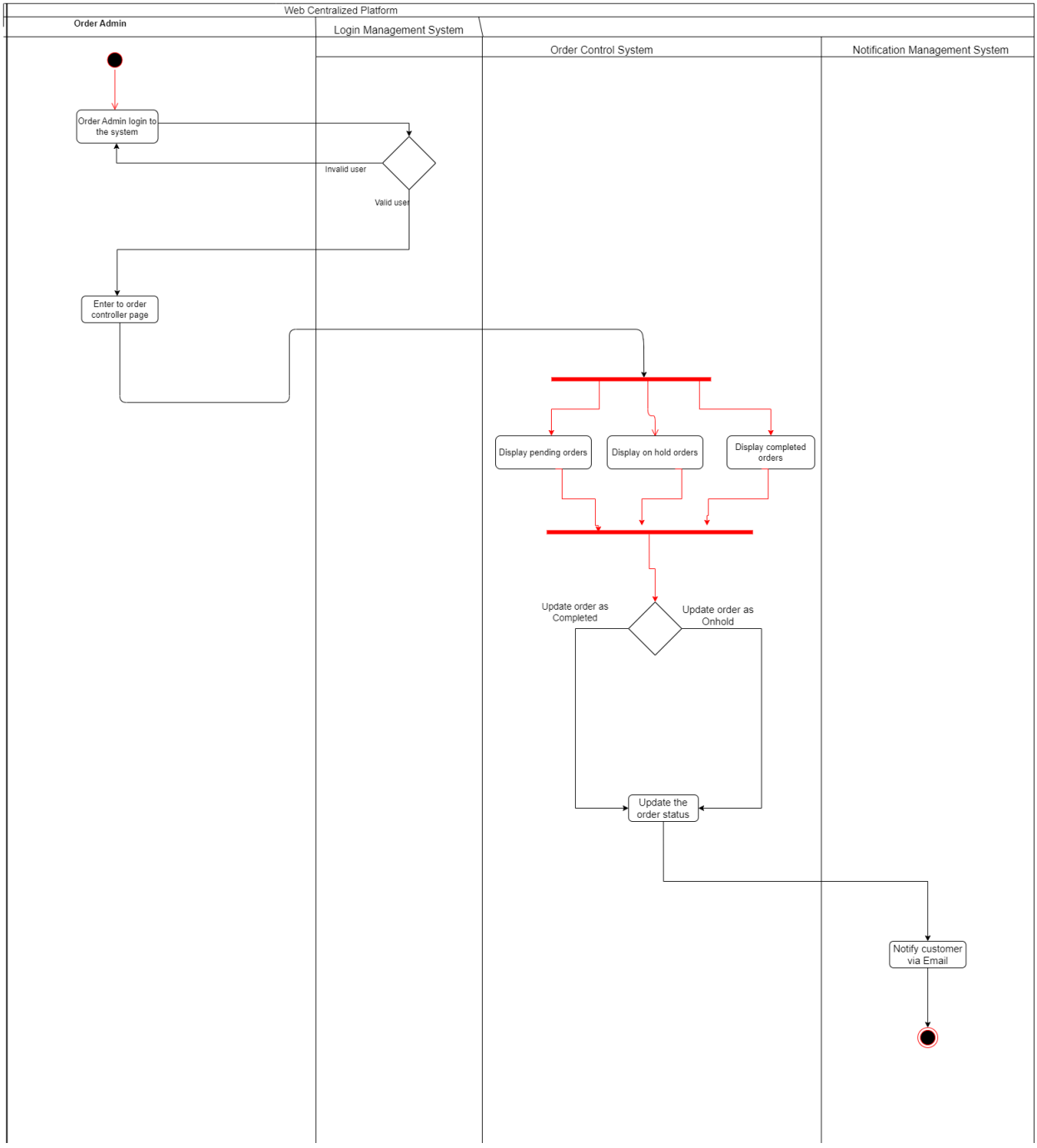


Figure 9 Order Management Sequence Diagram

Factory Management

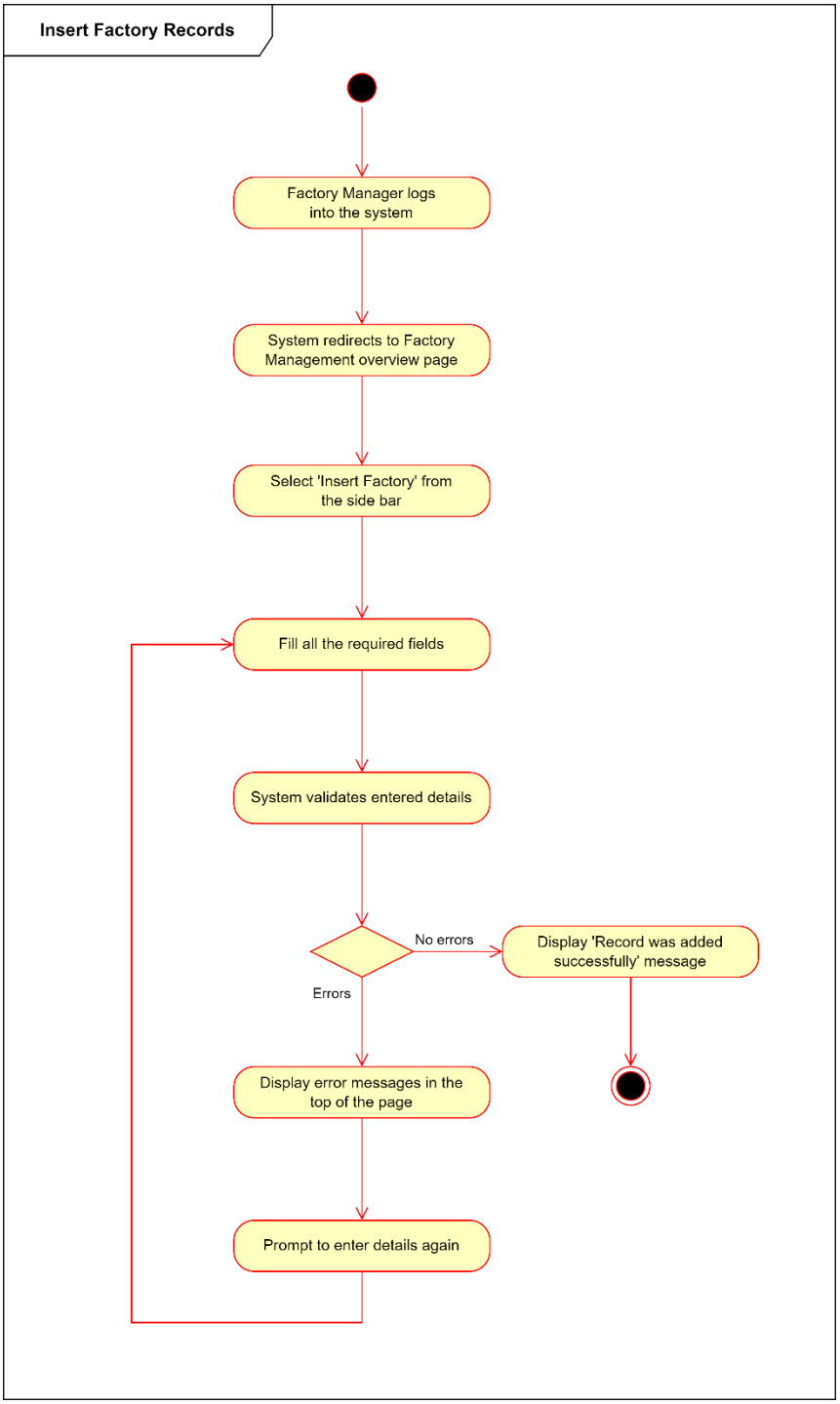


Figure 10 Factory Management (Activity Diagram - Insert Factory)

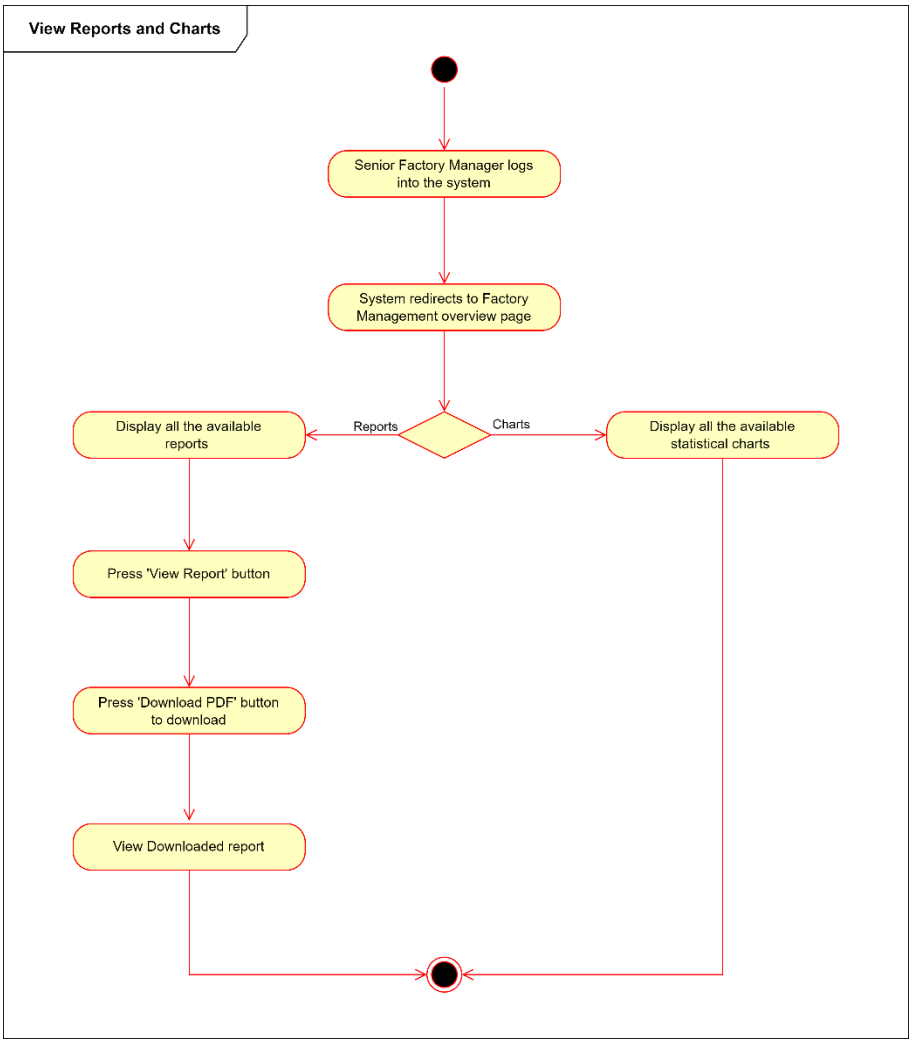


Figure 11 Factory Management (Activity Diagram - View reports)

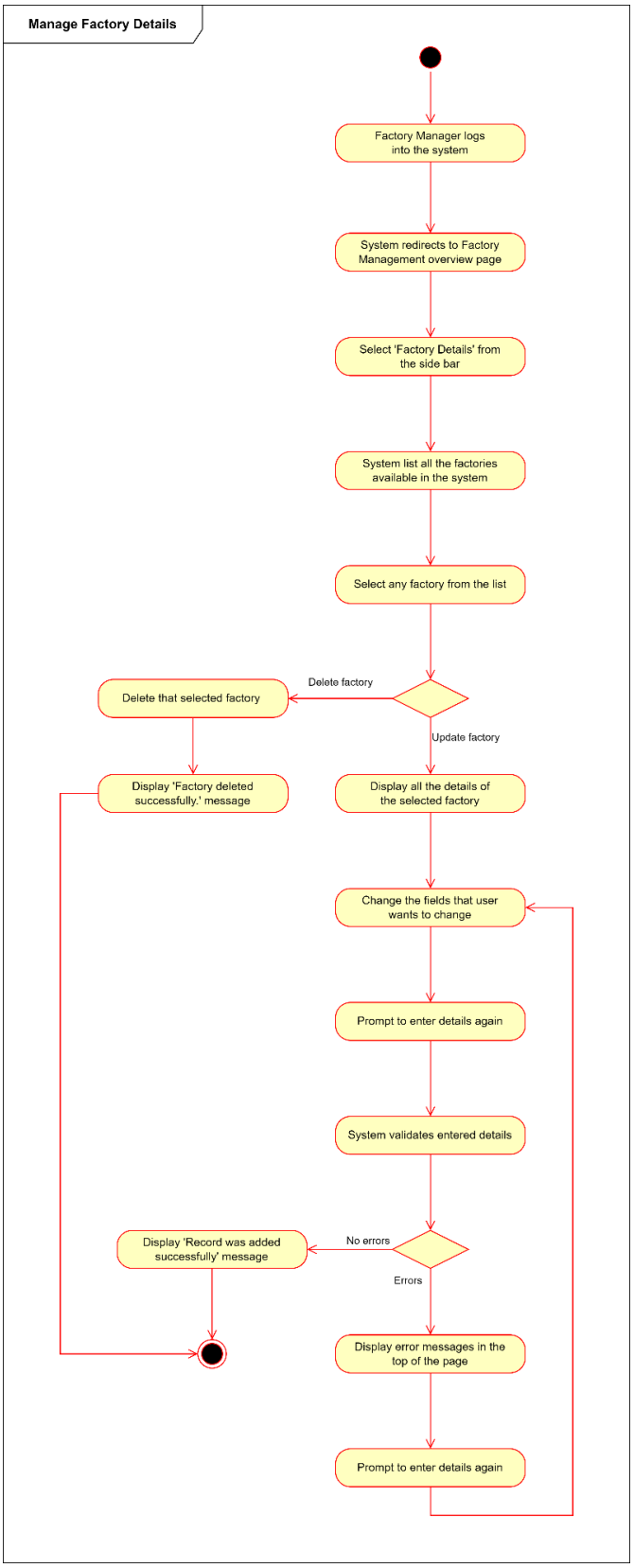


Figure 12 Factory Management (Activity diagram - Manage Factory)

Customer Management

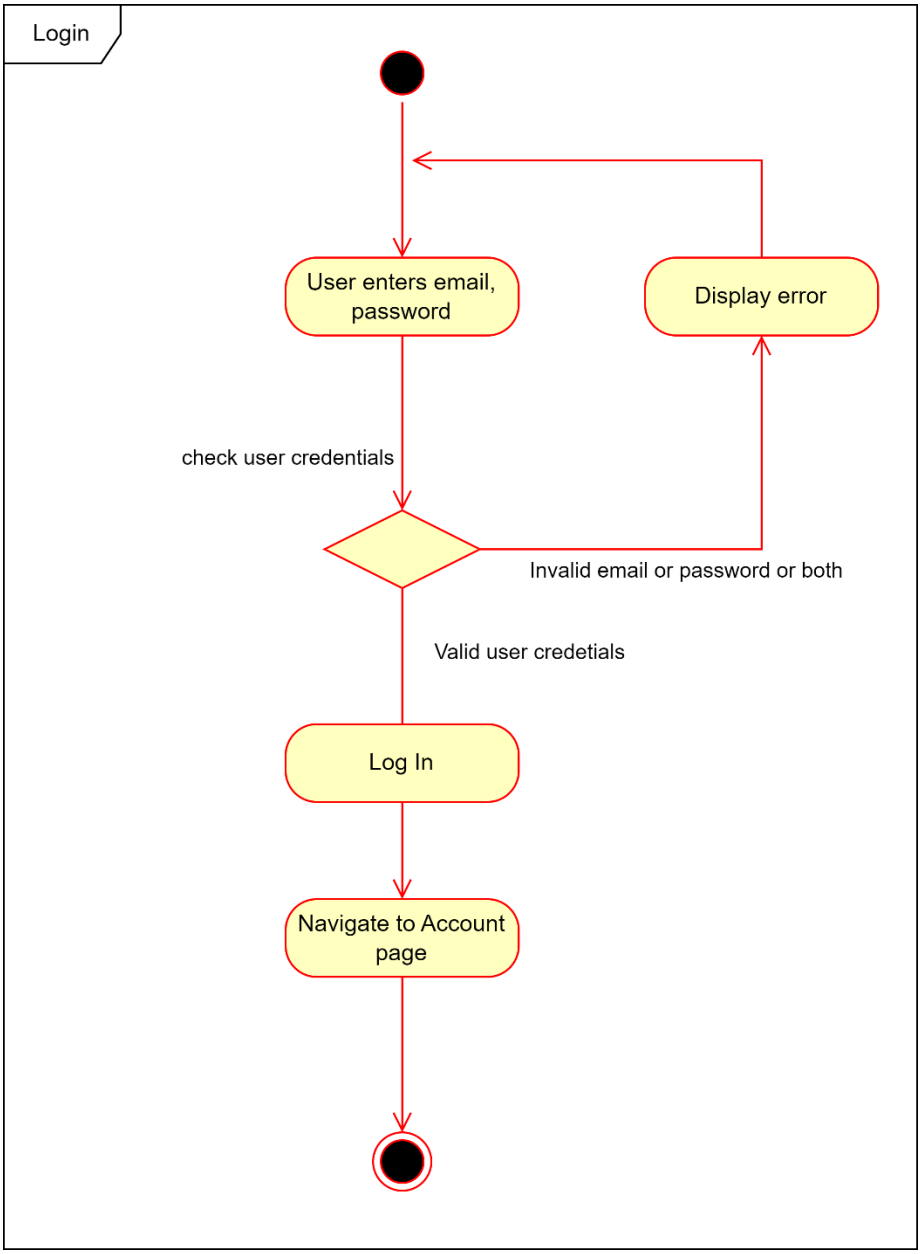


Figure 13 Customer Management (Activity diagram - login)

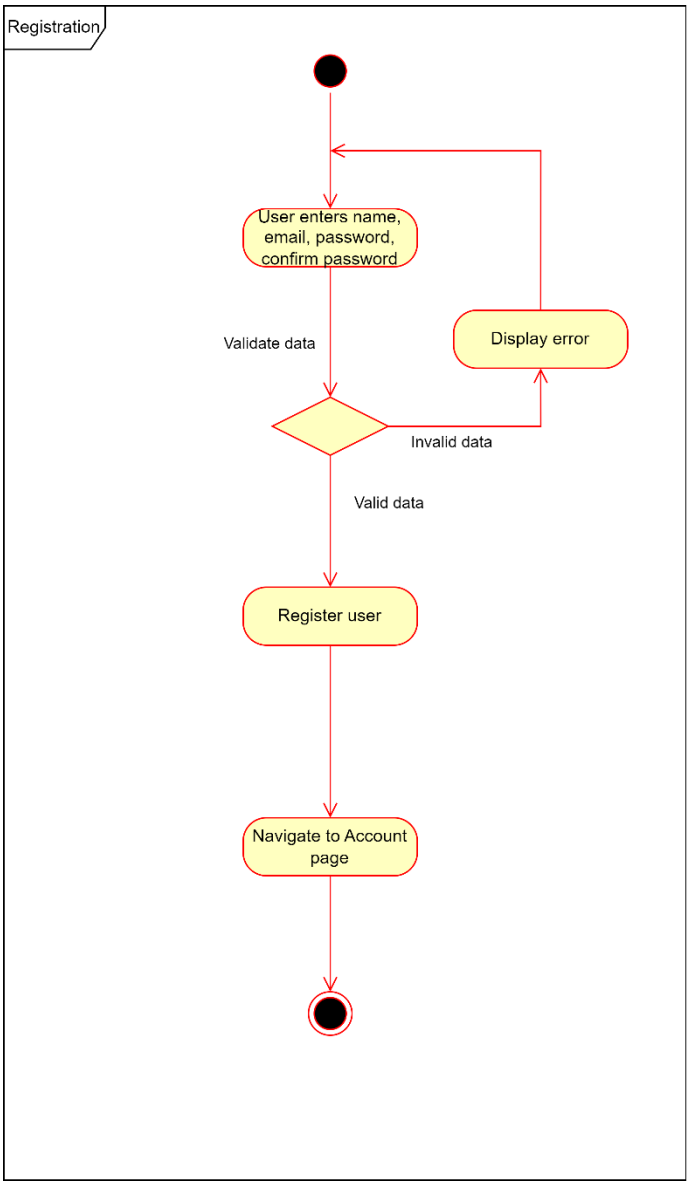


Figure 14 Customer Management (Activity diagram - Registration)

Finance Management

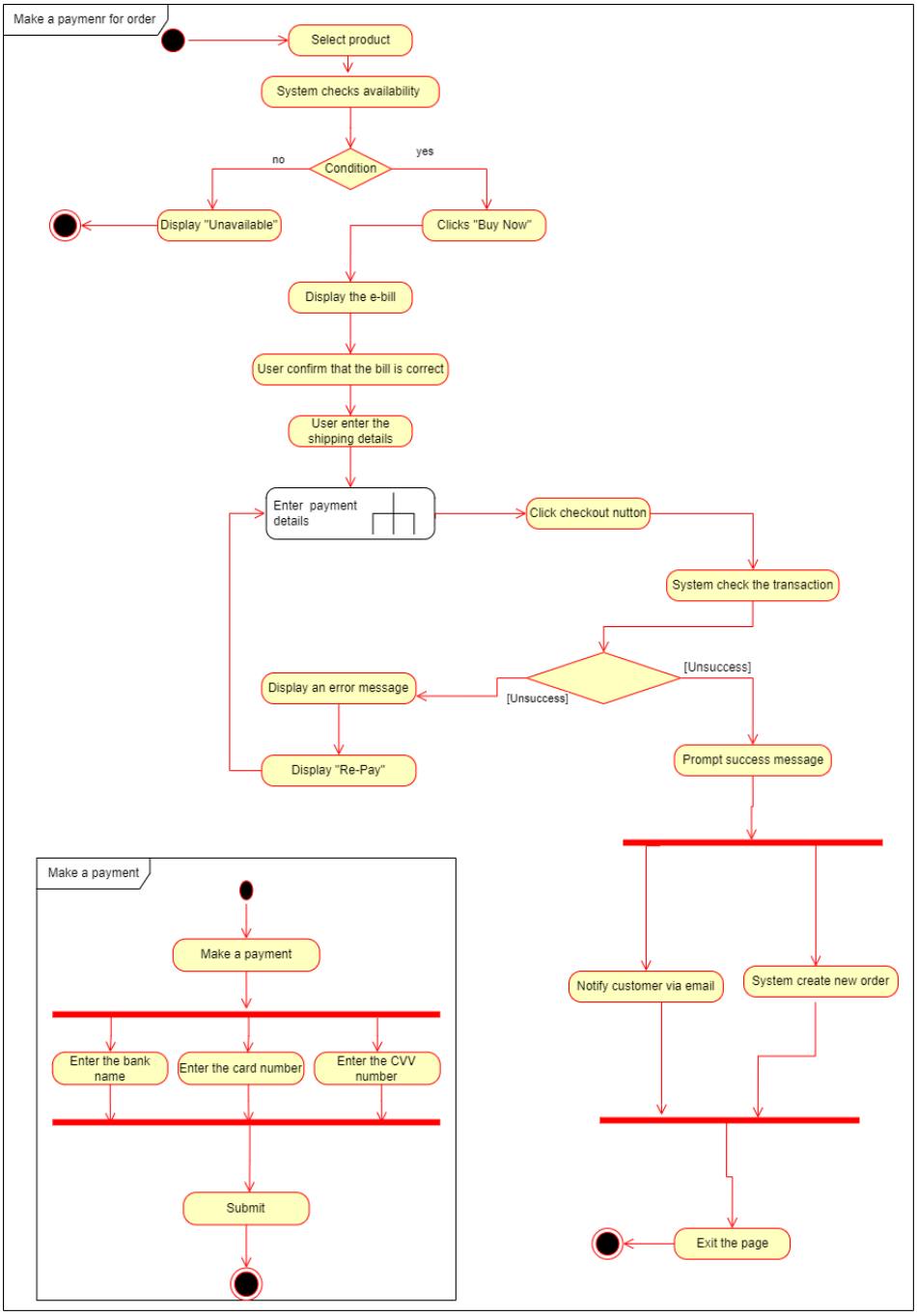


Figure 15 Finance Management (Activity diagram - Make a payment for order)

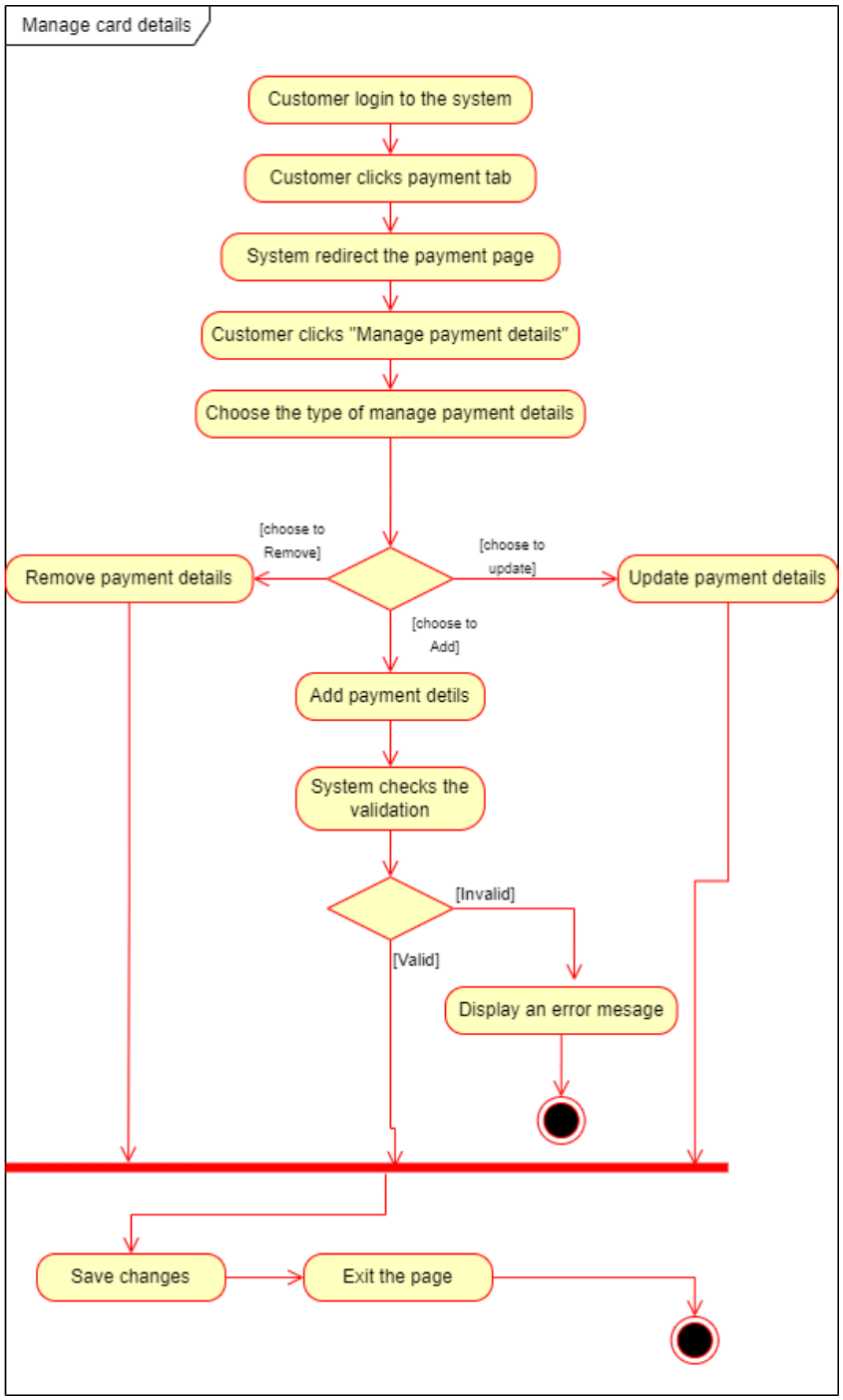


Figure 16 Finance Management (Activity diagram - Manage card details)

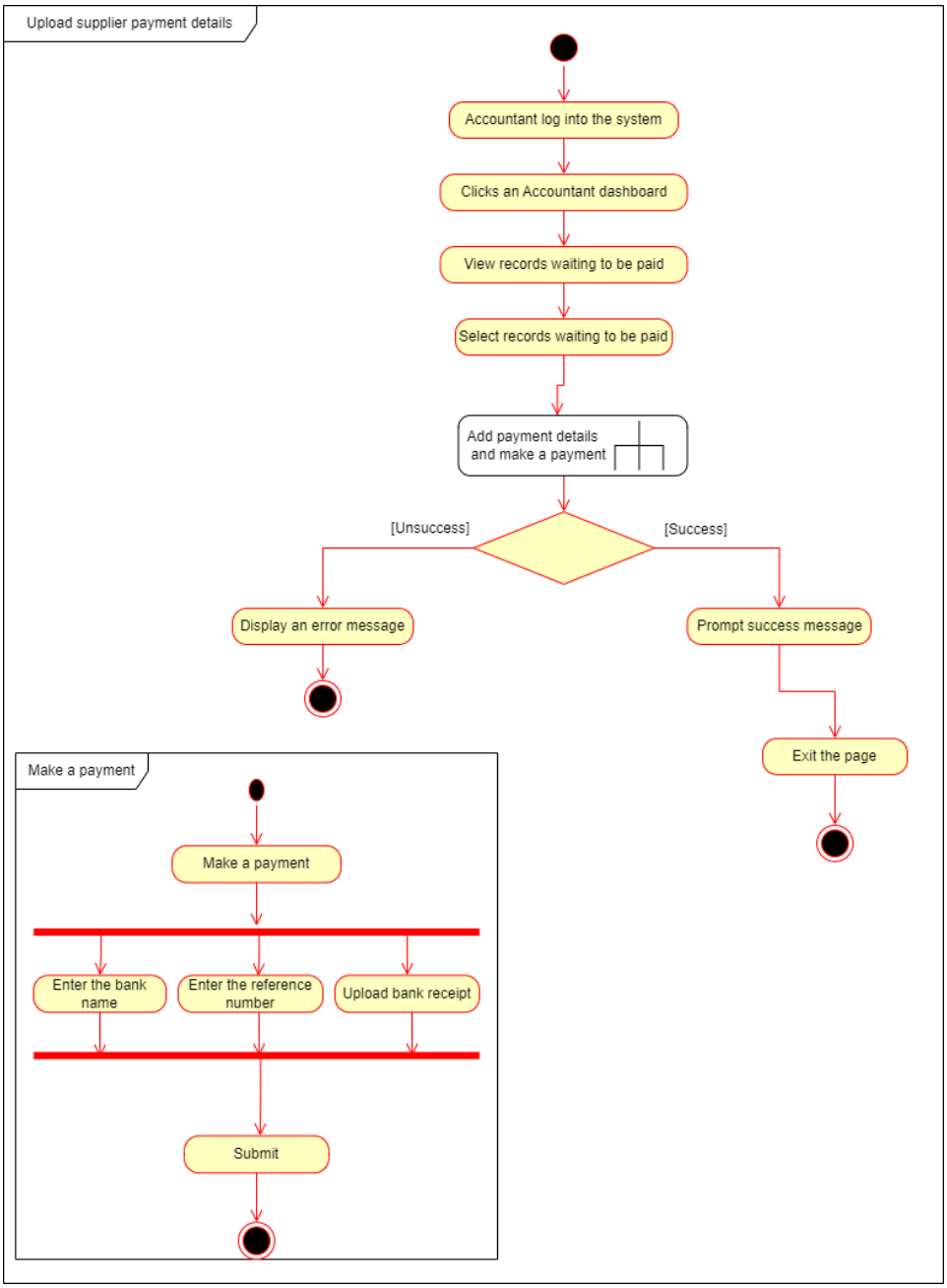


Figure 17 Finance Management (Activity diagram - Upload supplier payment details)

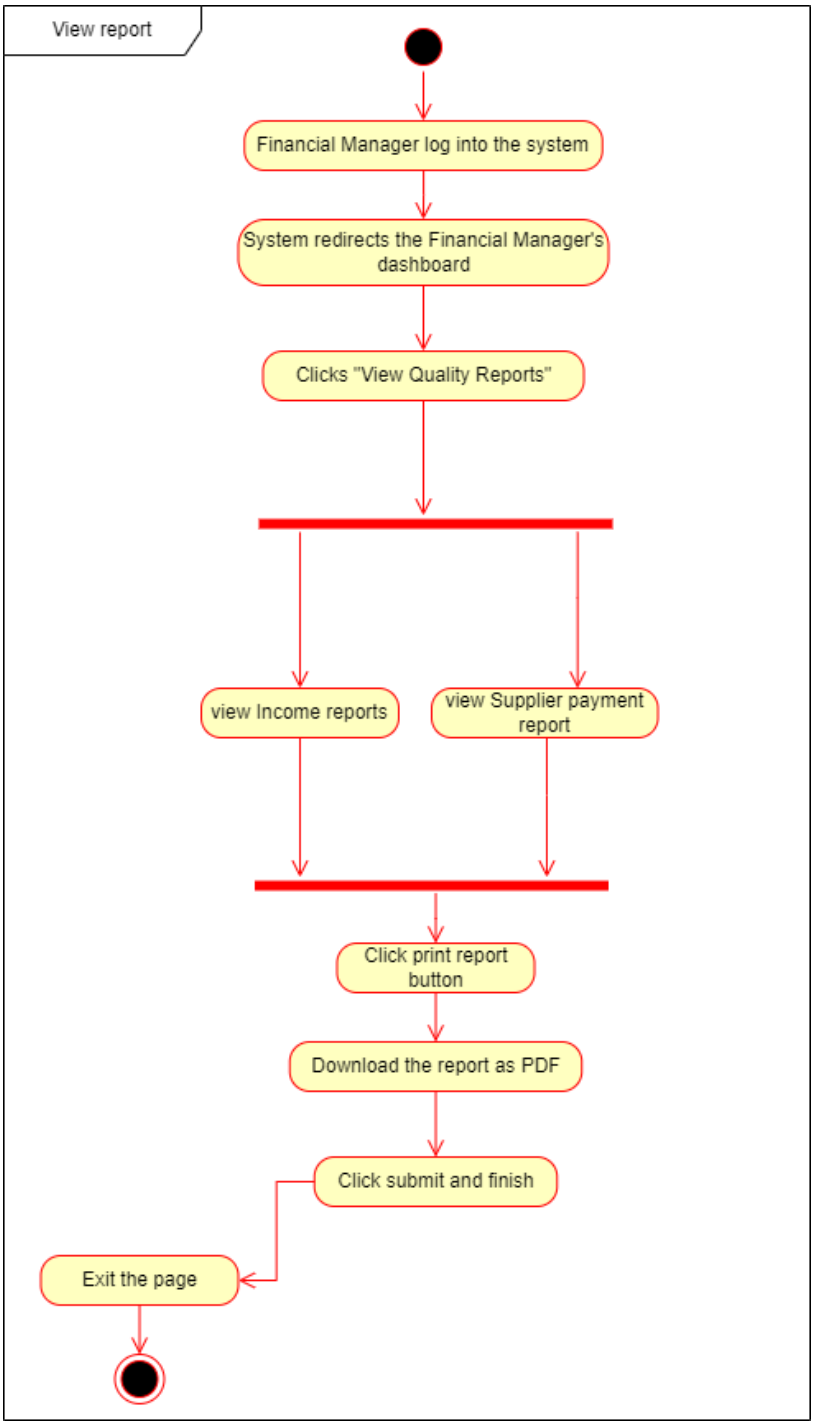


Figure 18 Finance Management (Activity diagram - View Report)

Supplier Management

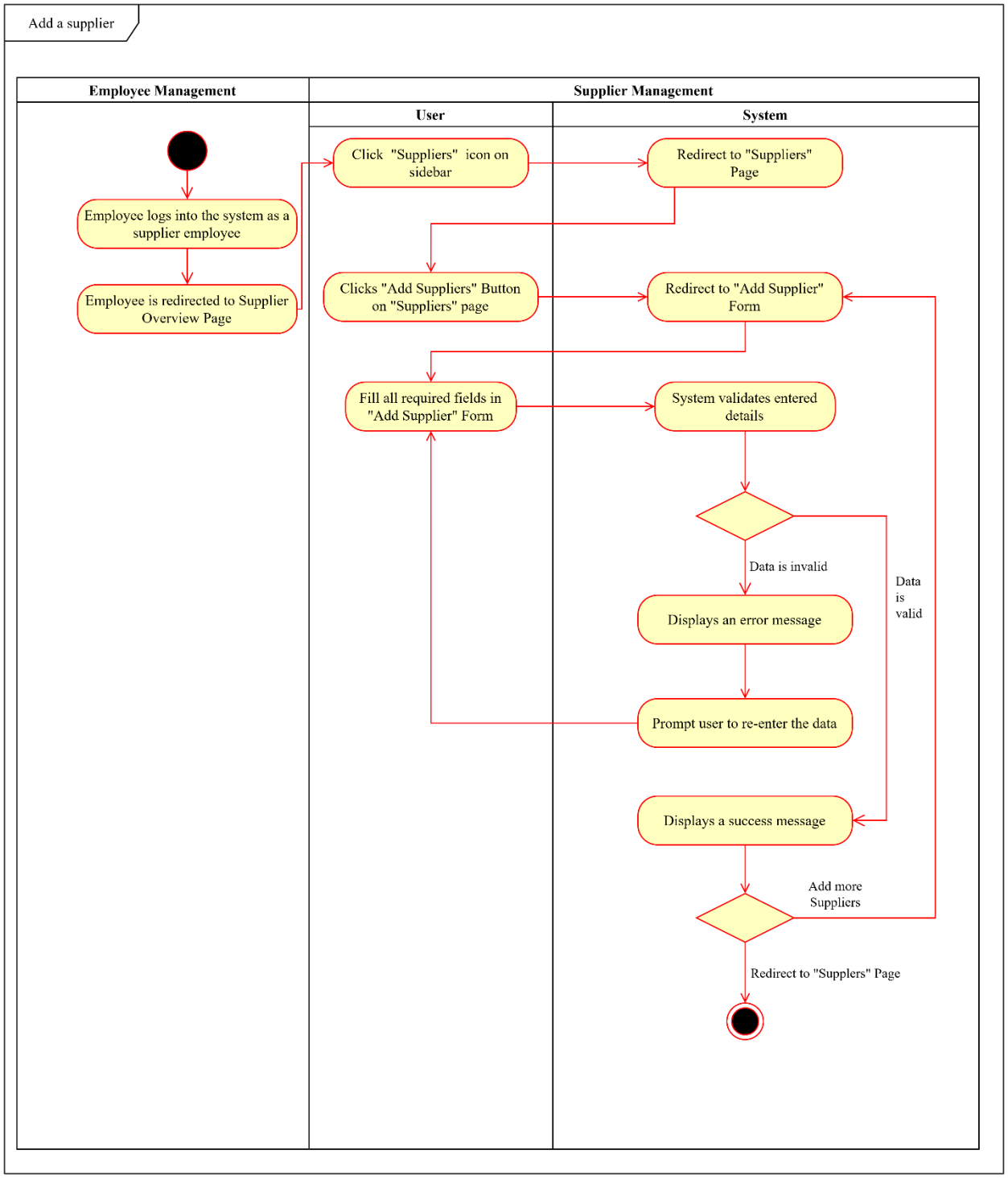


Figure 19 Supplier Management (Activity diagram - Add a supplier)

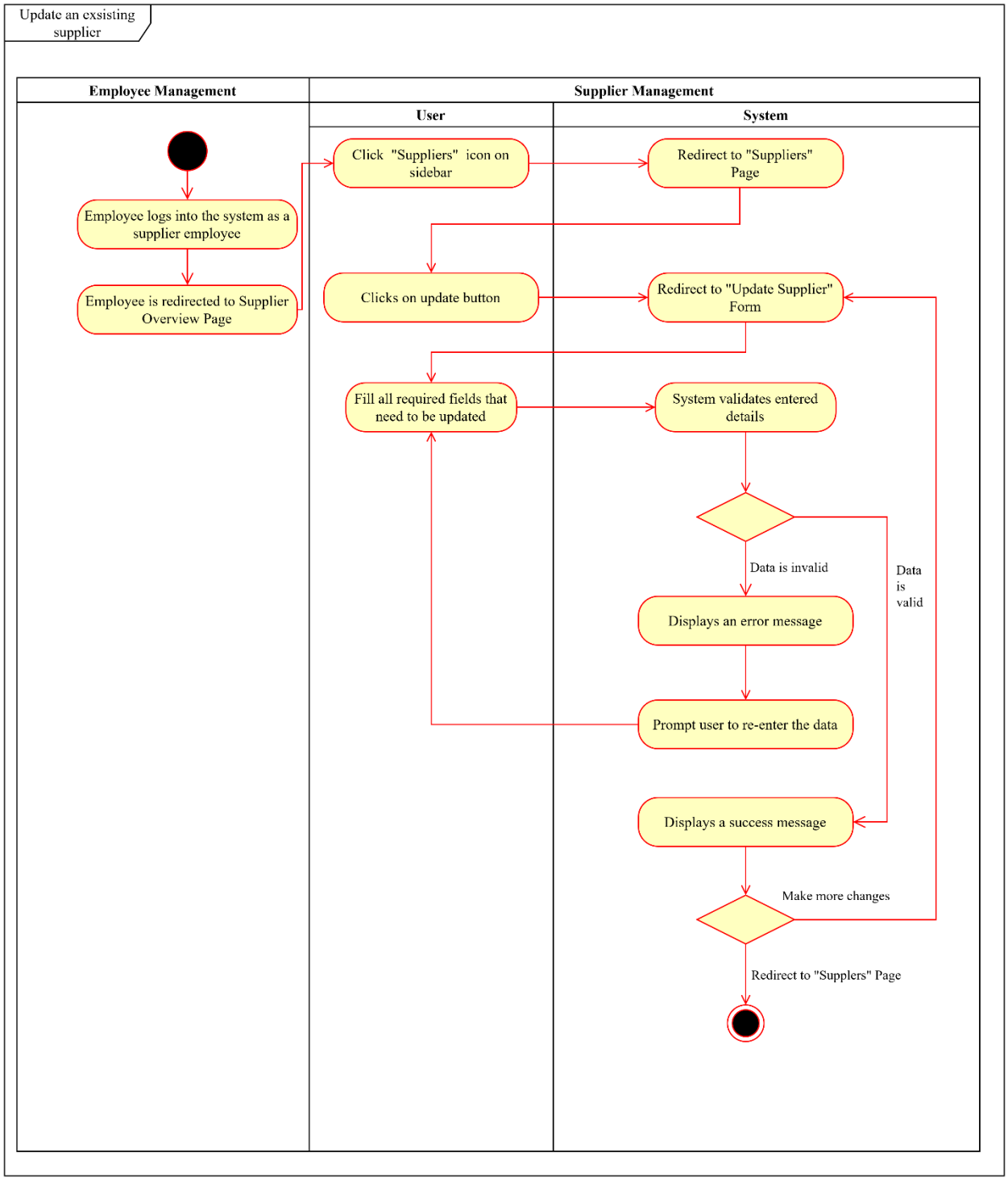


Figure 20 Supplier Management (Activity diagram - Update supplier)

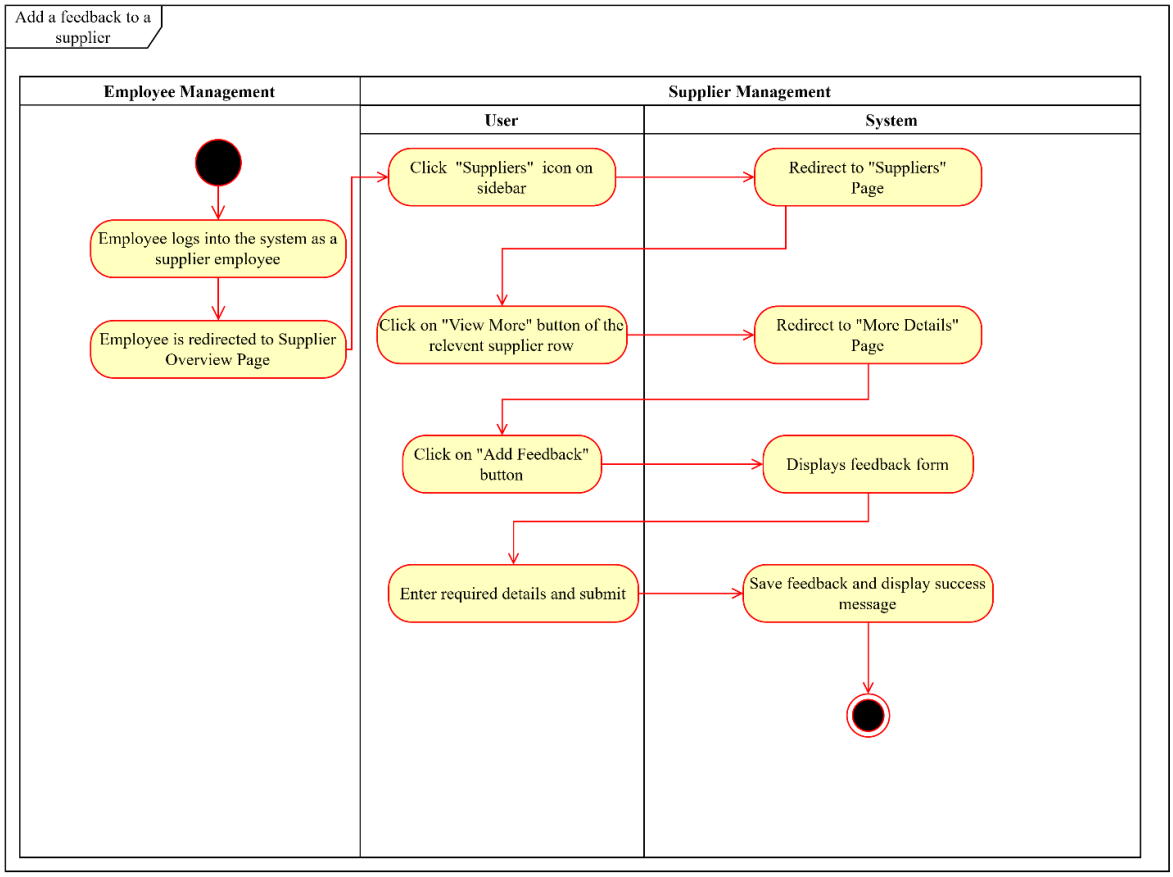


Figure 21 Supplier Management (Activity diagram - Add feedback)

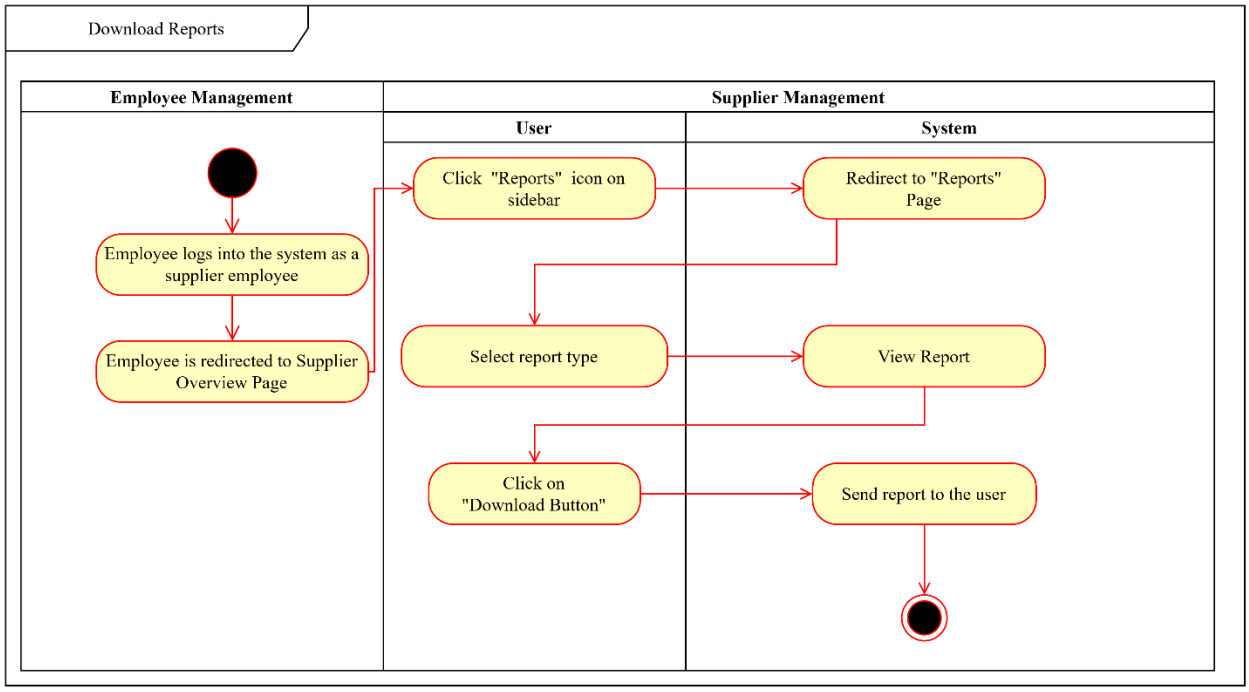


Figure 22 Supplier Management (Activity diagram - Download report)

Delivery Management

Employee Management

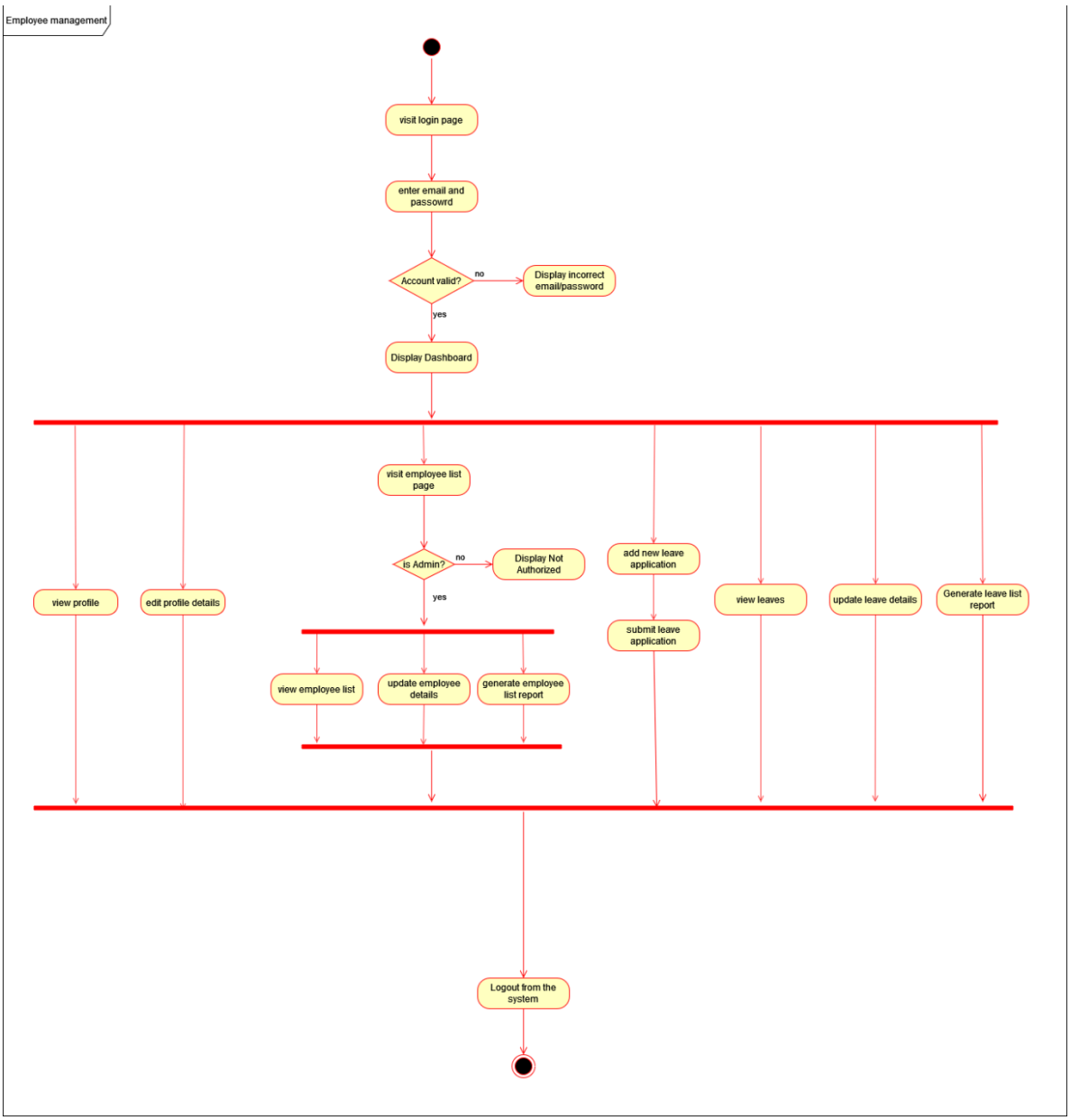


Figure 23 Employee Management (Activity diagram - Employee management)

Inventory Management

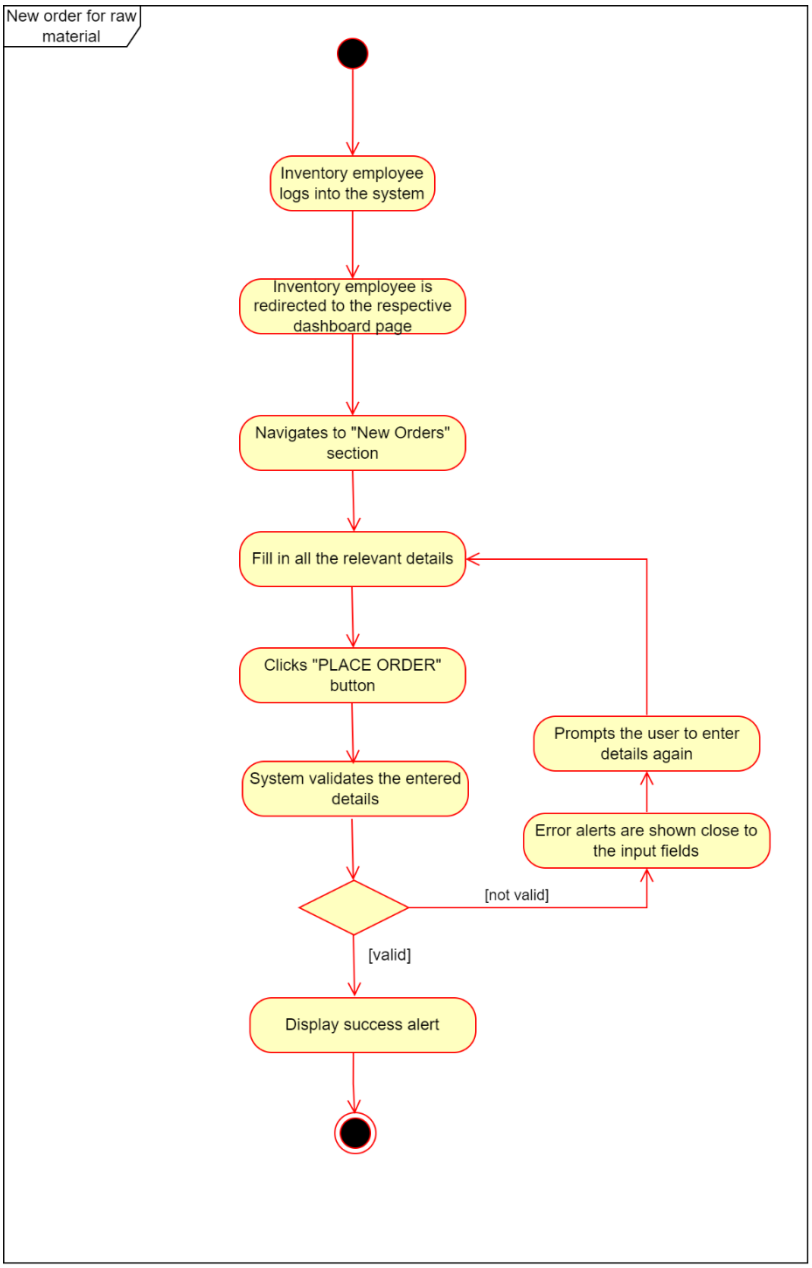
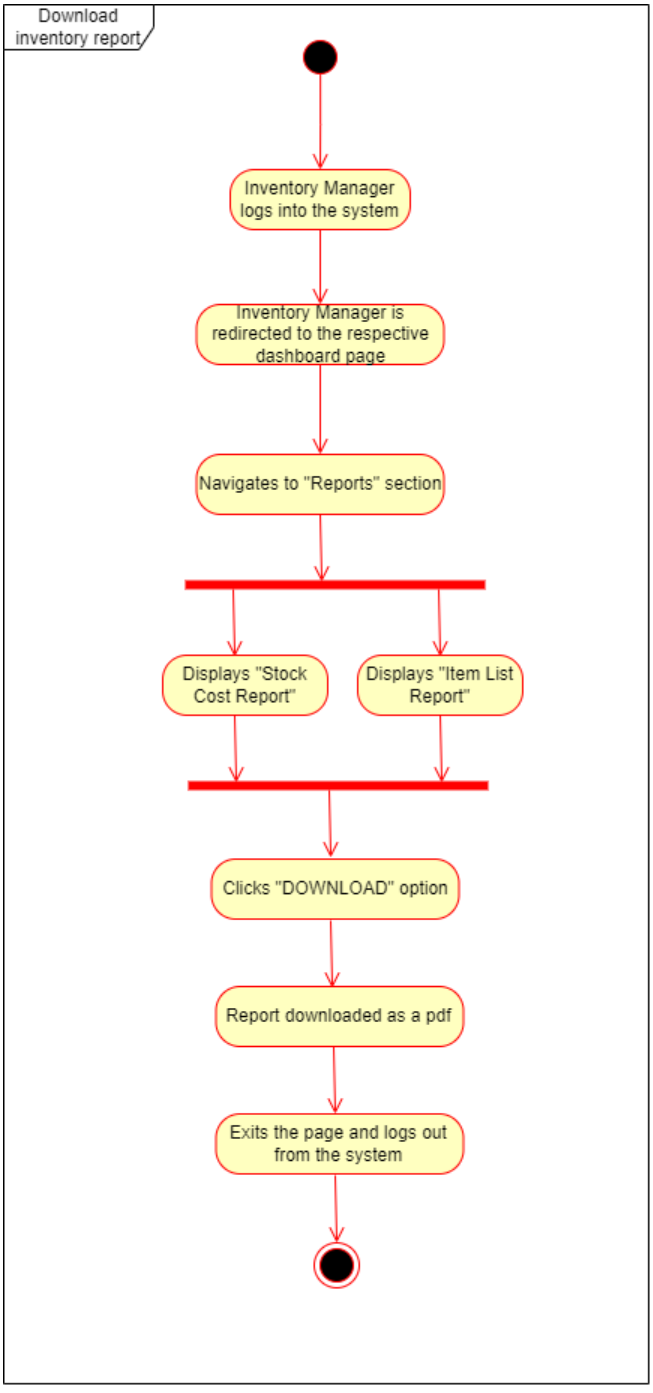


Figure 24 - Inventory Management (Activity diagram - New Order for raw material)



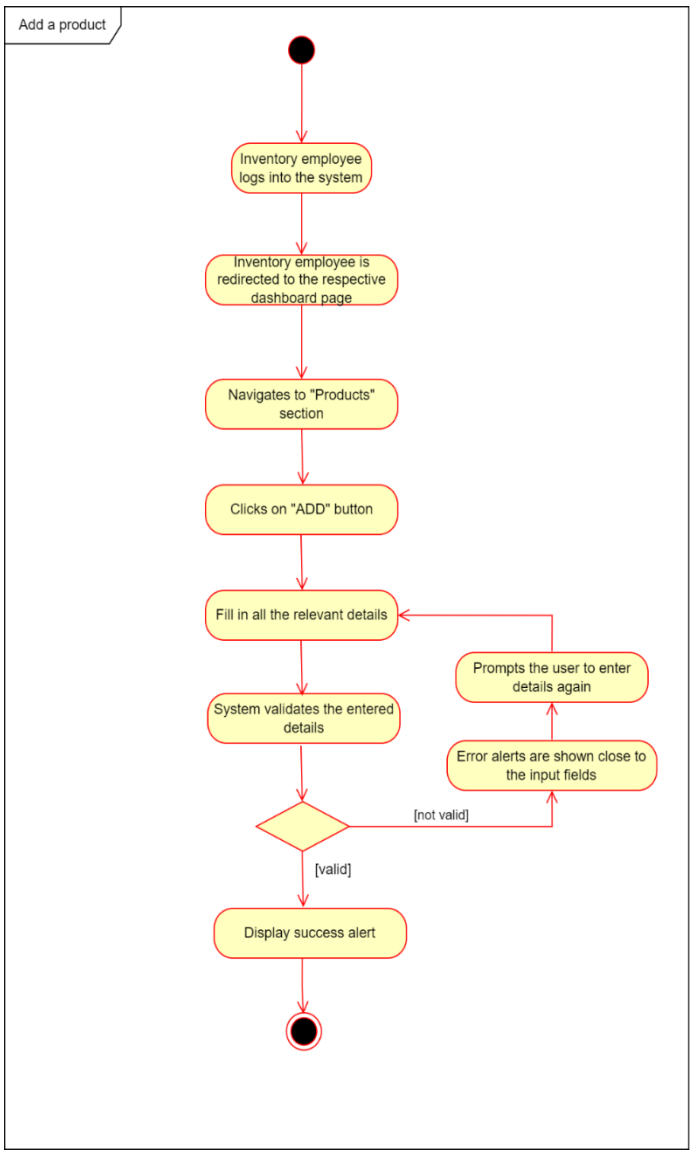


Figure 25 Inventory Management (Activity diagram - Add a product)

Figure 26 Inventory Management (Activity diagram - Download Inventory Report)

Databases

Order Management

Orders

oId	CustomerID	Status	DelevaryStatus	Reciever_Name	Shpiing_Address	Phone	Date

orderProducts

oId	ProductID	Quantity

Cart

Id	Item_number	quantity

Customer Management

SiteFeedback

FeedbackID	name	feedback	isApproved

user

userID	name	email	address	phone	password	lastLogin

Financial Management

Income History

Income_id	Order_id	total_amont	Date

customer Payment

Customer_id	Card_Number	Card_holder_name	Card_expiry_date	Card_CVC

Supplier Payment

Payment_ID	SupplierID	orderID	amount	transactionDate	PaymentReferencesNo	fileName

Factory Management

Factory

fId	fName	fLocation	numOfMachines	numOfVehicles	numOfEmployees	createdDate

Machine

mId	maxRunningHrs	product	mFactory	installedDate	totalProductions	totalRunningHrs

MachineStats (Machine Statistics)

currentDate	mId	product	completedProducts	ranHrs

RawData

currentDate	fId	rawMaterial	NoOfRaws

InventoryProductOrder

currentDate	product	productQuantity	status

Inventory Management

inventory_products

productNo	productName	unitPrice	reorderLevel	weightPerUnit	unitsInStock	description	image

inventory_raw_materials

rawMaterialNo	rawMaterialName	unitPrice	unit	qtyInStock	reorderLevel	supplierName

Delivery_Management

feedbackId	orderId	customerId	deliveryFeedback	qtyInStock	name	rating

Supplier Management

suppliers

_id	companyName	companyPhoneNo	brNo	companyAddress	contact Person Name	contact Person Phone No	contactPerson Email	raw Material	bank Name	bank Branch

Bank AccountNo	status

Employee management

Employee

_id	name	email	dob	role	address	phone	password

Leave

_id	description	startDate	endDate	type

Chapter 4 - Testing

Testing Methods

- Unit Testing
  - The smallest testable components of an application, known as units, are separately and independently tested for appropriate operation as part of the software development process is known as unit testing. Software engineers usually write and execute unit tests, which are automated. Unit testing's primary goal is to separate written code for testing to see if it functions as expected.

- Integration testing
  - Integration testing is the second phase in software testing in which individual software modules are combined and tested as a group. Main objective of integration testing is to determine whether a system or component fulfills with a list of functional requirements. Integration testing is done before system testing and after unit testing.

Customer Management

Table 1 Test Case - Customer management

Project ID: ITP_WD_B01_04	
Project Name: Web Centralized Platform for Jiffy (PVT) LTD	
Testing function: Register a new customer to the system.	
Test case ID: 01	Test case designed by, ID: IT21013928 Name: W. U. Piyumantha
Test Priority (High/Medium/Low)	Medium
Test description: When a customer visits to our site and needs to purchase a product, the customer should register to the system.	
Test Steps: 1: Visit to the home page. 2: Click on login button in the home page. 3: Click on the sign-up button in the Login form. 4: Fill all the fields in the registration form with valid details. 5: Click on the Submit button.	

Test ID	Test Inputs	Expected Outputs	Actual Output	Result	Comments
01	Name Email Contact Number Password Confirm Password	All the customer details should be successfully validated and passed to the database. "Successfully Registered" alert will be show up on the screen.	All the customer details should be successfully validated and passed to the database. "Successfully Registered" alert will be show up on the screen.	Pass	Data successfully inserted to the database.
02	Email	Email is successfully validated and display a green tick at the corner of the field	Email is successfully validated and display a green tick at the corner of the field	Pass	

Project ID: ITP_WD_B01_04					
Project Name: Web Centralized Platform for Jiffy (PVT) LTD					
Testing function: Login					
Test case ID: 02	Test case designed by, ID: IT21013928 Name: W. U. Piyumantha				
Test Priority (High/Medium/Low)	High				
Test description: When a customer visits to our site and needs to purchase a product, the customer should log in to the system.					
Test Steps: 1: Visit to the home page. 2: Click on login button in the home page. 3: Fill all the fields in the registration form with valid details. 4: Click on the Login button.					
Test ID	**Test Inputs**	**Expected Outputs**	**Actual Output**	**Result**	**Comments**

01	Email Password	All the login credentials should be successfully validated. "Successfully Login" alert will be show up on the screen.	All the login credentials should be successfully validated. "Successfully Login" alert will be show up on the screen.	Pass	

Order Management

Table 2 Test Case - Order management

Test case ID: 01	**Test Designed By:** Thilakaratne S.P
Test Title: Checking order updating	**Test Designed Day:** 02/11/2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Thilakaratne S.P
Module Name: Control orders page	**Test Executed Day:** 03/11/2022
Description: Making sure updated order status visible to customer	
Preconditions:	
Test Steps: • Navigate to 'Control orders' page • Update a specific order • Navigate to customer's orders page • Check whether that updated order has updated	

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
01	01	Display 'Completed' on order status	Display 'Completed' on order status	Pass

Test case ID: 02	**Test Designed By:** Thilakaratne S.P
Test Title: Checking auto generating email	**Test Designed Day:** 02/11/2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Thilakaratne S.P
Module Name: Shopping cart page	**Test Executed Day:** 03/11/2022
Description: Making sure the product quantity that need to buy passing to the shopping cart	
Preconditions:	
Test Steps: • Navigate to 'Products page • Select a specific product • Select the quantity needs • Click Add to Cart • Navigate to Cart page and check whether the product quantity has added to the cart	

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
02	01	Display the right product quantity that selected in product page, in the shopping cart	Displayed the selected product quantity that selected in product page, in the shopping cart	Pass

Factory Management

Table 3 Test Case - Factory management

Test case ID: FM001	**Test Designed By:** Siriwardana S.M.K.S.
Test Title: Validating Factory ID	**Test Designed Day:** 03.11.2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Siriwardana S.M.K.S.
Module Name: Add Factory Page	**Test Executed Day:** 04.11.2022
Description: To make sure that Factory ID is in the required format.	
Preconditions:	
Test Steps: 1. Navigate to 'Add Factory' page via the side bar 2. Enter the Factory ID	

3. Fill the rest of the fields 4. Click ‘Submit’ Button

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
FM001	FAC001	Redirect to the ‘Factory list’ page and display details of all factories	Redirect to the ‘Factory list’ page and display details of all factories	Pass
FM001	FAC2000	Redirect to the ‘Factory list’ page and display details of all factories	Redirect to the ‘Factory list’ page and display details of all factories	Pass
FM001	(empty)	Display ‘Please fill out all fields’ message	Display ‘Please fill out all fields’ message	Pass
FM001	FAC001	Display ‘Factory ID already exists’ message	Display ‘Factory ID already exists’ message	Pass
FM001	Fa00	Display ‘Factory ID must be longer than 6 characters’ message	Display ‘Factory ID must be longer than 6 characters’ message	Pass

Test case ID: FM002	**Test Designed By:** Siriwardana S.M.K.S.
Test Title: Validating Machine ID	**Test Designed Day:** 03.11.2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Siriwardana S.M.K.S.
Module Name: Add Machine Page	**Test Executed Day:** 04.11.2022
Description: To make sure that Machine ID is in the required format.	
Preconditions:	
Test Steps:	

1. Navigate to ‘Add Machine page via the side bar
2. Enter the Machine ID
3. Fill the rest of the fields
4. Click ‘Submit’ Button

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
FM002	MAC200	Redirect to the ‘Machine list’ page and display details of all factories	Redirect to the ‘Machine list’ page and display details of all factories	Pass
FM002	MAC1230	Redirect to the ‘Machine list’ page and display details of all factories	Redirect to the ‘Machine list’ page and display details of all factories	Pass
FM002	(empty)	Display ‘Please fill out all fields’ message	Display ‘Please fill out all fields’ message	Pass
FM002	MAC200	Display ‘Machine ID already exists’ message	Display ‘Machine ID already exists’ message	Pass
FM002	Ma345	Display ‘Machine ID must be longer than 6 characters’ message	Display ‘Machine ID must be longer than 6 characters’ message	Pass

Test case ID: FM003	**Test Designed By:** Siriwardana S.M.K.S.
Test Title: Validating Machine search	**Test Designed Day:** 04.11.2022
Test Priority(High/Medium/Low): Medium	**Test Executed By:** Siriwardana S.M.K.S.

Module Name: Machine List page	**Test Executed Day:** 04.11.2022
Description: To make sure that Machines can be searched based on product which it creates.	
Preconditions:	
Test Steps: • Navigate to 'Machine list' page via the home page • Enter the product id in the search field • Waiting to result to be appear according to the typed product	

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
FM003	Pall	Display all the machines which create pallets	Display all the machines which create pallets	Pass
FM003	grow	Display all the machines which create growbags and grow blocks	Display all the machines which create growbags and grow blocks	Pass
FM003	asdkj	Display no results in the list	Display no results in the list	Pass
FM003	(empty)	Display all the machines available in the database	Display all the machines available in the database	Pass

Inventory Management

Table 4 Test Case - Inventory management

Test case ID: IM001	**Test Designed By:** Maharanhindage V.A.R IT21109126
Test Title: Validating product details for adding a product/updating an existing product	**Test Designed Day:** 03.11.2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Maharanhindage V.A.R

Module Name: New Product Page/Update Product Page	**Test Executed Day:** 03.11.2022
Description: To make sure that entered product details are valid and as expected	
Preconditions:	
Test Steps: 1. Navigate to 'New Product/Update Product" page under inventory management section in the side bar. 2. Enter/update relevant details of a product 3. Click "ADD/SAVE" button	

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
IM001-01 (Product Name)	123	Alert saying "Please enter a text for the product name"	Expected output	Pass
IM001-02 (Description)	4562	Alert saying "Please enter a text for the description"	Expected output	Pass
IM001-03 (Unti Price)	-870	Alert saying "Invalid value for unit price. Please enter a positive value"	Expected output	Pass
IM001-04 (Unit Price)	0	Alert saying "Invalid value for unit price. Please enter a positive value"	Expected output	Pass
IM001-05 (Reorder Level)	-10	Alert saying "Invalid value for reorder level.	Expected output	Pass

		Please enter a positive whole number”		
IM001-06 (Reorder Level)	13.5	Alert saying “Invalid value for reorder level. Please enter a positive whole number”	Expected output	Pass
IM001-07 (Weight per unit)	-5.7	Alert saying “Invalid value for weight per unit. Please enter a positive number”	Expected output	Pass
IM001-08 (Weight per unit)	0	Alert saying “Invalid value for weight per unit. Please enter a positive number”	Expected output	Pass
IM001-09 (Units in stock)	-20	Alert saying “Invalid value for units in stock. Please enter a positive whole number”	Expected output	Pass
IM001-10 (Units in stock)	13.5	Alert saying “Invalid value for units in stock. Please enter a positive whole number”	Expected output	Pass
IM001-11	.pdf	Alert saying “Please upload only	Expected output	Pass

(File upload type)		png/jpg/jpeg file types"		
IM001-12	Input an already existing product name	Alert saying "Failed to add product! Product name already exists"	Expected output	Pass
IM001-13	All fields/any one field kept empty	Alert saying "Please fill all empty fields"	Expected output	Pass
IM001-14	All entered values are valid	Alert saying "New product added successfully/ Successfully updated"	Expected output	Pass

Test case ID: IM002	**Test Designed By:** Maharanhindage V.A.R IT21109126
Test Title: Validating raw material details for adding a raw material/updating an existing raw material	**Test Designed Day:** 04.11.2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Maharanhindage V.A.R
Module Name: New Raw Material Page/Raw Material Overview Page	**Test Executed Day:** 04.11.2022
Description: To make sure that entered raw material details are valid and as expected	
Preconditions:	
Test Steps: 1. Navigate to 'New Raw Material/Raw Material Overview" page under inventory management section in the side bar. 2. Enter/update relevant details of a raw material	

3. Click “ADD/SAVE” button

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
IM002-01 (Raw material name)	123	Alert saying “Please enter a text for the raw material name”	Expected output	Pass
IM002-02 (Unit Price)	-1000	Alert saying “Please enter a positive value for the unit price”	Expected output	Pass
IM002-03 (Unit Price)	0	Alert saying “Please enter a positive value for the unit price”	Expected output	Pass
IM002-04 (Reorder Level)	-20	Alert saying “Reorder level cannot be negative. Please enter a positive value”	Expected output	Pass
IM002-05 (Supplier Name)	3487	Alert saying “Please enter a text for the supplier name”	Expected output	Pass
IM002-06 (Quantity in stock))	-14	Alert saying “Quantity in stock cannot be negative. Please enter a positive value”	Expected output	Pass
IM002-07	All fields/any one field kept empty	Alert saying “Please fill all empty fields”	Expected output	Pass

IM002-08	Input an already existing raw material name	Alert saying “Failed to add raw material! Raw Material name already exists”	Expected output	Pass
IM002-09	All entered values are valid	Alert saying “New raw material added successfully/Successfully updated”	Expected output	Pass

Test case ID: IM003	**Test Designed By:** Maharanhindage V.A.R IT21109126
Test Title: Delete button functionality for a product/raw material	**Test Designed Day:** 04.11.2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Maharanhindage V.A.R
Module Name: Product Overview Page/Raw Material Overview Page	**Test Executed Day:** 04.11.2022
Description: To make sure that a selected product/raw material gets deleted successfully	
Preconditions:	
Test Steps: 1. Navigate to ‘Product Overview/Raw Material Overview” page under inventory management section in the side bar. 2. Click “DELETE” button	

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
IM003-01	Clicks on “DELETE” button	Confirm dialog box pops up asking the user’s confirmation for the action	Expected output	Pass

IM003-02	User confirms the action	Confirm dialog box closes and an alert is displayed saying "Successfully deleted"	Expected output	Pass
IM003-03	User does not confirm the action	Confirm dialog box closes	Expected output	Pass

Test case ID: IM004	**Test Designed By:** Maharanhindage V.A.R IT21109126
Test Title: New order for a product/raw material	**Test Designed Day:** 05.11.2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Maharanhindage V.A.R
Module Name: New Orders Page	**Test Executed Day:** 05.11.2022
Description: To make sure that an order for a product/raw material is successfully cerated	
Preconditions:	
Test Steps: 1. Navigate to 'New Orders" page under inventory management section in the side bar. 2. Enter the relevant details 3. Click "PLACE ORDER" button	

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
IM004-01 (Raw material quantity)	0	Alert pops up saying "Please enter the required quantity"	Expected output	Pass
IM004-02 (Raw material quantity)	-8	Alert pops up saying "Please enter a positive value"	Expected output	Pass

IM004-03 (Product quantity)	0	Alert pops up saying "Please enter the required quantity"	Expected output	Pass
IM004-04 (Product quantity)	-10	Alert pops up saying "Please enter a positive value"	Expected output	Pass
IM004-05 (Product quantity)	12.5	Alert pops up saying "Please enter a positive whole number"	Expected output	Pass
IM004-06	All fields/any one field kept empty	Alert saying "Please fill all empty fields"	Expected output	Pass
IM004-07	All entered values are valid	Alert saying "Order for product/raw material created successfully"	Expected output	Pass

Financial Management

Table 5 Test Case - Financial management

Test case ID: FM001	**Test Designed By:** Gunasekara S.N.W
Test Title: Validate card expiry date	**Test Designed Day:** 29/09/2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Gunasekara S.N.W

Module Name: Add Customer payment	**Test Executed Day:** 10/10/2022
Description: Make sure as to whether the card expiry date is in the required format	
Preconditions: The user has to log in to the system	
Test Steps: • Navigate to 'Add customer payment' page via the user account page • Enter the expiry date • Fill the rest of the details • Click 'Submit' Button	

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
FM001	12/28	Display 'Payment details added' alert Message	Display 'Payment details added' alert Message	Pass
FM001	12F8	Display 'Invalid expiry date' alert Message	Display 'Invalid expiry date' alert Message	Pass
FM001	1228	Display 'Invalid expiry date' alert Message	Display 'Invalid expiry date' alert Message	Pass
FM001	10/22	Display the Card is expired' message	Display the Card is expired' message	Pass
FM001	(empty)	Display 'Please Fill Out This Field'	Display 'Please Fill Out This Field'	Pass

Test case ID: FM002	**Test Designed By:** Gunasekara S.N.W
Test Title: Validate payment receipt upload	**Test Designed Day:** 02/10/2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Gunasekara S.N.W
Module Name: Supplier payment page	**Test Executed Day:** 25/10/2022
Description: Make sure as to whether the uploading file type is in the required format	

Preconditions: The financial manager must log in to the system
Test Steps: • Navigate to ‘Supplier payment’ page • Select a unpaid payment • Upload the image file • Fill the rest of the details • Click ‘Submit’ Button

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
FM002	.jpg	Display ‘Payment details added’ alert Message	Display ‘Payment details added’ alert Message	Pass
FM002	.png	Display ‘Payment details added’ alert Message	Display ‘Payment details added’ alert Message	Pass
FM002	.csv	Display the ‘Invalid file type’ mssage	Display the ‘Invalid file type’ mssage	Pass
FM002	.rar	Display the ‘Invalid file type’ mssage	Display the ‘Invalid file type’ mssage	Pass
FM002	.pptx	Display the ‘Invalid file type’ mssage	Display the ‘Invalid file type’ mssage	Pass
FM002	(empty)	Display ‘Please upload the receipt	Display ‘Please upload the receipt	Pass

Test case ID: FM003	**Test Designed By:** Gunasekara S.N.W
Test Title: Validate card number	**Test Designed Day:** 05/10/2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Gunasekara S.N.W
Module Name: Customer account page	**Test Executed Day:** 01/11/2022
Description: Make sure as to whether the card number is in the required format	

Preconditions: The customer must log in to the system
Test Steps: • Navigate to the 'Update customer payment' page via the user account page • Enter the card number • Fill in the rest of the details • Click the 'Update' Button

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
FM003	4242424242424242	Display 'Payment details updated' alert Message	Display 'Payment details updated' alert Message	Pass
FM003	4242424242	Display 'Invalid card number' alert Message	Display 'Invalid card number' alert Message	Pass
FM003	424242424242aksj	Display 'Invalid card number' alert Message	Display 'Invalid card number' alert Message	Pass
FM003	(empty)	Display 'Please Fill Out This Field'	Display 'Please Fill Out This Field'	Pass

Employee management

Table 6 Test Case - Employee management

Test case ID: EM001	**Test Designed By:** Kumari. K.A.D.H
Test Title: Adding a new employee	**Test Designed Day:** 10/10/2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Kumari. K.A.D.H
Module Name: Add employee page	**Test Executed Day: 02**/11/2022
Description: Making sure as to whether the employee phone number is in the required format	
Preconditions: The employee must be logged in**.**The logged-in employee must be an Admin	
Test Steps: • Navigate to the 'Add new employee' page via the side navigation bar • Enter employee details • Click the 'Add' Button	

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
EM001	0702345678 (With ten numbers)	Display 'Employee added' alert message	Display 'Employee added' alert message	Pass
EM001	070234567878 (More than ten numbers)	Display 'Invalid phone number' alert Message	Display 'Invalid phone number' alert Message	Pass
EM001	079734567 (Less than ten numbers)	Display 'Invalid phone number' alert Message	Display 'Invalid phone number' alert Message	Pass
EM001	(empty)	Display 'can't keep empty'	Display 'can't keep empty'	Pass

Test case ID: EM002	**Test Designed By:** Kumari. K.A.D.H
Test Title: Applying for leave	**Test Designed Day:** 10/10/2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Kumari. K.A.D.H
Module Name: Apply for leave page	**Test Executed Day:** 02/11/2022
Description: Making sure as to whether all the fields not empty when submitting	
Preconditions: The employee must be logged in**.**	
Test Steps: • Navigate to the 'Apply for leave' page via the side navigation bar • Enter leave details • Click the 'Add' Button	

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
EM002	Description Start date End date Type	Display 'New leave successfully created' alert message	Display 'New leave successfully created' alert message	Pass

EM002	(empty)	Display ‘can't keep empty’ alert Message	Display ‘can't keep empty’ alert Message	Pass

Supplier management

Table 7 - Test Case - Supplier management

Test case ID: SM001	**Test Designed By:** Shavinda H.K.L (IT21012488)
Test Title: Validate supplier details (Add/Update)	**Test Designed Day:** 01.11.2022
Test Priority (High/Medium/Low): High	**Test Executed By:** Shavinda H.K.L (IT21012488)
Module Name: New supplier form/ Update supplier form	**Test Executed Day:** 01.11.2022
Description: To make sure whether entered supplier details are valid	
Preconditions: User must log in to the system with relevant user role.	
Test Steps: 1. Navigate to ‘Add Supplier/ Update Supplier” page under Supplier management section in the side bar. 2. Enter/update relevant details of a supplier 3. Click “ADD / UPDATE” button	

Test ID	Test Inputs	Expected Output	Actual Output	Result (Pass/Fail)
SM001_01	All fields are kept empty	Display “Please fill all fields” message	Display “Please fill all fields” message	Pass
SM001_02	Enter characters other than numbers in “Contact Number” Fields and Bank Acc. No. Field	Display ‘Invalid input format’ message at the bottom of the relevant field	Display ‘Invalid input format’ message at the bottom of the relevant field	Pass
SM001_03	Enter more than 10 numbers in “Contact Number” Fields	Display ‘Check the contact no. length’ message at the bottom of the relevant field	Display ‘Check the contact no. length’ message at the bottom of the relevant field	Pass
SM001_04	Enter an already existing “Supplier Name”	Display “This supplier is already existing” message	Display “This supplier is already existing” message	Pass
SM001_05	Enter valid data to all fields	Display “Supplier successfully added. Do you want to add more suppliers?” message	Display “Supplier successfully added. Do you want to add more suppliers?” message	Pass

Chapter 5 - Evaluation and Conclusion

The goal of this project was to create a full-stack web application that makes use of JavaScript's capabilities under MERN technological stack (MongoDB, Express.js, React.js and Node.js). Each core technologies involved in the development of the application were discussed followed by the implementation process with authentication/authorization from the perspectives of the frontend and backend, respectively. In the end the final product is an ERP system that benefits the stakeholders of Jiffy Products Ltd that includes personnel management, customer management, inventory management, order management supplier management, delivery management, finance management, and factory management.

We received positive feedback on the final product from the stakeholders mentioning how the application that was created met majority of the user's requirements, had a nice user interface that is simple to use, and even novice users can easily navigate the web application. However, there is still room for further developments and new features. Overall, the application met the requirement criteria that were predetermined from the start.

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